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J. RAMSBOTTOM, O.B.E., DR.SC., M.A., P.L.S.
KEEPER, DEPARTMENT OF BOTANY, BRITISH MUSEUM (NAT. HIST.).

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CONTRIBUTORS TO THIS VOLUME.

- | | |
|--|--------------------------------|
| ALSTON, A. H. G., M.A., F.L.S. | LIND, E. M., B.Sc., Ph.D. |
| ARMITAGE, E. | LIVENS, H. M. |
| BAKER, E. G., F.L.S. | LOUSLEY, J. E. |
| BANCROFT, H., Ph.D., F.L.S. | MARTIN, M. T., M.Sc., Ph.D. |
| BLACKBURN, K. B., D.Sc.,
F.L.S. | MELVILLE, R., Ph.D., F.L.S. |
| BOX, H. E. | NELMES, E. |
| BRITTON, C. E., A.L.S. | NORMAN, C., F.L.S. |
| BURKILL, I. H., M.A., Sec. L.S. | PHILIPSON, W. R., B.A. |
| BURTT, B. L. | POLUNIN, N., Ph.D., M.A. |
| CAMPBELL, M. S., F.L.S. | PUGSLEY, H. W., B.A., F.L.S. |
| CHANDLER, S. E., D.Sc., F.L.S. | RAMSBOTTOM, J., O.B.E., P.L.S. |
| CLARK, W. A., B.Sc., Ph.D. | RIDLEY, H. N., C.M.G., F.R.S. |
| COOK, R. B. | SPRAGUE, T. A., D.Sc., F.L.S. |
| CORNER, E. J. H., M.A., F.L.S. | STEARN, W. T., F.L.S. |
| DANDY, J. E., M.A., F.L.S. | STILL, A. L., B.A. |
| DELF, E. M., D.Sc. | TANDY, G., B.A., F.L.S. |
| DEHL, W. W. | TAYLOR, G., D.Sc., F.L.S. |
| DIXON, H. N., M.A., F.L.S. | THOMPSON, H. S., A.L.S. |
| ENELL, A. W., M.A., F.L.S. | TURRILL, W. B., D.Sc., F.L.S. |
| HEBLOP-HARRISON, H., M.Sc. | TUTIN, T. G., B.A. |
| HEBLOP-HARRISON, J. W.,
D.Sc., F.R.S. | VACHELL, E., F.L.S. |
| HOPE-SIMPSON, J. F. | WALTON, J., M.A., D.Sc. |
| JACKSON, A. B., A.L.S. | WATSON, E. V., B.Sc., Ph.D. |
| KUNDU, B. C., M.A. | WATSON, W., D.Sc., A.L.S. |
| LAMB, I. M., B.Sc., F.L.S. | WEISS, F. E., D.Sc., F.R.S. |
| | WILMOTT, A. J., M.A., F.L.S. |
| | YUILL, E. |

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PLANTS NEW TO, AND RARE IN, THE OUTER HEBRIDES
(v.c. 110).—I. FROM SOUTH UIST, ERISKAY, AND
FUDAY.

BY J. W. HESLOP-HARRISON, D.Sc., F.R.S., HELENA HESLOP-
HARRISON, M.Sc., R. B. COOKE, AND W. A. CLARK, B.Sc.,
Ph.D.

For five successive seasons members of the Department of Botany, King's College, University of Durham, have worked the Inner and Outer Hebrides, and we intend to produce a County Flora of v.c.'s 103, 104, and 110. This season no fewer than three expeditions were organized to explore the Outer Islands, with results so successful that we have now records for approximately 660 species from these isles. Many of these are entirely new to v.c. 110 and others rare in the area.

In this paper it is proposed to place on record the plants discovered on South Uist and the islands lying just southward which appear to be absent from published lists for v.c. 110. Further, we shall include species not previously reported from, or rare in, South Uist and its neighbours.

It must not be supposed that the present list exhausts even the rare plants noted, for that is far from being so. More particularly, we would draw attention to novelties in the way of a *Brassica* collected on cliff-ledges at 750 feet above sea-level and of a *Rumex* likewise found on crags. In addition, there remains a series of plants only a little less rare than those set out here, as well as a number of forms in various critical genera; these will be discussed in later papers.

*=Species or form new to v.c. 110. †=Described in 'The Vasculum,' xxiv. 116-17 (1938).

Thalictrum alpinum L. Very abundant on the northern slopes of Beinn Mhor, S. Uist.

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- **Draba incana* L. Local in sandy ground on the east side of Fuday.
Arabis hirsuta Scop. Also on Fuday.
Cochlearia alpina Wats. On the cliffs on Beinn Mhor, S. Uist.
 **Viola silvestris* Lam. Several plants in flower on the "machair" between Howbeg and Ormaclett Castle, S. Uist.
 **V. agrestis* Jord. var. *segetalis* Jord. In sandy rye-fields, and others lying fallow just north of Loch a' Mhoil, S. Uist.
Elatine hexandra DC. In Loch Ollay, S. Uist.
Hypericum elodes L. In a ditch on the main road north of Lochboisdale and in a small burn on the lower slopes of Sheaval, S. Uist.
Radiola linoides Roth. Locally abundant along Loch Eynort, S. Uist, and along the north-east coast of Eriskay, in each place forming an important element of the turf.
 **Trifolium procumbens* L. Rare on path-sides south of Loch Altabrug, S. Uist.
Medicago lupulina L. Near Stoneybridge, S. Uist.
 **Vicia Orobus* DC. Very rare and local, on a sunny precipitous cliff on the east side of Eriskay.
 †*Rosa Sherardi* var. *Cookei* H.-Harrison. Locally common in the southern areas of S. Uist, especially around Loch Boisdale; also known from Eaval, N. Uist. This is a very distinct, endemic form of *R. Sherardi*.
 **Alchemilla minor* Huds. On rocky slopes near the sea on the east coast of S. Uist.
 **Agrimonia odorata* Mill. Just above the sea on a warm bank on the north side of Loch Boisdale, S. Uist.
 **Crataegus Oxyacantha* L. Almost certainly native on cliffs on the northern shores of Loch Boisdale.
 **Rubus dumoniensis* Bab. Rare near Maola Breac, S. Uist.
Saxifraga oppositifolia L. Very rare on cliffs in Hellisdale, S. Uist.
 **Callitriche autumnalis* L. In Loch Ollay, S. Uist.
 **Drosera longifolia* L. Locally plentiful on moorlands on S. Uist and Eriskay. All three *Droseras* are found on S. Uist, but *D. anglica* seems absent from Eriskay.
 **Epilobium tetragonum* L. Collected both on Eriskay and Fuday.
 **E. alsinefolium* Vill. Sparingly on a torrent running down Sheaval, S. Uist.
 **Sium erectum* Huds. Plentiful along the sides of a stream which runs into the sea near Heisinish, Eriskay.
 **Carum verticillatum* Koch. In damp grassy slopes on the southern shore of Loch Eynort, S. Uist.
Hedera Helix L. Quite abundant on cliffs on both sides of Loch Eynort, S. Uist.
 †*Lonicera Periclymenum* L. var. *Clarki* H.-Harrison. In exposed rocky places on S. Uist. A very striking variety with its broad, glabrous, subcoriaceous leaves.

- **Inula Helenium* L. Near Stoneybridge, S. Uist.
 **Arctium nemorosum* Lej. Frequent on sandy ground on S. Uist and Eriskay. On the latter island, owing to its compact habit and the bright colour of its flowers, it is an attractive plant.
Naussurea alpina DC. On rocks north of Beinn Mhor, S. Uist.
 **Gentarea nemoralis* Jord. Locally common in well-drained soil on S. Uist, Eriskay, and Fuday.
 **Leontodon taraxacoides* Lacaita. In sunny dry habitats on all three islands.
 **Paraxacum laevigatum* DC. On the "machair" between Bornish and Stoneybridge, S. Uist.
 **Gampanula rotundifolia* L. var. *speciosa* More. On Fuday; only the type on S. Uist.
Arctostaphylos Uva-ursi Spreng. On rock ledges on the north sides of Loch Eynort and Loch Boisdale.
Samolus Valerandi L. Quite common on the shores of Lochs Bornish, Ollay, and Ardvule, S. Uist.
Anagallis arvensis L. Obviously native on the sand-dunes on Fuday.
Gentunculus minimus L. Here and there in damp places on S. Uist and Eriskay.
 **Gentiana baltica* Murb. Grassy places near the sea on S. Uist and Eriskay.
 **Galystegia sepium* Br. In dune hollows near Daliburgh, S. Uist.
G. Soldanella Br. In one station on the sandy stretch on the west coast of Eriskay. Locally, there is a tradition that Prince Charlie brought some seed from France which he sowed when he landed. The natives believe that it will grow nowhere else.
Orobancha rubra Sm. Parasitic on thyme on S. Uist, Eriskay, and Fuday; some of the specimens observed were of enormous size.
Ajuga pyramidalis L. Locally plentiful on steep slopes north of Loch Eynort and Loch Boisdale, S. Uist.
Oxyria digyna Hill. Common on the mountains in the north of S. Uist.
 **Polygonum aequale* Lindman. Scattered on S. Uist and Eriskay.
Betula pubescens Ehrh. In a small, perfectly natural wood on the north side of Loch Eynort, S. Uist.
Salix alba L. On an island in a loch south of Howmore, S. Uist; alleged by the natives to have drifted ashore from the sea!
S. Andersoniana Sm. Rare, and always distorted, along moorland streams in S. Uist.
S. phylicifolia L. Well distributed on S. Uist, but often in suspicious localities.
S. herbacea L. Not rare on the mountains of S. Uist.

- **Anacamptis pyramidalis* Rich. Grows mingled with the fine variety *†fudayensis* H.-Harrison, in the southern half of Fuday, where it is not rare in sandy soil.
- **Gymnadenia conopsea* Br. On the east side of Fuday.
- **Leucorchis albida* Mey. In moist peaty ground near Loch a' Chlachain, S. Uist.
- Platanthera bifolia* Reich. Rare on Cas fo Dheas, S. Uist.
- **Sparganium neglectum* Beeby. Lochs near Stoneybridge, S. Uist.
- **Potamogeton praelongus* Wolf. In Loch Kearsinish, S. Uist.
- **P. angustifolius* Bercht. & Presl. In Loch Ollay, S. Uist.
- **Cladium Mariscus* Br. In a lochan on Eriskay.
- Scirpus Tabernaemontani* Gmel. In the same loch near Daliburgh, S. Uist, as *Cicuta virosa*.
- **S. compressus* Pers. On marshy ground near the two species just named; its distribution in the British Islands resembles that of *Cicuta virosa*.
- **Carex rupestris* All. On the mountain massif of S. Uist.
- C. rigida* Good. Not rare in the same areas.
- **C. rariflora* Sm. On the damp upper slopes of Beinn Mhor, S. Uist.
- **C. remota* L. South side of Loch Eynort, S. Uist.
- **Alopecurus alpinus* Sm. On the slopes of Beinn Mhor, S. Uist; very rare.
- **Deschampsia setacea* Richter. Not at all rare in and near lochs in the centre of S. Uist; especially fine in a small loch near Loch a' Chlachain.
- **Poa palustris* L. Amongst *Iris* growing on swampy ground between Stoneybridge, S. Uist, and the sea-shore.
- **Glyceria fluitans* Br. A fine viviparous form grows in a ditch near Bornish, S. Uist.
- **Festuca pratensis* Huds. On path-edges between Stoneybridge and Howmore, S. Uist.
- **Polystichum aculeatum* Roth. On the northern slopes of Hellisdale, S. Uist.
- Equisetum pratense* Ehrh. On the shores of Loch Ollay, S. Uist.

THE OCCURRENCE OF *ARENARIA NORVEGICA* GUNN.
AND *THLASPI ALPESTRE* LINN. ON RHUM (v.c. 104)
AND *CAREX HALLERI* GUNN. ON NORTH UIST
(v.c. 110).

BY WILLIAM A. CLARK, B.Sc., PH.D.
(Dept. of Botany, King's College, University of Durham).

FOR the past five years certain members of the staff of the Department of Botany, King's College, University of Durham,

have been investigating the Flora of the Inner and Outer Hebrides. This summer further visits were made to certain Inner and Outer Islands. It is thought expedient that the facts concerning certain species be placed on record without delay, since they are all new and important county records.

The new and third station for *Arenaria norvegica* Gunn. in Britain is situated on the mountain massif in Rhum at an elevation of 1500 feet. On the flat, bare, rocky plateau which forms the top of the south part of this area, the plant is to be found in considerable quantity wherever the weathered rock débris is damp enough to afford it a footing. The discovery of a new station for this very rare plant is a timely one, in view of the recent reports that it is now verging on extinction in the mainland station at Inchnadamph, W. Sutherland, discovered by Gray in 1887.

Outcrops of mugearite, at an altitude of 1250 feet, on the southern slopes of Fionchra provided the newly discovered station for *Thlaspi alpestre* L. on Rhum. In addition, it was collected later at a height of about 900 feet in a gully in the sea-cliffs which form the western face of Bloodstone Hill. In both of these stations the plant was in considerable quantity and, at the time my collections were made, was fruiting abundantly.

The third and last of these species, *Carex Halleri* Gunn., turned up in a batch of Carices I collected from gullies in the cliffs situated on the north side and immediately below the summit of Eaval (1138 feet), North Uist. This rarity is new to v.c. 110, and its detection there represents a very considerable extension of its known range, as it had been reported previously only from v.c.'s 88, 89, and 90.

NOTES ON THE FLORA OF BARRA,
OUTER HEBRIDES.

BY E. V. WATSON, B.Sc., PH.D.

IN the course of three expeditions organised by the Edinburgh University Biological Society in the summers of 1935, 1936, and 1937, respectively, to the Island of Barra in the Outer Hebrides, a fairly detailed study has been made of the Phanerogams of Barra and a few observations made on species of interest occurring on some of the adjacent small islands of the Barra group. It is hoped soon to publish a full account of the results obtained since 1935 (cf. Proc. Roy. Phys. Soc. Edin. xxii. 5, 1936, for preliminary report), but to save undue delay some notes are given on certain species which seem to be of particular interest.

- Ranunculus acris* L. Two distinct forms found. One, with much-cut leaves and tall habit, occurred on roadside grass-land and pasture and has been identified as var. *Boreanus* Jord. (det. A. J. W.). The other, with less divided leaves and more stunted habit, was confined to sand-dunes. It has not been possible to refer it to any recognised variety.
- Coronopus procumbens* Gilib. (recorded in 1 †). Occurred in only one locality, growing on the side of the road at Northbay.
- Arabis hirsuta* Scop. A plant of fixed dune or "machair" on the Island of Fuday; interesting as absent from Barra itself.
- Cochlearia danica* L. (det. A. J. W.). Occurred locally on rocky parts of the coast.
- Raphanus Raphanistrum* L. var. *aureus* Wilmott (det. A. J. W.). Cultivated land.
- Polygala oxyptera* Reichb. (det. A. J. W.). All material of this genus collected has been found to be *P. oxyptera*. If present, *P. vulgaris* cannot be common.
- Cerastium tetrandrum* Curt. (det. A. J. W., rec. 1 and 2). Of local occurrence on the coast.
- Sagina maritima* G. Don (det. A. J. W.). A minute caespitose form of this species occurred on the cliffs at Greian Head; not found elsewhere on Barra.
- Elatine hexandra* DC. (det. A. J. W., rec. 1 and 2). Rare; recorded for Loch St. Clair and Lochan nam Faoileann.
- **Rubus iricus* Rogers var. *iricus* Rogers & Riddelsdell (det. W. W.) Not the only species present, but others require more material for confirmation.
- Rosa mollis* Sm. and the forma *caerulea* Woods.
- Rosa omissa* Desegl. and the var. *subrecta* Ley (all roses det. J. R. M.).
- Epilobium obscurum* Schreb. (det. G. M. A.). Widespread in damp places.
- Oenanche crocata* L. (rec. 1). Rare, apparently confined to one locality on the east coast.
- Leontodon autumnale* L. var. *sordidum* Bab. (det. A. J. W.). Sand dunes, Allasdale.
- Centunculus minimus* L. Rare; found in one locality only, on the east coast.
- Erythraea Centaurium* Pers. var. *conferta* Wheldon & Salmon. A stunted form of Centaury, widespread on sand-dunes in Barra, is probably referable to this variety (A. J. W.).
- Calystegia sepium* Br. (rec. 1). On a garden fence at Castlebay, and considered to be not truly wild.
- Euphrasia borealis* Towns. Probably rare.
- E. brevipila* B. & G. forma *subeglandulosa* Bucknall. Widespread.

† These numbers are those of the references at the end of the paper.

* New vice-county record.

- E. nemorosa* (Pers.) Lohr. (rec. 2). Not uncommon in damp pasture.
- E. confusa* Pugsley. Sand-dunes.
- E. occidentalis* Wettst. Widespread.
- E. foulaensis* Towns. Found in one locality only, in the extreme north of Barra.
- E. scotica* Wettst. (rec. 3). Rare.
- E. micrantha* Reichb. and forma *simplex* Pugsley. Moorland. (All *Euphrasia* species det. E. O. C.).
- Orobancha rubra* Sm. On *Thymus*, in rich pasture on the Island of Fuday; not found on Barra.
- Scutellaria minor* Huds. Like the last species, of interest in being found only on one of the adjacent islands immediately north of Barra; Island of Hellisay.
- Atriplex laciniata* L. (det. A. J. W.). A local plant of unfixed sand, chiefly in the north of Barra.
- Salix aurita* L. (rec. 1 and 2). Margins of lochs.
- Salix atrocinerea* Brit. auct. ang. Not common; edges of moorland.
- Salix atrocinerea* Brit. auct. ang. × *S. aurita* L. Growing in Northbay plantation only.
- S. arenaria* L. sensu Floderus. This low-growing willow was widespread on hillsides, especially about rocky outcrops. (All willows det. A. J. W.)
- **Anacamptis pyramidalis* Rich. On 14th July, 1936, the first specimen of this species found in the Outer Hebrides was found by Miss C. M. Cant on sandy pasture at Eoligarry, Barra. Only one further specimen was found (in the following year) on Barra itself, but it was discovered in great profusion by a party who visited the Island of Fuday on 18th July, 1936. It grew on the rich sandy pasture, or "machair," which in the west of Fuday reached a more luxuriant development than on Barra.
- Orchis purpurella* Stephenson × *O. elodes* Gris. (det. W. H.). Found on one occasion only, in damp pasture; both parent species widespread on Barra.
- **Gymnadenia conopsea* Br. This species was discovered growing in pasture on the Island of Fuday on 18th July, 1936. Not found in any part of Barra itself.
- Potamogeton gramineus* L.
- P. filiformis* Pers.
- P. Friesii* Rupr. (collected by Mr. A. J. Wilmott and kindly presented to the Edin. Univ. Biolog. Soc. Barra Herbarium). Loch Doirlinn.
- These three species were all comparatively rare (all det. J. E. D. and G. T.), and, although their precise distribution on the island is not yet fully known, they were

* New vice-county record.

almost if not entirely confined to the lochs in the south-west of Barra.

Scirpus Tabernaemontani Gmel. (rec. 1, 2). Rare; lochs in south-west and in marsh at Eoligaray.

Agrostis stolonifera L. var. *palustris* (Huds.) Farn. (det. W. R. P.). Apparently scarce, occurring locally in meadow pasture.

A. stolonifera L. var. *stolonifera* (L.) Koch (det. W. R. P.). Widespread, chiefly on sand-dunes and saltmarsh.

* *Agropyron junceum* Beauv. var. *megastachyum* (Fries) Almquist (confirmed by A. J. W.). A very distinctive plant; found only among *Ammophila* on sand-dunes at Eoligaray.

NOTE.—Any new records of flowering plants for vice-county 110 appearing in the list given in the 'Book of Barra,' or in the 'Natural History of Barra, O.H.,' and not mentioned in the present list, must be regarded as lacking confirmation.

On behalf of the Edinburgh University Biological Society, I desire to thank the following referees, who have kindly been responsible for the determinations after which their initials appear above:—Professor J. R. Matthews of the University of Aberdeen, Dr. George Taylor, Messrs. A. J. Wilmott, J. E. Dandy, and W. R. Philipson of the Department of Botany, British Museum, and Messrs. G. M. Ash, E. O. Callen, William Handyside, and William Watson.

In particular are we indebted to Mr. A. J. Wilmott and Miss M. S. Campbell for their constant co-operation and assistance.

I desire also to emphasise that the observations set forth here are the outcome of work by a team of Edinburgh botanists, and I gladly take this opportunity of expressing my thanks to them all, especially to my friends Messrs. H. W. B. Barlow and A. S. Boughey, Dr. Christine M. Cant, and Miss A. M. Macleod, without whose help both in the field and subsequently these notes would not have been possible.

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- (1) 'The Book of Barra.' By Compton Mackenzie, edited by J. L. Campbell. Routledge, 1936.
- (2) 'The Natural History of Barra, Outer Hebrides,' edited by J. E. Forrest, A. R. Waterston, and E. V. Watson. Proc. Roy. Phys. Soc. xxii. no. 5, 1936.
- (3) "Notes on British Euphrasias." By H. W. Pugsley, Journ. Bot. lxxiv. 71, 1936.

* New vice-county record.

NEW SPECIES AND VARIETIES OF *TRICHOSANTHES* LINN. FROM INDIA.

By B. C. KUNDU, M.A.

THE present paper deals with the description of a few new species and varieties of *Trichosanthes* L. from India. The species were detected whilst working in the Kew Herbarium on a revision of the Indian species of the genus *Trichosanthes*.

Trichosanthes pachyrrhachis, sp. nov.

Folia indivisa vel breviter lobata, membranacea; racemi masculi rhachis robusta, subanfractuosa, multiflora; flores bracteati; pedicelli brevissimi; calycis tubus subcylindricus, superne dilatatus; fructus ovoideo-ellipsoideus, apicem versus attenuatus, apice acuminatus, epicarpio tenuiter papyraceo; semina plana, basi truncata, apice bidentata.

Stem slender, deeply grooved, glabrous or slightly papillose. Leaves membranous, suborbicular or reniform, with a cordate-emarginate base densely covered with short hairs with occasional long ones on the upper surface, lower surface densely shortly pubescent, very shortly 3-5-lobed, lobes subacute; margin denticulate or dentate; 3.5-5 cm. long, 5-6.5 cm. broad, usually 3-nerved at the base, veins slender. Petiole slender, 2-3 cm. long, striate, sparsely papillose. Tendrils somewhat robust, grooved, puberulous, 3-fid. Flowers monoecious. Male raceme 10-16-flowered; rhachis robust, somewhat geniculate, sometimes nearly as thick as the stem, succulent, striate or grooved, glabrous, 7-11 cm. long, usually flowering from near the base. Pedicels terete, robust, erect, slightly puberulous, 3-6 mm. long. Calyx-tube short, dilated at the apex, about 13-20 mm. long, 4 mm. broad at the apex; teeth spreading, 1 mm. long. Petals oblong. Staminal filaments slender, very short, 1 mm. long; anther-head subquadrangular, 2.5-3 mm. long, 2.5 mm. broad. Female flowers not seen. Fruiting pedicel solitary, 2.5 cm. long. Fruit ovoid-ellipsoid, attenuate into an acuminate apex; epicarp thin. Seeds flattened, with undulate margins, truncate at the base, bidentate at the apex, 10-11 mm. long, 7 mm. broad, 2 mm. thick.

N.W. India, 1844, *M. P. Edgeworth*, 63 (type in Herb. Kew.); Mangalor, only male racemes (cultivated), 1847, *R. F. Hohenacker*.

This species differs from *T. cucumerina* L. in having undivided or very shortly lobed leaves, and in the common peduncle of the male raceme, which is robust, slightly geniculate and many-flowered, the flowers being bracteate. The fruit-wall of *T. cucumerina* is rather tough, while in this species it is thin. From *T. brevibracteata* (see below) it differs in the form of the leaves, in the many-flowered, robust, and succulent peduncle of the male

raceme, which is usually glabrous, and also in the structure of the fruit and seed. The above characters serve also to distinguish it from *T. anguina*.

***Trichosanthes brevibracteata*, sp. nov.**

Folia membranacea, 3-5-angulata vel brevissime 5-lobata, reniformia, apice acuta, basi cordato-emarginata, supra pilis minutis cum paucis longioribus vestita, subtus pubescentia; racemus masculus pauciflorus; pedicelli breves, minute bracteati; calyx puberulus; calycis tubus ab apice ad basin attenuatus; dentes breves, subulati vel triangulares.

Stem very slender, grooved, subglabrous. Leaves membranous, very thin, 3-5-angled or very shortly 5-lobed, reniform, apex acute, base cordate-emarginate, margin dentate; on the upper surface covered with minute hairs together with a few longer ones, on the lower surface pubescent; deep green on the upper surface, pale green on the lower surface; 3.5-7.5 cm. long, 4.5-9 cm. broad, 3-5-nerved at the base, veins very thin, prominent on the lower surface. Petioles slender, striate, 2-4.5 cm. long, papillose-puberulous with some long hairs. Tendrils very slender, 2-3-fid. Flowers monoecious or (?) dioecious. Male flowers in racemes. Rhachis bearing male flowers slender, striate, puberulous, 5-10.5 cm. long, at the apex 5-10-flowered. Pedicels slender, erect or spreading, puberulous, 5-15 mm. long. Calyx tubular, attenuate from the apex towards base, 14-18 mm. long, 3-4 mm. broad at the apex; teeth spreading, 1-1.5 mm. long. Petals oblong, 8-10 mm. long, 3 mm. broad. Filaments of the stamens slender, about 2 mm. long; anther-head oblong, 2.5 mm. long, 1-2.5 mm. broad. Pistillodes filiform, 12-13 mm. long. Female flowers not seen. Fruiting peduncles solitary, 8-10 mm. long. Fruit ellipsoid, attenuate into a conical apex, 3.5-4.5 cm. long, 1.5-2.5 cm. thick, with about 7-8 seeds. Seeds flattened, oblong, subglabrous on both surfaces, somewhat undulate at the sides, base and apex truncate, 10 mm. long, 6-6.5 mm. broad, 2 mm. thick.

Karnal, Punjab, 1885-1888, *J. R. Drummond*, 24669, 24979, 24988, 25000, 25003, 25006, 25010, 25031 (type), 25999.

Ahmedabad, July 1920, *L. J. Sedgwick* (type). N.W. India, *Thomson* s. n. (Herb. Hook. fil. et Thoms.).

This species differs from *T. cucumerina* L. in the form of the leaves and in having bracteate male flowers. The leaves are very characteristic and can be easily distinguished from those of allied species. They are usually very thin, angular or very shortly lobed; the margin is always dentate and the upper surface somewhat rough, being covered with short hairs with occasional long ones. From *T. anguina* L. it differs in the character of the leaves and of the fruit. It can easily be distinguished from *T. Horsfieldii*, the Philippine species in which

the female flowers are in short racemes, by the character of the leaves and in having solitary female flowers.

T. brevibracteata

var. **sublobata**, var. nov., a typo foliis majoribus breviter lobatis, bracteis crassioribus applanatis facile distinguitur.

Distinguished from the species by the following characters:

Leaves larger, shortly lobed, 7.5-10 cm. long, 9-15 cm. broad; margin denticulate; petioles robust, 2-7 cm. long; stems puberulous or somewhat villose. Tendrils 2-3-fid. Bracts although very short usually thicker than in the type, and somewhat flattened.

Quilon, June 1836, *Wight*. Cachar, June 1874, *Keenan*. Sangha Jungle, Karnal, Punjab, Sept. 1887, *J. R. Drummond*. Banda, N.W.P., Dec. 1902, *Mrs. A. S. Bell*. Nagpur-Wardha, C.P., Sept. 1912, *Haines* (type in Herb. Kew.).

T. brevibracteata

var. **longirostrata**, var. nov., a typo foliis majoribus angulato-lobatis denticulatis, petiolis villosis, fructibus longirostratis differt.

Stems and petioles villous. Leaves larger, 7.5-8 cm. long, 10 cm. broad, petiole 5-6 cm. long. Tendrils robust, 3-4-fid. Bracts more conspicuous than those of the type, up to 2 mm. long. Young fruit 5.5-6 cm. long, with a long beak.

Burma, 15 Aug. 1908, *J. H. Lace*, 6335 (type in Herb. Kew.).

***Trichosanthes khasiana*, sp. nov.**

Folia membranacea, ambitu ovato-suborbicularia, nervis supra leviter pilosa, subtus glaberrima, fere usque ad basin palmatim triloba, interdum lobis lateralibus basin versus breviter unilobulatis; lobi oblongo-lanceolati, apice acuminati, marginibus distanter denticulati; racemus masculus apice laxo pauciflorus; rhachis robustissima, interdum caule crassior; bractea glabra, ovata, subintegræ vel crenulatae, multinerviæ; calycis tubus ab apice ad basin attenuatus, puberulus; calycis dentes erecto-patuli, triangulari-lanceolati; ovarium fusiforme, glabrum; fructus oblongo-ellipsoideus, utrinque subacutus; semina ambitu irregularia, plus minusve ovato-oblonga, utrinque lævia.

Stem robust, elongate, angulate, grooved, glabrous. Leaves membranous, ovate-suborbicular in outline, slightly hairy on the nerves on the upper surface, glabrous on the lower surface, deeply palmately 3-lobed near to the base, sometimes with an additional short lobe on the side of each of the lateral ones, lobes oblong-lanceolate, apex acuminate, margin distantly denticulate, deep green on the upper surface, paler on the lower surface, 9-15 cm. long, 8-13 cm. broad, truncate or emarginate at the 3-nerved base, veins slender. Petiole robust, striate,

punctate or glabrous, 2.5–5 cm. long. Male raceme loosely few-flowered at the apex; rhachis very robust, sometimes stouter than the stem, grooved, glabrous, puberulous in the younger regions, 9–15 cm. long. Bracts glabrous, ovate, subentire or crenulate, multinerved, 2–4.5 cm. long. Calyx-tube attenuate from the apex towards base, puberulous, 4.5–5 cm. long, 8.5–10 mm. broad at the apex; teeth erect-spreading, triangular-lanceolate, 8–10 mm. long, 5–6 mm. broad at the base. Penduncle of the female flower 1.5–2.5 cm. long. Calyx-tube cylindrical; teeth spreading, subulate-dentate, 6–8 mm. long, 1.5–2 mm. broad at the base. Ovary fusiform, glabrous. Fruit oblong-ellipsoid, subacute at both ends, 11–12.5 cm. long, 3.5–5 cm. thick. Seeds irregularly shaped, somewhat ovate-oblong, smooth on both sides, 10–14 mm. long, 5–8 mm. broad, 2 mm. thick. Cotyledons thin.

Khasia mountains, alt. 2000–6000 ft., *Hooker & Thomson*, no. 11 (type in Herb. Kew.).

This species is related to *T. Wallichiana* Wight, from which it can be distinguished by the character of the leaves, fruit, and seeds; in *T. Wallichiana* the leaves are shortly villous-hirsute and very rough on the upper surface, the fruit is ovoid or subrotund with an acute or subacute apex (5–8 cm. long, 4–8.5 cm. thick) and the seeds are truncate at the base, very much swollen in the middle (15–18 mm. long, 7–12 mm. broad, and 6–9 mm. thick), and have thick oily cotyledons. It differs from *T. multiloba* Miq. in (i.) the deeply tri-lobed or sub-5-lobed leaves which are hairy at the nerves on the upper surface (in *T. multiloba* the leaves are always 7–9-lobed with both the surfaces glabrous and smooth); (ii.) the ovate, subentire or crenulate, multinerved larger bracts (in *T. multiloba* the bracts are oblong-lanceolate, subulate-crenulate, penninerved, and shorter (1–1.5 cm. long)); (iii.) the structure of the fruit (in *T. multiloba* the fruit is ovoid, subacute at base and apex, 8–9 cm. long, 5–6 cm. thick).

***Trichosanthes majuscula* (C. B. Clarke), comb. nov.**

(*T. Wallichiana* Wight var. *majuscula* C. B. Clarke in Cogn. Monogr. iii. 369; *T. multiloba* Miq. var. *majuscula* C. B. Clarke in Hook. f. Fl. Brit. Ind. ii. 608.)

Folia maxima, profunde palmatim 5-loba, utrinque laevia, nervis supra distincte pubescentibus; cirrhi robustissimi, lignosi, 3-fidi, ramulo intermedio lateralibus multo prominentiore et longiore; racemi masculi rhachis valde crassa, lignosa, multiflora, pedunculo triplo longior; bractea oblonga, subtiliter serrata.

Stem very stout, elongate, grooved, glabrous. Leaves very large, membranous, glabrous and smooth on the lower surface, smooth but slightly hairy at the nerves on the upper surface, deeply palmately 5-lobed, lobes elliptic-obovate, cuspi-

date, narrow towards the base, up to 8 cm. broad in the middle, sinus between lobes obtuse, margin irregularly crenulate, deep green on the upper surface, pale green on the lower surface, 23 cm. long, 22–25 cm. broad, 3-nerved at the base. Petiole very robust, striate, covered with very short hairs, 6–6.5 cm. long. Tendrils very robust and woody, grooved, very slightly hairy, branched above at a distance of 11 cm. from base, 3-fid, the middle branch much more prominent and much longer than the lateral ones. Male flowers in racemes; rhachis very stout and woody, 30 cm. long, many- (25–30-) flowered, very much grooved and puberulous; peduncle 9.5 cm. long. Bracts oblong, finely serrate, multinerved, 3.5–4.5 cm. long. Pedicels very short, thick, and woody. Calyx-tube about 6 cm. long, 1 cm. broad at the apex, attenuate from the apex towards the base; teeth elongate, triangular-lanceolate, spreading, papillose, margins entire, 1 cm. long, 5 mm. broad at the base. Female flowers and fruit unknown.

Khasia mountains, Assam, 4000 feet, *Hooker & Thomson*, no. 7 (type in Herb. Kew.).

C. B. Clarke in Hooker's 'Flora of British India,' vol. iii. p. 608, treated this as a variety of *T. multiloba* Miq., but he thought that it might be a new species. (His *T. multiloba* has been later identified as *T. Wallichiana* Wight.) Cogniaux in his monograph retained it as a variety of *T. Wallichiana* Wight. It is quite distinct as a separate species, although female flowers and fruit are at present wanting. I have carefully examined the specimens of *T. Wallichiana* collected from different parts of India and have not found any like this. It is also quite distinct from the Japanese specimens of *T. multiloba* Miq.

It can very easily be separated from *T. Wallichiana* Wight, of which it has been regarded as a variety by Cogniaux and Clarke, by (i.) the very big 5-lobed leaves which are smooth on both sides, though distinctly hairy at the nerves on the upper surface (in *T. Wallichiana* the leaves are shortly villous-hirsute and very rough on the upper surface and smooth or hairy at the nerves on the under surface); (ii.) the very thick, woody, and many-flowered axis of the male raceme which flowers from near the base (in *T. Wallichiana* the axis is never so very thick and woody and is only few-flowered at the apex); and (iii.) the oblong, finely serrate bracts (the bracts are ovate and deeply subulate-crenulate or incised in *T. Wallichiana*). From *T. multiloba* Miq. it can be distinguished by (i.) the deeply palmately 5-lobed leaves which are hairy at the nerves on the upper surface (in *T. multiloba* the leaves are deeply palmately 7–9-lobed and glabrous on both surfaces); (ii.) the very thick, woody, and many-flowered rhachis of the male raceme which flowers from near the base (in *T. multiloba* the rhachis of the male raceme is never so very robust and is only few-flowered at the apex);

(iii.) the very large, oblong, finely serrate bracts (the bracts in *T. multiloba* are short, oblong-lanceolate, and subulate-crenate); (iv.) the long calyx-tube (about 6 cm.) which is attenuate from the apex towards the base (the calyx-tube in *T. multiloba* is shorter, obconical, and dilated at the apex).

THE BRITISH BRYOLOGICAL SOCIETY.

BY ELEONORA ARMITAGE.

THE British Bryological Society held its Annual Meeting and Excursion at Llangollen, Denbighshire, from August 27 to September 3, 1938. Mr. J. B. Duncan, President and Treasurer, Miss E. Armitage, Vice-President, Mr. A. Thompson, Secretary, Mr. W. R. Sherrin, Librarian, and upwards of twenty-five members and friends were present, including a distinguished American bryologist, Dr. Winona H. Welch, of De Pauw University, Indiana, U.S.A., who was visiting the principal European Herbaria to further her work of monographing the Fontinalaceae of Europe and America.

The rambles were principally in the County of Denbigh (v.c. 50), but Montgomeryshire (v.c. 47), Merionethshire (v.c. 48), and Shropshire (v.c. 40) were also visited. Many mosses and hepatics were met with, but, save in Sphagna, not many new records were made, as, except in v.c. 47, the ground had been thoroughly worked by such veterans as S. J. Owen, T. Barker, and D. A. Jones.

The first afternoon was spent exploring the rocky bed of the Dee near Llangollen, where, owing to the lowness of the river, access was gained to rocks which are usually submerged, where *Madotheca Porella* was found, and on dry rocks *Grimmia leucophaea*.

Next day there was a long excursion in cars through Chirk and Llan Rhaeadr, where we were indebted to Dr. H. Hamshaw Thomas for acting as our guide. The long narrow valley ends in the high falls of Pistyll Rhaeadr. A large volume of peat-brown water falls over an imposing rock-wall and is spanned by a natural arch of rock. The stream here divides the Counties of Denbigh and Montgomery. Then we drove by Llangunog up the Tanat Valley, which has recently been made accessible by a fine road to the top of the Pass. Here is a grand view of Snowdonia, with masses of purple heath and golden tussocks of *Ulex Gallii* in the foreground. This area, with a rocky stream and gorge should yield bryophytes of interest if a long day could be spent there.

On Tuesday the Llangollen district was farther explored, up the long wooded valley to "World's End." On the left are Ordovician rocks, and the fine limestone escarpment of the

Eglwyseg Rocks is on the right. Wednesday was spent beyond Llanarmon up Swch-cae-Rhiw, along a steep bracken-clad valley to the fine rocky gorge of the Ceiriog Falls. On Thursday we had a long drive beyond Bala, climbing up to the high pass of Bwlch-y-Groes (1,750 ft.); the road was rough and narrow, with much loose scree. Having reached the small plateau we explored the extensive boggy moor-land with rough peat bogs, under the great bulk of Aran Mawddwy, nearly 3,000 ft.; this hid Snowdon from us, but we had a grand view from the Arenigs to Plinlimmon.

Excursions on the last day, Sept. 2, included one to Tal-y-llyn Lake (v.c. 48) and another to Whixall Moss (v.c. 40), an extensive bog, which has become drier of late years owing to draining and peat removal.

The Annual Meeting was held on Tuesday, August 30. Miss E. Armitage succeeds Mr. J. B. Duncan as President in 1939. Mr. W. R. Sherrin was elected Vice-President. Mr. C. V. B. Marquand succeeds Dr. L. B. C. Trotter, who has given several years' much-appreciated service as Bibliographer. Mr. A. Thompson continues as Secretary. It is proposed to hold the 1939 Meeting at Glencoe and Ballachulish next summer.

The List of Sphagna is collated by Mr. A. Thompson.

SPHAGNA.

The specimens of Sphagna collected during the excursion were poor and small and the number of species and varieties noted rather few.

The following are all new vice-county records:—

- S. fimbriatum* var. *validius*, Ceiriog Ddu (50);
var. *intermedium*, Whixall Moss (40).
- S. Girgensohnii* var. *microcephalum*, Tanat Valley (47).
- S. Warnstorfi*, Ceiriog Ddu (50).
- S. rubellum*, Cyn-y-Brain (50).
- S. squarrosum* var. *subsquarrosum*, Tanat Valley (47).
- S. teres* var. *subteres*, Ceiriog Ddu (50).
- S. amblyphyllum* var. *macrophyllum*, Tanat Valley (47); Bwlch-y-groes (48); Ceiriog Ddu (50);
var. *mesophyllum*, Bwlch-y-groes (47); Ceiriog Ddu (50).
- S. pulchrum*, near Bwlch-y-groes (47); Cyn-y-Brain and Ceiriog Ddu (50).
- S. recurvum* var. *majus*, Tanat Valley (47);
var. *robustum*, Ceiriog Ddu (50).
- S. fallax* var. *laxifolium*, Tanat Valley (47).
- S. cuspidatum* var. *falcatum*, Whixall Moss (40); Bwlch-y-groes (47);
var. *submersum*, Whixall Moss (40);
var. *plumosum*, Whixall Moss (40).

- S. subsecundum* var. *intermedium*, Ceiriog Ddu (50).
S. inundatum var. *robustum*, Ceiriog Ddu (50);
 var. *eurycladum*, Ceiriog Ddu (50); *S.* of Bwlch-y-groes (47);
 var. *densum*, Tanat Valley (47);
 var. *lancifolium*, south of Bwlch-y-groes (47); Cyn-y-Brain and Ceiriog Ddu (50);
 var. *diversifolium*, Pistyll Rhaiadr (47).
S. auriculatum var. *ovatum*, south of Bwlch-y-groes (47); Cyn-y-Brain (50);
 var. *laxifolium*, south of Bwlch-y-groes (47); Bwlch-y-groes (48);
 var. *canovirescens*, Pistyll Rhaiadr (47);
 var. *submersum*, Pistyll Rhaiadr (47).
S. crassycladum, Ceiriog Ddu (50).
S. contortum, Tanat Valley (47).
S. papillosum var. *normale*, Whixall Moss (40); Tanat Valley (47);
 var. *sublaeve*, Whixall Moss (40).

TRUE MOSSES *

Andreaea petrophila and *Rothii*, 50. *Oligotrichum hercynicum*, 47. *Polytrichum urnigerum*, 47; *P. strictum*, 40*, 47*, 48; *P. formosum*, 50. *Pleuridium axillare*, 48, 50. *Rhabdoweisia fugax*, 50, and *R. denticulata*, 50. *Cynodontium Bruntoni*, 47*, 50. *Dichodontium flavesceus*, 50. *Dicranella cerviculata*, 40; *D. rufescens*, 50; *D. squarrosa*, 47, 50. *Dicranum fuscescens*, 47*. *Campylopus atrovirens*, 47. *Fissidens decipiens*, 50. *Grimmia trichophylla*, 50; *G. Hartmani*, 50; *G. retracta*, 50; *G. Doniana*, 47; *G. commutata*, 50; *G. leucophaea*, 50. *Rhacomitrium protensum*, 47. *Weisia rupestris*, 50. *Trichostomum crispulum*, 50; *T. mutabile*, 50, and var. *cophocarpum*, 50; *T. tenuirostre*, 50, var. *Holtii*, 50*; *T. tortuosum*, 50. *Zygodon Mougeotii*, 50. *Funaria ericetorum* and *F. Templetoni*, 47. *Webera annotina* var. *erecta*, 47*, 50*. *Bryum filiforme*, 47*. *B. alpinum*, 47, var. *viride*, 50. *Mnium serratum*, 50, and *M. cinclidioides*, 48. *Neckera crispa* var. *falcata*, 50. *Pterogonium gracile*, 50. *Heterocladium heteropterum*, 47, 50, var. *fallax*, 50. *Orthothecium intricatum*, 50. *Hyocomium flagellare*, 50. *Eurhynchium myosuroides* var. *rivulare*, 47, 50. *Plagiothecium elegans*, 47. *Amblystegium irriguum*, 50. *Hypnum Patientiae*, 50. *H. ochraceum*, 47, 50.

HEPATICS.

Aneura pinguis var. *angustior*, 50*. *Metzgeria pubescens*, 50. *Marsipella Pearsoni*, 48; *M. aquatica*, 47*, 48. *Alicularia*

* Only plants of some interest are included, new v.c. records are starred.

compressa, 47*, and *A. scalaris* var. *procerior*, 47*. *Eucalyx obovatus*, 47*. *Aplozia cordifolia*, 47, 50. *Lophozia ventricosa*, 48, 50; *L. incisa*, 48, 50; *L. quinquedentata*, 50; *L. Floerkii*, 47, 50. *Plagiochila asplenoides* var. *minor* forma *laxa*, 50. *Leptoscyphus Taylora*, 48; *L. anomalus*, 40*, 48. *Chiloscyphus polyanthus*, 50. *Saccogyna viticulosa*, 50*. *Cephalozia con-nivens*, 40. *Nowellia curvifolia*, 50. *Cephalozia Starkii*, 50. *Odontoschisma Sphagni*, 48. *Lepidozia reptans*, 47, 48, 50; *L. Pearsoni*, 50. *Ptilidium ciliare*, 47, 50. *Scapania aspera*, 50; *S. nemorosa*, 47*; *S. dentata*, 47, var. *ambigua*, 47*, 50*; *S. intermedia*, 47*; *S. undulata*, 47; *S. irrigua*, 50. *Madotheca Porella*, 50. *Cololejeunea calcarea*, 50. *Lejeunea patens*, 50.

NEW MALVACEAE FROM ANGOLA.

BY EDMUND G. BAKER, F.L.S.

THE following novelties have been collected recently in Angola:—

Abutilon membranifolium, sp. nov. *Herba* perennis ad *A. mauritanum* Medik. accedens differt foliis majoribus membranaceis grosse serratis interdum levissime lobatis. *Caulis* erectus teres pilosus. *Stipulae* angustae. *Folia* membranacea petiolata, lamina suborbicularia, basi cordata, apice acuminata, 10–15 cm. longa, 8–12 cm. lata; petiolis sparse pilosis 6–13 cm. longis. *Pedunculi* solitarii axillares, sparse pilosi 5–7 cm. longi. *Calyx* floriferus ±12 mm. longus; lobi lanceolati 8–9 mm. longi acuminati. *Petala* aurantiaca. *Carpella* circ. 14–15, 10 mm. longa, apice aristata, hirsuta.

Hab. HUÍLA: Ungueria, c. 1300 m. alt., June 2, 1937, *Exell* and *Mendonça* 2483. (Type in Herb. Mus. Brit.; Herb. Conimbr.) “Perennial herb 1–1.5 m., flowers orange.”

This plant is allied to *A. mauritanum* Medik., *A. indicum* Sweet, and *A. longipes* Mattei. The distinguishing characteristics are:—It is a perennial herb 1–1.5 m. high; the leaves are large membranous, paler below than above, grossly serrate, acuminate; the peduncles are 5–7 cm. long, the carpels distinctly and rather shortly aristate; the petals orange-colour and the calycine lobes lanceolate acuminate.

A. mauritanum Medik. is well figured by Jacquin as *Sida mauritiana* Jacq. in his *Icones Pl. Rar.* tab. 137.

The true *A. indicum* Sweet is figured by Wight in his *Icones*, i. tab. 12. It has been frequently recorded for Tropical Africa, but some of these records are incorrect and should be placed under *A. mauritanum* Medik.

Abutilon Mendoncae, sp. nov. *Perennis* erectus ad *A. matopense* Gibbs valde accedens differt petiolis 6–12 cm. longis haud circ. 1 cm. longis. *Caulis* gracilis teres cinereo-pubescent. *Folia* longe petiolata, lamina suborbicularia vel ovata apice acuta margine serrata subtus cinerea basi profunde cordata 6–10 cm. longa, 7–11 cm. lata, petiolis gracilibus 6–12 cm. longis. *Flores* inter mediocres generis. *Petala* aurantiaca. *Calyx* in toto 10 mm. longus, lobi ovato acuminati 5–6 mm. longi. *Carpella* numerosa circ. 25 sæpissime 1-sperma, 6–7 mm. alta, primum dense stellato-tomentosa.

Hab. MOSSAMEDES: km. 70 on the railway, 350–450 m. alt., 19. v. 1937. Perennial flowers orange-colour. Rock crevices, dry scrub edge of Mossamedes Desert, *Exell* and *Mendonça* 2179. (Type in Herb. Mus. Brit.; Herb. Conimbr.) This is a close ally of *A. matopense* Gibbs from the Matopo Hills. It differs more particularly by the much longer petioles and by the rather different indumentum.

Hibiscus (Calyphylli) Exellii, sp. nov. *Frutex* circ. 1 m. altus. *Caulis* erectus tomentosus ad *H. calyphyllum* Cav. accedens differt primo intuitu foliis diversis, involucri bracteolis diversis. *Folia* petiolata ovata levissime lobata, basi cordata, margine crenata serrata subtus stellato-tomentosa, lamina 2–4 cm. longa, 2–4.5 cm. lata; petiolis pubescentibus 1–2 cm. longis. *Flores* in racemos dispositi. *Pedicelli* erecti 10–20 mm. longi. *Involucri bracteolæ* 15–17 mm. longæ, pubescentes apice acutæ lanceolatæ vel lineares. *Calyx* fructiferus 15–17 mm. longus, lobi triangulares acuti. *Petala* 20–30 mm. longa flava basi purpurea. *Capsula* ±17 mm. alta, apice acuminata, seminibus nigris glabris vel sparse hirtis.

Hab. HUILA: between Humpata and Posto Zootechnico, 2000 m. alt., May 16, 1937, *Exell* and *Mendonça* 1992. (Type in Herb. Mus. Brit.; Herb. Conimbr.) "Flowers yellow with a very small purple centre, 1 m. high."

The leading characters of this species are:—It is a shrub about 1 m. high with tomentose stems. Leaves ovate, slightly lobed, petiolate. Flowers on erect pedicels, ultimately in a raceme. Bracteoles strap-shaped or lanceolate, pubescent. Capsule about 17 mm. high, pointed.

H. Exellii differs from *H. calyphyllus* Cav. in the thicker, smaller, and differently shaped leaves and in the shape of the bracteoles. It differs from *H. lunariifolius* Willd. in the shape of the leaves and from *H. macranthus* Hochst. in the much smaller flowers etc. The staminal column is much shorter, about 19 mm. long.

Hibiscus (Bombycella) rubriflorus, sp. nov. *Herba* perennis ad *H. Castroi* Bak. fil. et *Exell* accedens differt floribus rubris. *Caulis* ramosus in specimine nostro 30–40 cm. altus, ramis tere-

tibus. *Stipulæ* parvæ. *Folia* breviter petiolata; lamina ovalis vel oblongo-ovata margine serrata apice obtusa, basi rotundata, utrinque pubescens, 15–25 mm. longa, 9–18 mm. lata; petiolis gracilibus 5–8 mm. longis. *Flores* axillares solitarii. *Pedunculi* erecti 8–18 mm. longi. *Involucri bracteolæ* circ. 8–9, ±2 mm. longæ. *Calyx* in toto 3.5–5 mm. longus; lobis acutis. *Petala* rubra ±8 mm. longa. *Capsula* 8–9 mm. alta, seminibus gossypinis.

Hab. MOSSAMEDES: 50–60 km. from Mossamedes, 350–400 m. alt., May 20, 1937, *Exell* and *Mendonça* 2138. (Type in Herb. Mus. Brit.; Herb. Conimbr.) "Perennial herb, flowers red."

This species is allied to *H. Castroi* Bak. f. & *Exell*. Its distinguishing characteristics are:—The oval or oblong-ovate leaves with short petiole, the short involucral linear bracteoles, ±2 mm. long, the short calyx, the red petals ±8 mm. long, and the lanate seeds.

It is also allied to the true *H. micranthus* L. f., but this is a plant with subrotund leaves and pink or white petals which reflex.

Hibiscus (Bombycella) selesiensis, sp. nov. *Herba* perennis erecta ad *H. Gossweileri* Sprague accedens differt primo intuitu foliorum basi cordata non cuneata vel subrotunda, petiolis foliorum inferiorum longioribus, calycis lobis ovato-acuminatis non ovato-triangularibus, bracteolis 7–8 mm. longis. *Caulis* erectus 50–80 cm. altus. *Folia* petiolata, ovato-lanceolata integra vel leviter lobata pubescentia basi cordata apice acuta vel subacuminata, lamina 4–9 cm. longa, 3–7 cm. lata; petiolis pubescentibus, 3–10 cm. longis. *Flores* axillares. *Bracteolæ* lineares 7–8 mm. longæ. *Calyx* 8–9 mm. longus pubescens; lobis acutis. *Petala* delapsa.

Hab. CUANZA SUL: Vila Nova do Seles, July 12, 1937, *Exell* and *Mendonça* 3185. (Type in Herb. Mus. Brit.; Herb. Conimbr.) "Perennial herb. On rocks."

There are now numerous rather closely related species in the Section Bombycella. The nearest ally of this plant is *H. Gossweileri* Sprague in Kew Bull., 1908, 56. The type of this is *Gossweiler* 398 from Loanda, with the base of the leaves cuneate or subrotund, the petioles 5–10 mm. long.

Leaf-base cordate. Bracteoles 7–8 mm. long. *H. selesiensis*.

Leaf-base cuneate or rounded. Bracteoles 3–4.5 mm. long *H. Gossweileri*.

Hibiscus (Furcaria) nigricaulis, sp. nov. *Herba* annua erecta ad *H. cannabinum* L. accedens differt involucri bracteolis furcatis. *Caulis* erectus aculeatus teres. *Stipulæ* parvæ. *Folia* petiolata, lamina 3–5-palmatisecta, lobis intermediis 2–5 cm. longis grosse serratis superne glabris, lobis lateralibus minoribus; petiolis

aculeatis 3-5.5 cm. longis. Flores axillares subsessiles. Involucri bracteolæ 9-10 angustæ ± 10 mm. longæ ad apicem furcatæ. Calyx fructiferus 17-18 mm. longus; lobi lanceolati vel ovato-lanceolati apice acuminati vel acuti 13 mm. longi. Petala flava basi purpurea ± 4 cm. longa. Columna staminea $\pm 12-14$ mm. longa. Capsula 18 mm. alta dense hirsuta; seminibus glabris.

Hab. BRÉ: between Coemba and R. Cuanza, c. 1300 m. alt., May 7, 1937, Exell and Mendonça 1759. (Type in Herb. Mus. Brit.) "Flowers yellow with purple-brown centre."

This plant is allied to *H. cannabinus* L. and *H. asper* Hook. fil. Its leading characteristics are:—Stem erect, aculeate. Leaves palmatisect, the middle lobe oblong or oblong-oval; petiole aculeate. Involucral bracteoles very narrow, generally furcate near the apex. Fruiting calyx 17-18 mm. long, lobes lanceolate acuminate, verrucose on the back; capsule very hairy.

Hibiscus (Furcaria) **flavo-roseus**, sp. nov. *Caulis* erectus ramosus aculeolatus ad *H. Hiernianum* Exell & Mendonça accedens differt foliis diversis nunc integris subhastatis nunc alte trilobatis. *Caulis* circ. 4-pedalis. *Stipulæ* parvæ. *Folia* heteromorpha integra vel trilobata, foliis integris superne sparse stellato-pubescentibus subhastatis subtus cinereo-tomentosis 3-4 cm. longis, 10-20 mm. latis, foliis trilobatis lobis intermediis 3-5 cm. longis 15-25 mm. latis, petiolis 3-22 mm. longis aculeolatis. Flores sæpissime ad apicem ramulorum nunc solitarii nunc pauci. *Pedicelli* 4-7 mm. longi. *Involucri bracteolæ* circ. 10, 10-12 mm. longæ apicem versus furcatæ. *Calyx* 15 mm. longus, lobi triangulari-lanceolati 8-9 mm. longi, acuti. *Petala* flavo-rosea ± 30 mm. longa. *Capsula* ignota.

Hab. LUNDA: Saurimo, R. G. N. Young 646. (Type in Herb. Mus. Brit.)

"Shrub about 4 ft. flowers yellowish pink, stems scabrid." This plant is allied to *H. Hiernianus* Exell & Mendonça and *H. Gilletii* De Wild. The leading characteristics are the erect aculeolate stem, the heteromorphous leaves sometimes entire, sometimes deeply trilobed, cinereous tomentose below, the short petioles, the 10 involucral bracteoles furcate, and the calyx, 15 mm. long.

Hibiscus (Furcaria) **Noldeæ**, sp. nov. *Caulis* erectus recurvo-aculeatus, aculeis rubris, ad *H. surattensem* L. accedens, differt primo intuitu, stipulis diversis, involucri bracteolis furcatis non spatulato-appendiculatis. *Stipulæ* lanceolatae. *Folia* petiolata 3-5-palmati-lobata, 5-8 cm. longa, lobis intermediis 4-6 cm. longis grosse serratis et sæpe iterum lobulatis membranaceis subtus nervis aculeolatis, petiolis aculeolatis 3-6 cm. longis. Flores axillares. *Pedunculi* breves ± 3 mm. longi. *Involucri bracteolæ* furcatæ ± 15 mm. longæ, patentim pilosæ. *Calyx* ± 17 mm. longus, lobi acuminati. *Capsula* ignota.

Hab. MALANGE: Quela, Baronin Nolde 713. (Type in Herb. Mus. Brit.) This plant is allied to *H. surattensis* L., but the stipules and the involucral bracteoles are different. In *H. surattensis* L. the bracteoles are furnished on their back about the middle with an oblong foliaceous appendage. It is also allied to *H. Hiernianus* Exell & Mendonça, but differs in the shape of the leaflets. The leading characteristics of the species are the aculeate stems, the membranous 3-5-palmatilobed leaves, the nerves below being aculeolate, the furcate patent pilose involucral bracteoles reaching 15 mm. long, and the acuminate calyx about 17 mm. long. The flowers are yellow dark red at the base. Dümmer 8560 from Uganda is probably the same. There are good capsules on this plant. The fruiting calyx is 20-22 mm. long.

Hibiscus (Furcaria) **moxicoensis**, sp. nov. *Herba* perennis prostrata ad *H. Hiernianum* Exell & Mendonça accedens differt primo intuitu foliis valde dissectis fere ad basin 3-5 lobatis subtus incano-tomentosis. *Caulis* in specimine nostro circ. 16 dm. longus. *Folia* petiolata profunde 3-5-lobata subtus incano-tomentosa; lobis intermediis majoribus 25-35 mm. longis lobulatis, lobis lateralibus brevioribus; petiolis incano-tomentosis 10-25 mm. longis. Flores in racemos terminales dispositi et axillares. *Pedunculi* 1-5 mm. longi. *Bracteolæ* 8-10 mm. longæ, furcatæ. *Calyx* 10-15 mm. longus, lobis lanceolatis. Flores flavi ad basin brunnei. *Capsula* 10-12 mm. alta; seminibus glabris.

Hab. MOXICO: River Luena, near Vila Luzo, c. 1240 m., May 4, 1937, Exell and Mendonça 1599. (Type in Herb. Mus. Brit.; Herb. Conimbr.) "Perennial prostrate herb, flowers yellow with brown centres."

The distinguishing features of this species are:—The prostrate habit; the deeply lobed leaves, incano-tomentose below; the furcate bracteoles 8-10 mm. long, the capsule 10-12 mm. high, and the glabrous seeds.

Hibiscus (Furcaria) **lundaensis**, sp. nov. *Herba* annua ad *H. moxicoensem* Bak. fil. valde accedens, differt petalis circ. 40 mm. longis, columnæ stamineæ 20-25 mm. longa, foliis superne stellato-pubescentibus. *Caulis* gracilis in specimine nostro 30-40 cm. longis, pilis stellatis vestitus. *Stipulæ* angustæ. *Folia* petiolata profunde 3-5-lobata, lobis angustis serratis, lobis intermediis 20-25 mm. longis non iterum lobatis, superne stellato-pubescentibus, subtus dense stellato-pubescentibus, petiolis 5-15 mm. longis, tomentosis. *Pedicelli* breves 2-5 mm. longi. Flores axillares et apicem versus congesti. *Bracteolæ* angustæ furcatæ 10-12 mm. longæ, pilosæ. *Calyx* fructiferus circ. 15 mm. longus, lobis apice in acumen terminantibus, pilosis. *Capsula* in specimine nostro non bene evoluta ± 10 mm. alta.

Hab. LUNDA: Cacolo, River Cuilo, Gossweiler 11821. (Type in Herb. Mus. Brit.)

The distinguishing features of this plant are:—The slender stems, the deeply lobed leaves, the middle lobe not again lobed, but serrate, the shortly peduncled flowers, the furcate narrow bracteoles, the calyx about 15 mm. long, longly acuminate at the apex, the staminal column 20–25 mm. long, not as in *H. moxicoensis* about 12 mm. long.

Petals 16–20 mm. long. Staminal column about 12 mm.

Leaves very densely hairy *H. moxicoensis*.

Petals about 40 mm. Staminal column about 20–25 mm.

Leaves not so densely hairy *H. lundaensis*.

Hibiscus (Furcaria) malangensis, sp. nov. *Herba erecta ad H. cannabinum* L. accedens differt floribus minoribus sæpius apicem versus aggregati, foliis aspero-pubescentibus. *Caulis* teres asper in specimine nostro circ. 50 cm. longus. *Folia* longiuscule petiolata, lobata, basi subcordata vel truncata margine serrata, subtus aspero-pubescentia, lamina 4–7 cm. lata; petiolis asperis 3–6.5 cm. longis. *Flores* apicem versus aggregati et axillares. *Calyx* circ. 13 mm. longus; lobis acutis. *Bracteolæ* circ. 10 mm. longæ. *Petala* pallide flava ad basin purpurea circ. 3 cm. longa. *Capsula* ignota.

Hab. MALANGE: River Cuango, near Xa-Sengue, c. 1045 m. alt., April 5, 1937, *Exell* and *Mendonça* 274. (Type in Herb. Mus. Brit.; Herb. Conimbr.) "Flowers pale yellow with purple centres. Cangoa (Chiokwe). Concoction drunk for stomach trouble."

This plant is allied to *H. cannabinus* L., which is well figured by Roxburgh in Pl. Coromandel, tab. 190. It differs in the smaller flowers, which are aggregated towards the summit of the stem and also slightly axillary, and in the tomentum of the leaves, which are aspero-pubescent.

This plant belongs to that series of the Section *Furcaria* in which the bracteoles are not furcate.

LICHENOLOGICAL NOTES.—IX.

BY WALTER WATSON, D.Sc.

SINCE the publication of my "Lichenological Notes.—VIII.," in this Journal (1935, 149–160) many new vice-county records have been made. The most important of these are given in this article, being indicated as usual by asterisks. In 1937 a visit to Bundoran and Achill gave much information about the distribution of lichens in these districts, twelve of the lichens found being new to Ireland. Some further unnamed lichens, collected by Lindsay and others, have been sent from the herbarium of the Royal Botanic Gardens, Edinburgh, and determined, as well as the unnamed material collected by the late D. A. Jones, whose death

was such a serious loss to British lichenology. Mr. Lamb joined in the field-work at New Radnor and some other districts and from time to time has sent me notes on new vice-county records. My thanks are especially due to him for the critical comparison of many rare lichens with specimens in the British Museum. Other correspondents have also supplied me with material and data and my thanks are also due to them. Additional districts, in which especial attention in the field has been paid to lichens are Llandudno, Llangollen, and the New Forest.

Parmelia saxatilis (L.) Ach. var. nov. **terrestris**. Differt a typo habitu terrestri, colore albiore et reticulis paucis aut excepto margine absentibus. On ground on exposed headland, Hurlstone Point, W. Somerset, v.c. 5; April 1936. In general appearance the plant is strikingly different from typical *P. saxatilis* in colour, habitat, and rarity of reticulations. Its isidia are variable in quantity, but are sometimes as many as in form *furfuracea*. Dark rhizinae occur on the under surface right to the margin, and the reactions with potassium hydrate are similar (though less intense) to those of the type. The differences may possibly be due to the exposed habitat. A co-type specimen is in the British Museum.

P. crinita Ach. (*P. proboscidea* Tayl.). Cashelgarran (Ireland, v.c. *28).

P. perlata var. *ciliata* (DC.) Schaer. Lizard (*1), Cashelgarran, Ireland, v.c. *28.

P. soredata (Ach.) Th. Fr. Near Ringwood (*11).

P. Mougeotii Schaer. Near Ringwood (*11), Buckstone (*34).

P. Delisei (Dub.) Nyl. On sarsen stones, Lambourn (*22, leg. H. H. Knight); Dugort, Achill I. (*1, 27).

P. tiliacea (Hoff.) Ach. Christchurch (*11).

P. conspersa (Ehrh.) Ach. Buckstone (*34) with form *isidiata* Leight.

P. caperata var. *subglaucæ* Nyl. Lydeard Hill near Taunton (*5). This has not been recorded from the British Isles till now. It is rather a colour-form than a variety and Harmand (Lich. de France) gives it as form *subglaucæ*. The thallus is glaucous-grey with little greenish tint. At Lydeard Hill it had an appearance distinctly different from specimens of the type growing on neighbouring trees. The thalline reactions have been stated to differ slightly from those of the type, but Harmand (*loc. cit.*) discredits such statements and in the Taunton plant they are similar.

Platysma glaucum var. *fallax* (Web.) Nyl. Buckstone (*34), New Radnor (*43), near Llandrhaidr (*50).

L. praepostera Nyl. Lelant and Lizard (*1).

L. sordida var. *inflexa* (Johns.) A. L. Sm. Lizard (*1).

L. gangaleoides Nyl. Buckstone (*34), Clapham (leg. Lindsay, *64).

L. effusa (Pers.) Ach. Tregaron (*46), Clova (*90, leg. D. A. Jones), Bundoran (I. 34). New to Ireland.

L. crenulata (Dicks.) Hook. Rumney (*35, A. E. Wade), Achill (I. *27), Bundoran (I. *34).

L. conizaeoides Cromb. Near Checkenden (*23), Wigpool Common (*34), Pistill Rhaidr (*47 with form *tenuis*), Llangollen (*50). Erichsen in "Weitere Beiträge zur Flechtenflora Schleswig-Holstein" (1937) still maintains that his *L. pityrea* is not the same as Crombie's species. He considers that in my Lich. Notes in this Journal (1933) I was doubtful as to the identity of his *L. pityrea* with Crombie's *L. conizaeoides*. Apparently he mistakes the courteous method of correction for uncertainty. There is no doubt that Crombie's specimens belong to the same species as specimens authenticated by Erichsen himself as *L. pityrea*.

L. fugiens var. *chlorophaeodes* (Nyl.) A. L. Sm. On a wall between Zennor and Morvah (*1) with *L. sordida*. It was at first thought to be a form of the latter, but Mr. Lamb found that it was identical with Larbalestier's plants from Guernsey labelled as *L. chlorophaeodes* Nyl. These are the plants which have been accepted as *L. chlorophaeodes* by Leighton, Crombie, and A. L. Smith, though Nylander "in his original description of the type from Finland makes no mention of any reaction with C."

Aspicilia caesiocinerea (Nyl.) Arn. Pennant (*47, with form *obscurata*), Talsarnau (*48, leg. D. A. Jones), Berwyn (*50), Kinnoul Hill (*89, leg. Lindsay), Aviemore (*96 f. *obscurata*, leg. H. H. Knight).

A. Prevostii (Fr.) Th. Fr. Annacoona (I. *28). New to Ireland judging from Knowles, Lichens of Ireland. A plant mentioned in Mudd's Manual, 161, under *A. epulotica* v. *punctata* as collected by Adm. Jones in North Ireland is probably this.

***Aspicilia cambusiana*, sp. nov.** Thallus sordide flavo-cinereus, propter multa apothecia nigrescentia nigrescente facie, verrucoso-areolatus, subcrassus, K—C—I—; gonidia protococcoidea, diam. 11–24 μ , interdum majora, flavo-virescentia, membrana decolora circiter 0.75 μ crassa cincta; hypothallus sordidus indistinctus. Apothecia plus minusve innata in areolis, nigra, margine indistincto, plus minusve concava aut plana, circa 0.2–0.3 mm. diam. Paraphyses discretæ, tenuissimæ, indistincte septatæ, cellulis 3–4-plo longioribus quam latis, supra clavatæ cærulescentes interdum ramosæ. Hypothecium hyalinum aut pallido-fuscescens plecten-

chymatum, cum gonidiis infra. Asci elongato-obovati aut plus minusve oblongi, muris paullum crassioribus ad apicem; epithecium cærulescens æruginoso-cærulescens cum hydrato kalico. Sporæ octonæ, simplices, hyalinæ, oblongæ, 11–15 $\times$ 4–6 μ . Hymenium cærulescens, cum iodo, murus asci cærulescens, paraphyses solæ flavescentes. On siliceous rock, Old Cambus, Scotland (v.c. 82), collected by Hardy in 1856 and placed by Lindsay under *Aspicilia cinerea*. In herb. Edinburgh.

***Aspicilia Lindsayi*, sp. nov.** Thallus flavescenti-cinereus vel ochraceus, indistincte ambitu hypothallo atro circumdatus, tenuis, crustaceus, areolatus, areolæ angulares, vulgo minus quam 0.5 mm. diam., K+ lutescens deindeque rubescens, medulla non reagens cum iodo, gonidiis viridibus 8–10 μ diam. Apothecia parva, nigra, 0.2–0.3 mm., sæpe lecideoidea ab initio thallo immersa deinde magis elevata et margine thalloidi distincto, disco interdum pruinoso. Paraphyses septatæ, satis discretæ, interdum plus minusve submoniliformæ præsertim cum hydrato kalico, supra coherentes. Hymenium cærulescens (præsertim asci) cum iodo deindeque sordido- aut vinoso-rubescens. Hypothecium pallidum aut hyalinum, flavescentia cum hydrato kalico, cum gonidiis infra. Sporæ octonæ, hyalinæ, simplices, oblongæ aut ovatæ, 8–11 $\times$ 5–6 μ . Asci late clavati 45–50 $\times$ 18 μ . On siliceous rock, Craig Rossie, Dunning, Scotland, v.c. 88, leg. Lindsay, 1858. In herb. Edinburgh. *A. cinerea* has a similar reaction to potassium hydrate, but its spores are much larger and its external appearance is different.

Psora ostreata Hoff. Kingston (*5), near Llangollen (*50), Llyn of Dee (*92, leg. D. A. Jones).

Biatra quernea (Dicks.) Fr. New Radnor (*43), near Llanrhaidr (*47).

B. coarctata (Sm.) Th. Fr. New Radnor (*43), Llandudno (*50), Stornoway (*110, leg. Lindsay).

Var. *glebulosa* (Sm.) Arn. Buckstone (*34).

B. uliginosa (Schr.) Fr. Near Checkenden (*23), New Radnor (*43), Near Llanrhaidr (*47).

Var. *fuliginea* (Ach.) Fr. Peterston Wentlogg (*35, A. E. Wade), Myndd Mayo (*41, A. E. W.), New Radnor (*43).

Var. *humosa* (Ehrh.) Fr. Bewley Down (*3), Buckstone (*34), Myndd Mayo (*41, A. E. Wade).

B. flexuosa Fr. New Radnor (*43).

B. viridescens (Schr.) Mann. On thick stems of heather, New Radnor (*43), on ground over vegetable debris and on *Driedalea*, near Llangollen (*50).

(To be continued.)

*The Botanical Society and Exchange Club of the British Isles.
Report for 1937.*

THE first part of the Report for this year stands in the name of the Hon. Editor, Mr. P. M. Hall, and the second part in that of the Hon. Secretary, Mr. J. F. G. Chapple, who has now undertaken to act as Distributor. The Editor's Report follows the lines adopted in the previous year, but an account of the Club's excursions, with lists of the plants observed, is a welcome addition. The plant-notes are of considerable value, and on this occasion offer more to interest the batologists than the orchidophiles; the plant-records, which occupy over sixty pages, do not seem to include an undue proportion of aliens.

Miss Campbell continues her work on the flora of the Outer Hebrides with a second paper, embodying very many new records; and the Department of Botany, King's College, Durham, has a further contribution to the knowledge of the flora of Raasay. Dr. Turrill writes an important paper on the study of taxonomic problems in the genus *Taraxacum*, which will be of great value to any botanists who attempt to investigate this difficult group. A list of the *Charadryta* of Wales is compiled by Mr. A. E. Wade. Among the reviews, Wilson's 'Flora of Westmorland' is dealt with by Dr. W. A. Sledge, and Wolley-Dod's 'Flora of Sussex' by Mr. E. C. Wallace.

The least satisfactory feature of the Report appears in the second volume, which records once more a falling off in the number of specimens sent in (1752) and of contributions (17).—H. W. PUGSLEY.

BOTANICAL MONKEYS.—Several references have been made in the Press to the use of monkeys in plant collecting. It may, therefore, be interesting to readers to see the account which Mr. E. J. H. Corner (Acting Director of Gardens) wrote in the Annual Report of the Director of Gardens for the year 1937, Straits Settlements, 1938:—

"Toward the end of the year there were added to the collecting equipment of the Department two berok-monkeys (*Macacus nemestrina*), which were kept in the garden of the Assistant Curator's Quarters, Cluny Road, and the second Malay plant-collector, Ngadiman, was given charge of them.

"The berok is the Coconut or Pig-tailed Monkey which, as is well-known, is widely used in the East by Malays for gathering coconuts. The wild monkeys are caught as young as possible—so small even that they will sit in the hand; and they are trained gradually to twist young fruits off the coconut-inflorescences so that when they have grown strong enough they can climb the tallest trunks and drop the full-sized nuts

from the crown. But it may not be so well-known that a few of these monkeys are taught also such other jobs as plucking mangoes or pulling bunches of rambutans from the orchard trees. It seemed possible, therefore, that a monkey so trained would solve even the botanist's problem of obtaining specimens from tall trees, palms and climbers the height of which rendered them inaccessible; for, if the tree cannot be felled—and to cut down a forest giant for the sake of a few twigs is not merely costly but destructive—then one must employ a native climber or use a shot-gun, and both have their limitations. The berok is imperfect, too, because it cannot scale big trees unless there are climbers on it or small trees beneath by which it can ascend to the main limbs and overcome the long bole, but the experience of the last year has justified the idea that the berok offers the ablest assistance which the student of trees can have in the high forest. A berok upon the shoulder can be likened, in effect, to a falcon on the wrist; and its employment is recommended both to amateurs for its charm and cheapness and to keepers of Reserves where it is desirable to collect specimens repeatedly from the same trees without damage to them. It must be added that the berok is immune, moreover, to the irritation provoked by *rengas*-sap so that it enables one to collect specimens from these poisonous trees of the Mango-family, so abundant in the forest and yet, through avoidance, so little known.

"When Mr. Corner was in Kelantan in April he was fortunate in finding a young berok which had been educated just as a botanist might wish. This monkey, called Merah, was brought to Singapore and after several weeks' training it complied with every expectation. On one occasion in Johore, for instance, it worked in the crown of a Wild Chem-pedak at the height of 170 feet; on another day it collected specimens from 24 trees, all of which were over 100 feet in height. At Fraser's Hill it obtained good specimens from five of the giant palms, *Caryota equatorialis*, which seem to have been collected only once before in Malaya, many years ago, and of which there were no specimens in the Singapore Herbarium: it revelled, too, in throwing down fruits from so many plants of a big climbing fig that it was discovered for the first time that the gall-figs of this species (*F. callicarpa* var.) were twice as big as the seed-figs and differently marked. Unfortunately this monkey developed an obscure illness at Fraser's Hill and, though it became a patient at the College of Medicine in Singapore, it had to be put away at the end of September. In its brief career, it had collected specimens from more than 300 different kinds of tree at negligible expense. The technique having thus been proved, the Malay plant-collector, Ngadiman, was sent to Kota Bahru to find two more

such monkeys and to learn how to train them and how to talk to them. After much difficulty he found the two young beroks, Jambul and Puteh, which were purchased by the Department and installed at the Botanical Gardens.

"Now the method of collecting by these monkeys is this. They are kept on a string or, in the forest, they would run away. The string, which is 180 feet long, or more if need be, is wound on a wooden frame like a fishing line and is attached by a swivel to a collar round the monkey's neck. One speaks to the monkey in Malay, though in the present case it is 'Kelantanese.' 'Gi ata' one says, and the monkey goes up the tree. Should it climb along a branch not intended, one shouts 'Bukan itu, gi ata lagi': and when it gets to the right branch 'Belah itu' and along it the monkey goes. When it reaches the twigs to be collected, one jerks the string and shouts 'Ambil itu' whereupon the monkey pulls back and bites off ('repis itu') a twig and drops it clear. If more are needed, one shouts 'Ambil lagi' and the monkey will bite off as many as are wanted. When it has finished, one cries 'Turun' and the monkey comes down. But should any twigs in their fall have been caught up among the lower branches the monkey will have noticed and then one says 'Turun, pelepas itu' whereon the monkey finds the quickest way to the twigs, lifts them up and drops them clear as many times as may be necessary. A well-trained monkey, when it reaches the ground, picks up the twigs and puts them into one's hand. The twigs which they gather are generally so ample that each can be divided into three or four herbarium-specimens: they do not pull off the flowers or fruits but break off the whole twig from behind the leaves. In the case of trees which flower from the branches, such as durians and wild nutmegs, some patience is needed to teach the monkey to rip the flowers from the branches after having collected the twigs, but as soon as the idea is grasped a rain of blossom descends.

"It will be obvious that these monkeys delight in what they are doing: and the more one speaks to them, using the same words, the more they understand. After some practice in the jungle, they do not have to climb every tree but by a series of shouts and jerks on the string and pointing and slapping of trunks they can be induced to free their strings and leap from bough to bough so that they can visit numerous trees before they are obliged to come down for a drink of water. Further, the more practice they get, the more they understand what is wanted and they drop down any arresting objects such as opening buds, flowers, fruits and galls which are invisible from below: indeed, to work with a clever berok in the jungle is like fishing in the tree-tops. At the end of his days, Merah was able to find in the trees flowers and fruits

which had been shown to him on the ground: and he knew the meaning of 18 words of Malay. The present pair are by no means so accomplished. They have a vocabulary of only 12 words but they are younger and the one, Puteh, is full of promise. As for their strings becoming tied up through entanglement in the branches or in the stems of climbers, there need be no fear: there is hardly a knot which they cannot undo and once it is loose they pass their bodies through the coils by pulling on the string and following their chins: if need be, they dangle by their necks.

"By the end of the year, both monkeys had done considerable work in Bukit Timah Forest Reserve whither the one or the other had been sent every day. The specimens, which they obtained, have already repaid their cost of purchase, the price of such monkeys being about \$25. It seems that these two must be congratulated, moreover, on being the first apes to enter Government service."

REVIEW.

The Cambridge Region. Edited by H. C. DARBY. 8vo. Pp. xiii+234. Cambridge University Press, 1938. Price 6s.

THIS book was prepared for the Cambridge meeting of the British Association, when it was issued as "A Scientific Survey of the Cambridge District." Thirty-four authors have collaborated in writing a most interesting survey of the administrative counties of Cambridge and the Isle of Ely. There are chapters on soils, climate, botany, zoology, agriculture, archaeology, history, on the growth of Cambridge, and on the past and present problems of the draining of the Fens. There are three types of country—Upland, comprising both clay and chalk; Fenland, marked by a contrast between the peat and silt areas, and including the few islands; and the equally characteristic Breckland.

The Chapter on Botany is by Dr. H. Godwin and occupies sixteen pages. It deals with the ecological aspect of the vegetation—but there is an additional section of nine pages by Dr. A. S. Watt on the ecology of Breckland. Both are interesting summaries of the vegetational types which are present, and gain in value when read in conjunction with some of the other chapters. The book is of general interest. It should be in the hands of all Cambridge undergraduates.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on October 27th resolutions were passed thanking all those who had helped in any way to make the 150th anniversary celebrations a success; Mr. Francis Druce, Treasurer of the Society, for his generosity in meeting by a donation of £195

the expenses of the celebrations; and Lt.-Col. A. Gage for his History of the Society. A further resolution thanked His Grace the Duke of Bedford for his readiness to house the Linnaean Collections at Woburn Abbey in the event of war.

Mr. B. C. Sharman gave an account of the development of the sinker of *Orchis mascula*. Genera of the Ophrydeae perennate by means of swollen underground structures. It is proposed that the term sinker be used to cover the whole of the structure with its bud and attachment to the parent plant, and that the term tubercle be reserved for the swollen root portions containing the food-reserve. The sinker in *Orchis mascula* is largely foliar in nature. The sinker-tube is in part composed of the axial region of the sinker-bud; the vascular strand of the second leaf of the bud, distal to the parent axis, may be traced from the leaf, beneath the meristem of the bud, and up the side of the tube nearest the parent axis. The polystelic structure of the tubercle is misleading: there is a single large root initial, as is shown by the coalescence of these bundles into a normal root-stele at the end of growth of the tubercle.

Mr. E. Milne-Redhead and Dr. H. G. Schweickerdt summarised their paper on "A new Conception of the Genus *Ammocharis* Herb." They have shown that *Amaryllis longifolia* Linn. is conspecific with *Ammocharis falcata* (Jacq.) Herb., and that for over a century the epithet *longifolia* has been misapplied to a species of *Crinum*. *A. longifolia* is so different in flower and fruit characters that a new genus is proposed for its reception. Certain tropical African species of *Crinum* are transferred to *Ammocharis* and the monotypic genus *Stenolirion* is shown to be conspecific with *Crinum* (*Ammocharis*) *Tinneanum*.

At the General Meeting on November 10th Dr. B. Millard Griffiths's paper on "Early references to Waterbloom in British Lakes" was read. Water-bloom is the discoloration of lakes by large quantities of free-floating micro-organisms. It is more frequent in larger bodies of water especially on the newer geological formations. The earliest reference appears to be in the Anglo-Saxon Chronicle under the date 1096 when at Finchampstead (Berkshire) "a pond flowed with blood." There are many references in the Chronicle to the phenomenon, but it is not clear whether or not they refer to one or several occurrences. Another record is that of Geraldus Cambrensis, who in 1186 accompanied the Archbishop of Canterbury on a tour in Wales to preach the Crusade on behalf of Henry II. He describes both green and red water-bloom in Lake Llangors and the River Leven which flows into it, though apparently not seen by himself.

Mr. I. Mackenzie Lamb gave an account of his review of the genus *Neuropogon*. He emphasised the importance of chemical characteristics in lichen-classification; certain lichen-acids belonging to the depsidone-group form characteristically

shaped crystals of their potassium salts with potassium hydroxide, and paraphenylenediamine produces coloured condensation products with many lichen acids. Dealing with the geographical distribution of *Neuropogon*, it was pointed out that it is predominantly Southern Hemisphere, but *N. sulphureus* is widely distributed in the Arctic circumpolar basin, occurring again at high altitudes in the Andes of Ecuador and Peru, penetrating also far southwards in the Antarctic.

At the General Meeting on November 24th Major F. C. Stearn gave a lantern lecture on "A Geographical Survey of the Genus *Lilium*." The genus is distributed only in the Northern Hemisphere with the greatest concentration in Eastern Asia, and, like other genera with similar distribution, it radiates mostly east and west from there with a few attempts to go north and south. Species of all the different sections of lilies are found in Eastern Asia, and here also occur the two closely allied genera, *Nomocharis* and *Notholirion*, not found elsewhere. All species of *Lilium*, *Nomocharis*, and *Notholirion* can be grown in the British Isles except perhaps the two most southerly species, *Lilium philippinense* and *L. neilgherrense*.

At the General Meeting on December 8th National Parks were discussed with special reference to the National Park at Belair, South Australia. This park was described by Professor T. G. Osborn, who also showed several lantern-slides. The definition of a National Park and the different aspects of the general problems were dealt with by Sir P. Chalmers Mitchell, Dr. Julian Huxley, Mr. J. Dower, Dr. G. F. Herbert Smith, Professor F. E. Weiss, Dr. W. T. Calman, and Mr. J. Ramsbottom.

'THE TIMES.'—It is not often that Botany figures in a leader in 'The Times.' However, in the issue for November 22nd last there appeared under the heading "Statesman and Botanist" one which was both amusing and informed. After commenting on the fact that public figures, if they are to succeed, must have personal peculiarities it proceeds:—

"Imagine, then, the excitement which has raged among the Press jesters upon their discovery that Mr. Neville Chamberlain, in addition to having unmistakable features, carrying a permanent umbrella, and being mad about fishing, is also an ardent botanist. For here indeed is a foible to conjure with, especially for those whose jesting is not untinged with malice. What a wagging of belled heads, what a waving of painted banners in the Fleet Street milk-bars! And what a consequent lengthening of the odds against any immediate change in the Premiership! And all this, mark you, because Mr. Chamberlain has been reported by another botanist to have knelt down suddenly while crossing a lawn, and said: 'Isn't that *Ranunculus minimus*?' Or rather, this is what the other botanist is reported to have reported. But as he himself is a Fellow of the

Linnean Society and as Mr. Chamberlain is clearly one of the botanically initiated, it seems almost certain what he really said was: 'Isn't that *Centunculus minimus*?' Neither Sowerby nor Bentham (no not even in the exciting additional volume) gives *Ranunculus minimus*: whereas *Centunculus minimus* is a flower that any botanist would be proud to bow to on a lawn. It is barely an inch in height, which makes people with indifferent eyesight think it even scarcer than it actually is. It is to British plants what the shrewmouse is to British mammals—the midget, the minikin, the tantony-pig. It would be the very plant for a doll's house window-box. Its Latin name means, roughly, the smallest of the little scraps. Its English name is Chaffweed, or Bastard Pimpernel. The jesters are welcome to make what they like out of either or both of these.

"But let them remember this. The qualities which go to make a good botanist have a curious and profound resemblance to those which go to make a good statesman. Both professions need, above all things, patience, energy, and endurance—as anyone will agree who has climbed to the top of Ben Lawers on a sweltering July day to take a respectful look at the Drooping Saxifrage. In fact, what Linnaeus himself said about the one profession is equally true of the other: *Botanicus verus desudabit in augendo amabilem scientiam*. Both professions need a firm grasp of apparently trivial detail; and a preference for the rare (even when it is soberhued) over the commonplace (even when it is conspicuously attractive). Both statesman and botanist must be able to handle other human beings, to inspire their confidence and to justify it: let anybody who thinks otherwise watch a clumsy novice trying to worm out of a suspicious inn-keeper in Teesdale the exact habitat of the Alpine Bartsia. The botanist (like the statesman) must be neither afraid to reach up for what he is seeking, nor ashamed to kneel down for it. And, finally, the statesman (like the botanist) must have that sublime single-mindedness which makes him indifferent to ridicule."

ABNORMAL GROWTH IN HORSE-CHESTNUT.—The warm weather of last autumn had its effect on vegetation. At the end of November Mr. D. Dilwyn John noticed a fairly young horse-chestnut tree in Putney Park Lane which was partly in young leaf, most of the new leaf being on its lower branches. Growth continued until the sudden cold and windy weather of the third week of December.

POSTAGE STAMP BOTANY.—In the recent French 90 c. stamp which is inscribed "Route du Col de l'Iseran (Savoie) alt. 2769 m.," there is an interesting error which has not eluded the French botanists. The road is the highest in Europe and goes above the tree limit which there is about 2000 m. The artist apparently misinterpreting the significance of the absence of trees has inserted clumps of conifers.

LICHENOLOGICAL NOTES.—IX.

BY WALTER WATSON, D.Sc.

(Concluded from p. 25.)

L. phylliscina Nyl. Buckstone (*34). This was included by Miss Smith in *L. pilati* Krb., but it seems distinct.

L. fuscoatra (L.) Ach. Bodmin Moor (*2, I. M. Lamb), Buckstone (*34). This belongs to the form *turgida* (Anzi) Vain. Pennant (*47), Dalwhinnie (*96, leg. Lindsay).

L. panaeola Ach. Buckstone (*34). This is the form *sub-consentiens* Leight. Pass of Leny (*87, leg. Lindsay).

L. goniophila (Flk.) Schaer. Whimble (*43).

L. subsequens Nyl. Norton Fitzwarren (*5), Oxenton Hill (*33), near Henllys (*35, A. E. Wade), New Radnor (*43). New to Ireland from Cashelgarran (*I. 28).

L. recensa Stirt. On rocks near a moorland stream above Pennant (*47).

L. lygaea Ach. Pennant (*47), near Llanrhaidr (*50).

L. contigua form *Hoffmanni* Leight. Buckstone (*34), Cashelgarran (*I. 28).

Form *nobilis* Fr. Buckstone (*34).

Var. *flavicunda* (Ach.) Nyl. Bodmin (*2, I. M. Lamb), New Radnor (*43), near Llanrhaidr (*47 and *50). Ben Nevis (*97, leg. Lindsay). Loch Coruisk, Skye (*104, leg. Lindsay). Mts. of Lismore (*I. 6).

L. mersata Stirt. Lizard (*1, leg. D. A. Jones).

L. scutellata Wats. Church Cove, Lizard (*1, leg. D. A. Jones), near Cleobury Mortimer (*40, leg. I. M. Lamb), Tregaron (*46), Goyts Bridge (*57, leg. H. Britten), Errwood (*58, leg. H. B.).

L. auriculata Th. Fr. Loch Brandy (*90, leg. D. A. Jones).

L. expansa Nyl. Church Cove, Lizard (*1, leg. D. A. Jones).

L. pycnocarpa Krb. Buckstone (*34).

L. soredizodes var. *ochracea* Lynge. On siliceous rocks at 1500 feet, Eel Crag near Keswick (*70). This is externally similar to *L. contigua* v. *flavicunda*, but has white sorediate patches. The medulla beneath the tawny orange portions, and also beneath the sorediate portions, gives no blue coloration with iodine. *L. sorediza* with a blue coloration of the medulla with iodine is on the same stone and *L. contigua* v. *flavicunda* was on neighbouring rocks, so that one wonders whether some unknown method of interaction has occurred so as to cause *L. sorediza*.

(=*L. tumida* f. *sorediza* Lamb, Lich. Notes, this Journal, 1938, 159) to have no medullary reaction with iodine, or *L. contigua* var. *flavicunda* to be so changed as to produce soredia. When I collected this in 1933 it was put in my herbarium as a flavicund form of *L. soredizodes*. Recently I found that a similar plant had been named as above by Lynge in Medd. om Grønland. Degelius in "Lichens from S. Alaska and the Aleutian Islands," Medd. från Göteborg Botaniska Trädgård 1937, considers it to be a sorediate form of *L. flavocoerulescens* Hornem. (= *L. flavicunda* Ach. p.p.) and therefore makes the new combination of *L. flavocoerulescens* var. *ochracea*. Apart from Degelius's view that the plant is not a form of *L. soredizodes*, Lynge's name is open to objection. Vainio in Lich. Fenn. iv. 160, adopts the name *L. soredizodes* for the plant given as *L. phaeenterodes* var. *soredizodes* Nyl. in Fl. 1875, 363. In his list of synonyms he, however, gives *L. albuginosa* Nyl. Fl. 1877 as the earliest specific name.

L. flavocoerulescens Hornem. A plant from Ben Lui (*88) under *L. contigua* var. *flavicunda* in my herbarium has the apothecia pruinose and therefore belongs to this species.

L. silacea Ach. and *L. subsilacea* Nyl. The latter is said to differ from the former in the absence of any blue coloration of the medullary hyphae to iodine. In many lichenological works (e.g., Leighton Lich. Flora, Lindau Flechten, A. L. Smith Monog. ii. ed. 1) the reaction to iodine is given as negative. In British specimens of *L. silacea* the coloration is often said to be absent, though, when sufficient care is exercised, a distinct blue coloration of the medullary hyphae can be shown and in A. L. Smith Mon. ed. 2, this reaction is indicated. There seems to be no distinct evidence of any difference between *L. silacea* and *L. subsilacea* Nyl. According to an observation in Vain. Lich. Fenn. iv. 116, Nylander, after he described *L. subsilacea*, found that in the original Acharian specimen of *L. silacea* iodine gave a blue coloration to the medulla. Migula in Fl. Deutschland, 1931, gives both as distinct species, the medullary hyphae of *L. silacea* having no blue coloration with iodine.

PERTUSARIA AMARESCENS Nyl. On rock, Dunkery (*5), Myndd Mayo (*41), Glenshee (*89, leg. D. A. Jones), Garrynahine (*110, leg. Lindsay). As this has not been recorded previously from the British Isles, Nylander's description is given. "Subsimilis *P. amara* (Ach.), sed thallus vix amaro et K⁺(CaCl) aurantiaco, sorediis K(CaCl) fugaciter purpurascenti-violascentibus." It is similar to rupestral forms of *P. amara*, but the taste is not bitter and the authentic specimen has a distinct yellow coloration with K. Rupestral forms of *P. amara* have been noted at Taunton (5), Cuddleston (23), and Dugort (I. 27): the bitter taste is sometimes not so pronounced as in arboreal forms, but there is no yellow coloration with K.

P. leucosora Nyl. Buckstone (*34).

Acarospora fuscata (Schr.) Th. Fr. Bodmin Moor (*2, I. M. Lamb), Pennant and Pistill Rhaidr (*47), near Llandudno (*50), Cathlie (*90, leg. W. Smith).

A. smaragdula (Wahl.) Mass. May Hill (*34, H. H. Knight), Borth (*46), Stornaway (*110, leg. Lindsay).

A. Lesdainii (Harm in litt.) A. L. Sm. This was first published by A. L. Smith in Mon. Br. Lich., pt. i. ed. 2 (1918). It was retained by Magnusson in his Mon. Scand. *Acarospora* (1924). In Mon. Br. Lich., pt. ii. ed. 2 (1926) Miss Smith called attention to "some misapprehension in Magnusson's description as Harmand based it on the reaction K+red," whereas Magnusson distinguished it from *A. smaragdula* by its thick uneven thallus K— or yellowish. The creation of this new species was due to a mistake. In British lichenological works the thallus of *A. smaragdula* was stated to be K—, so that when Hebden found a plant on the sandstone guide-post to Ryecroft on Harden Moor, he thought that it could not be *A. smaragdula*, as K gave a distinct red coloration. He therefore sent to it B. de Lesdain, who forwarded it to Harmand, by whom the name of *A. Lesdainii* was bestowed on it. This was during the war, and Hebden wrote to me that no description had been supplied to him and that the new *Acarospora* "differs mostly in the crimson reaction in the cortex with K." Hebden also sent a specimen to Miss Smith, who is responsible for its description and publication. Magnusson rightly points out (*op. cit.* 69) the mistake of British lichenological works in regard to the reaction of the thallus of *A. smaragdula*. Had this been done ten years earlier there would have been no *A. Lesdainii* described and I see no point in its retention. The reasons which Magnusson assigns for its distinction are historically incorrect and cannot apply to Hebden's type-specimen. The unevenness of the thallus is usual in Millstone Grit lichens and that described as *A. Lesdainii* is merely the form of *A. smaragdula* usually found on Millstone Grit.

Biatorella simplex (Dav.) Br. & Rostr. Rumney (*35, A. E. Wade).

B. pruinosa (Sm.) Mudd. Eyeford (*33), New Radnor (*43 with form *nuda*), Garretts town (*I. 3, L. Porter), Ben Bulbin (*I. 28).

B. flavocinerea Wats. This must be expunged. Magnusson has examined it and considers it is not a *Biatorella* at all, but a leucideoid lichen with undeveloped spores. On re-examination I consider that his opinion is justifiable. In its present condition it seems remarkable that several lichenologists thought that

numerous spores were present in the ascus and suggests that drying has altered its appearance. It does not now suggest many-spored asci to either Mr. Knight or myself, the only survivors of those who previously examined it. Hebdén was the only one who expressed some doubts about it. *In litt.* he stated "I found one ascus with 24 spores, $3 \times 2 \mu$, and another with many more, probably 36. I am doubtful if it is a *Biatorrella* at all, because the spores in many cases are mere dots and do not fill the space allotted and are badly developed." The plant is almost certainly *Lecidea subsequens*.

Lecania actaea (Nyl.) B. de Lesd. On rocks above usual high-water mark, Dugort quay, Achill (*I. 27).

Thalloidima candidum (Web.) Mass. Great Orme (*50), Annacoona, Ben Bulbin (*I. 28).

Biatorina graniformis (Hag.) A. L. Sm. Llandmadog (*41), Balmerino (*85).

B. prasina (Fr.) Sydow. Bochym near Lizard (*1), Wyre Valley (*60).

B. erysiboides (Nyl.) Th. Fr. Bochym (*1).

B. lenticularis var. *chloropoliza* (Nyl.) A. L. Sm. Rumney (*35, Wade). Pass of Leny (*87, leg. Lindsay).

Gatillaria episema (Nyl.) Oliv. (*Scutula* e. Zopf). Kineton Thorns (*33).

Microphiale diluta (Pers.) Zahl. New Radnor (*43).

Toninia squamulosa (Deak.) Mudd. Ben-y-Gloe (*89).

Bilimbia leucoblephara (Nyl.) Arn. New to Ireland. Dugort (*I. 27).

B. Naegeli (Hepp.) Anzi. Hadleigh (*26, I. M. Lamb), near Cheltenham (*33, leg. D. A. Jones). Glenade (*I. 29).

Bacidia umbrina (Ach.) Br. & Rostr. Stanner Rocks (*43, D. A. Jones). Dumfries (*72), and W. Lomond (*85, leg. Lindsay), Pass of Leny (*87), Lerwick (*112).

B. vermifera (Nyl.) Th. Fr. On root of beech, New Radnor (*43).

B. flavovirescens (Dicks.) Anzi. Glen Fee (*90, leg. D. A. Jones), near Eagle's nest, Killarney (*I. 2).

Xanthoria parietina var. *aureola* form *congranulata* Cromb. This is usually found on trees, but occurs on stone at Venton-gimps in W. Cornwall and on tiles near Taunton.

Placodium murorum var. *pusillum* (Mass.) Flag. New Radnor (*43). Near Llangollen (*50).

P. dissidens Nyl. Bossington (*5). Llanarmon (*50).

P. medians Nyl. Avon near Ringwood (*11), Claremorris (*I. 26). New to Ireland.

Gallopisma phloginum (Ach.) Arn. Dryburgh (*81). Muckross (*I. 2). Bundoran (*I. 34).

C. ferrugineum (Huds.) Trevis. On tree, Cashelgarran (*I. 28); var. *festivum* (Ach.) Mudd. New Radnor (*43), Ballantrae (*75), Cashelgarran (*I. 28), Bundoran (*I. 34).

C. cerinum (Ehrh.) De Not. Keel, Achill I. (*I. 27).

C. albulutescens (Nyl.), comb. nov. Kynance (*1, leg. D. A. Jones).

Physcia stellaris (L.) Nyl. Glen Beag (*92, leg. D. A. Jones). Dugort (*I. 27).

P. caesia (Hoff.) Nyl. New Radnor (*43), L. Hine (*I. 3, l. Porter), Claremorris (*I. 26).

P. lithotea (Ach.) Nyl. Near Ringwood (*11).

P. elaeina (Borr.) Leight. Muckcross (*I. 2, with form *areolata*).

P. virella (Ach.) Lynge. Claremorris (*I. 26). Bundoran (*I. 34).

Rinodina Bischoffii (Hepp) Krb. Eyeford (*33).

R. demissa (Krb.) Arn. Near Looe (*2, I. M. Lamb), Borth (*46), Llandudno and near Llangollen (*50).

R. albidorimosula (Harm.) Zahl. Cefn Bryn (*41, leg. D. A. Jones).

Buellia alocizoides (Leight.) A. L. Sm. On limestone, Purn Hill (6). This has been previously recorded from Weston in v.c. 6 by W. Joshua in Leight. Fl.

B. myriocarpa var. *chloropolia* (Fr.) Th. Fr. Ickenham (*21).

Rhizocarpon viridiatrum (Flk.) Krb. New Radnor (*43), Berwyn (*50), Dugort (*I. 27). Cashelgarran (*I. 28), Glenade (*I. 29), Bundoran (*I. 34).

R. obscuratum (Ach.) Mass. Kynance (*1), Stanner Rocks (*43, leg. D. A. Jones), Pennant (*47 and f. *ferratum*), Llangollen (*50), Craig Spardon (*90, leg. W. Smith, with f. *ferratum*), Dugort (*I. 27 and f. *ferratum*), Glenade (*I. 29, with f. *ferratum*), Bundoran (*I. 34).

Diploschistes scruposus (L.) Norm. New Radnor (*43). Buckstone (34, f. *flavescent*), Llanarmon (*50).

Gladina sylvatica f. *grandis* (Flk.) Cromb. Slieve More (*I. 27); form *portentosa* Leight. New Radnor (*43).

Gladonia pyxidata var. *pocillum* (Ach.) Fr. Perranporth (*1), Church Hope (*9), New Radnor (*43), Pennant (*47), Gt. Orme (*50), Ben Bulben (*I. 28), Bundoran (*I. 34); var. *floccida* (Nyl.) Parr. Kenley (*17), Mudeford (*11); var. *chlorophaea* Flk. Buckstone (*34), New Radnor (*43), near Llanrhaidr (*47), Llangollen (*50).

G. gracilis (L.) Willd. Horsey (*27, Burn), Slieve More (*I. 27).

G. cyathomorpha Wats. On wall bounding a wood at Seattoller (*70). It was collected in 1933 and had provisionally been placed as a form of *G. pyxidata*, but with "squamules much too large." Dr. Sandstede agrees with me that it conforms to *G. cyathomorpha*. The plant has well-developed podetia and from their structure he considers that its relationship is nearer to *G. chlorophaea* (= *G. pyxidata* var. *chlorophaea* of A. L. Smith's Monograph) than to *G. foliacea*, because the cortex is somewhat sorediate, especially in the cavity of the scyphus, and the conidia are not situated on the thalline squamules. Some portions have scyphi with large squamules at the margin and these may be placed as forma *lophyra*:—typo similis sed scyphus squamosus ad marginem.

G. parasitica Hoff. Cashelgarran (*I. 28).

G. furcata (Huds.) Schrad. New Radnor (*43), Pistill Rhaidr (*47); var. *spinosa* (Huds.) Leight. Buckstone (*34), Borth (*46); var. *palamaea* (Ach.) Nyl. Maol Ghaordi (*88).

G. squamosa Hoff. New Radnor (*43), L. Hine (*I. 3, L. Porter). Ben Bulben (*I. 28).

G. subsquamosa Nyl. Glenade (*I. 29).

Stereocaulon coralloides Fr. Mynnd Mayo (*41, A. E. Wade).

S. denudatum Flk. Myndd Machen (*35, Wade, with var. *pulvinatum*), near Llanrhaidr (*47, with var. *pulvinatum*).

S. condensatum Hoff. Buckstone (*34), near Llanarmon (*50), near Aviemore (*96, leg. D. A. Jones), Slieve More, Achill (*I. 27).

S. pileatum Ach. Near summit of Slieve More (*I. 27).

Baeomyces rufus (DC.) Huds. New Radnor; var. *subsquamulosus* Nyl. Ventongimps (*1), near Llanrhaidr (*47), Delamere Forest (*58), Dugort (*I. 27).

B. roseus Pers. New Radnor (*43), Ben Bulben (*I. 28).

Petractis clausa (Hoff.) Kremp. Bundoran (*I. 34).

Peltigera spuria DC. Perranporth (*1), Clifton (*34, leg. D. A. Jones).

P. rufescens (Weis.) Hoff. Near Llanrhaidr (*47), Llandudno (*50); var. *practextata* (Flk.) Nyl. New Radnor (*43), near Llangollen (*50).

Leptogium sinuatum (Huds.) Mass. Dugort (*I. 27), Annacoona (*I. 28), Bundoran (*I. 34); var. *scotinum* (Ach.) Krb., Twiston (*59, W. G. Travis).

L. fragile (Tayl.) Nyl. Little Orme (*50), Annacoona (*I. 28).

L. cretaceum (Sm.) Nyl. Annacoona (*I. 28). New to Ireland. The form is much more compact than the usual plant.

L. massiliense Nyl. Annacoona (*I. 28). New to Ireland.

L. biatorinum (Nyl.) Leight. Lizard (*1, leg. D. A. Jones).

Ephebeia hispidula (Ach.) Nyl. Cromaglowm (*I. 2), Dugort (*I. 27).

Schizoma lichinodeum Nyl. Annacoona (*I. 28). New to Ireland. Previously recorded from the Ben Lawers district only. The Irish plant is much smaller than the Ben Lawers or the Ben Eachan specimens and Mr. Lamb thinks that it might be distinguished as a form. It grew more directly on the rock and its impoverished condition is probably due to its habitat.

Psorotichia lugubris var. *gelatinosa*, var. nov. Thallus tenuis, gelatinosus, sordido-cinereus aut nigrescens, K—C—I—, interne similis *P. lugubris* cum gonidiis gloeocapsoides et hyphis hyalinis intricatis intertextis interdum sparsis 2–3 μ crassis. Apothecia dispersa nigrescente-cinerea aut nigra 0.3 mm. diam., plus minusve, plana cum margine propria, demum convexa immarginata et majora, adfixa rarius semi-immersa, muris pseudoparenchymarum cum cellulis minutis et sordide-fuscis, hypothecio pallido. Hymenium fuscescens cum iodo non coloratum, ascis subcylindricis aut subclavatis, 60–80 $\times$ 9–12 μ , apice attenuatis ad basin. Sporae octonae, hyalinae, vulgo uniseriatae, globosae, aut semiglobosae, 6–8 μ diam., muris bene distinctis, saepe primo paulo cuboideae per compressionem. The plant was common in August 1935 on peat along the ridge from Old Weir Bridge to the woods on the north of Eagle's Nest, Killarney, Ireland, its thallus forming a gelatinous crust and following the inequalities of the peaty substratum. It was collected for *Biatora gelatinosa*, but is near *Psorotichia lugubris* var. *lugubrior*, from which it differs in habitat, less definite thallus, indefinite paraphyses not dark green above, lack of hymenial coloration with iodine and smaller apothecia and spores. It might almost be considered as a new species.

As the plant was supposed to be *Biatora gelatinosa* it was collected merely for determination purposes and so the amount was very small. There is some doubt about the advisability of describing a new species or variety considering the little material

gathered, but it was so common where it occurred that this reasonable objection is largely discounted.

Arthonia gregaria var. *astroidea* (Leight.) Mudd. *64, leg. Carrington, Cashelgarran (*I. 28).

A. punctiformis Ach. Buckland Farrington (*22, leg. Mrs. Milne), near Llangollen (*50), Cashelgarran (*I. 28), Bundoran (*I. 34); var. *melantera* (Ach.) Leight., near Llangollen (*50), Glenade (*I. 29).

A. dispersa (Schrad.) Nyl. Hayle (*1, leg. D. A. Jones).

A. subvarians Nyl. = *Gonida clemens* Mass. Cemaes (*52, W. G. Travis).

Allarthonia phaeobaea (Norm.) Zahl. = *Arthonia paralia* Nyl. Peel (*71, leg. W. G. Travis).

Lithographa tesserata (DC.) Nyl. Ben Ledi (*87, leg. Lindsay).

Opegrapha betulina Sm. Pitlivie Den (*90, leg. W. Smith).

O. saxicola Ach. Great Orme (*50), Ben Bulbin (*I. 28), Bundoran (*I. 34); var. *Decandollei* Stiz., Clifton (*34).

O. atrula Nyl. Cemaes (*52, leg. W. G. Travis).

O. vulgata Ach. Horsley (*17, I. M. Lamb), New Radnor (*43), Llangollen (*50); var. *subsiderella* Nyl. Near Pentre-dwfr (*50), Lodore (*70, leg. Travis), Dugort (*I. 27).

Graphis scripta var. *minuta* (Leight.) Mudd, Worle (*6), Stanner Rocks on holly (*43, leg. D. A. Jones); var. *stellata* (Leight.), Mudd, Eagle's Nest, Killarney (*I. 2); var. *serpentina* (Ach.) Nyl., Glencar (*I. 28); var. *pulverulenta* (Pers.) Ach., Killarney (*I. 2).

Phaeographis inusta (Ach.) Mull. Parkrice (*41), Cashelgarran (*I. 28).

P. dendritica (Ach.) Mull. Bideford (*4).

Graphina anguina (Mont.) Mull. Near Looe (*2, I. M. Lamb), Broughty Ferry (*90, leg. Lindsay); var. *pulverulenta* (Sm.) A. L. Sm., Glenade (*I. 29).

Stenocybe byssacea (Fr.) Nyl. Llanfihangel near New Radnor (*43).

Sphaerophorus globosus (Huds.) Wain. New Radnor (*43), near Llanrhaidr (*47), Iona (*103, leg. L. B. C. Trotter).

Dermatocarpon miniatum (L.) Th. Fr. Carreg Cennen Castle (*44, H. H. Knight), Great Orme (*50).

D. insulare (Mass.) Migula. Rumney (*35, leg. A. E. Wade), Gt. Orme (*50).

Verrucaria scotina Wedd. Lizard (*1), Llandudno (*50), Treardhu Bay (*52, leg. D. A. Jones), Dugort (*I. 27).

V. striatula Wahl. Lizard (*1, with form *continua* Knowles), near Looe (*2, I. M. Lamb), Plymouth (*3, Wyatt-Smith), Loch Hine (*I. 3, L. Porter).

V. prominula var. *minor* A. L. Sm. Cashelgarran (*I. 28).

V. aethiobola Wahl. New Radnor (*43), Pennant (*47); var. *submersa* (Schaer.) Wats., Kynance (*1), Water-break-its-neck, New Radnor (*43), Pennant (*47).

V. laevata Ach. Seatoller (*70).

V. aquatilis Mudd. Rocks near Water-break-its-neck (*43).

V. PRAETERMISSA (Trev.) Anzi. On a wall, $\pm$ moist, as it is a retaining wall for the bank of a cut-out lane, Dolgelly (48). This was collected by me in 1922, but has not been hitherto recorded for Great Britain as I was unable to compare it with an authenticated specimen. Mr. Lamb has recently found one and has kindly compared the Dolgelly plant with it. It is not unlike *V. laevata* in general characters, but has a distinct reddish tinge. Other distinctions are critical in regard to structure. There is little doubt that it has been placed with *V. laevata* by many lichenologists (e. g., Koerber).

V. ochrostoma (Borr.) Mudd. Tredegar (*35, A. E. Wade).

V. coerulea DC. Berwyn (*50), Cashelgarran (*I. 28).

V. glaucina Ach. Lizard (*1).

V. maculiformis Kremp. Lizard (*1).

V. mutabilis Borr. Ventongimps (*1) near Grantully (*88).

V. muralis Ach. Avon (*9), New Radnor (*43), Llandudno (*50), Cashelgarran (*I. 28); var. *submuralis* (Nyl.) Oliv., Longhope (*34), Llandudno (*50).

Thelidium immersum (Leight.) Mudd. Little Orme (*50), Loggerheads (*51).

T. incavatum (Nyl.) Mudd. New Radnor (*43).

T. viride (Deak.) Zahl. Kynance (*1).

T. mesotropum (Nyl.) A. L. Sm. This is given as an *Arthopyrenia* in Zahl. Cat. Univ. Zahlbruckner followed Arnold in thus changing the generic name. As Arnold never saw the type-specimen (Arn. in 'Flora,' liii. 1878, 485), there were no real grounds for the change. Specimens recently collected from Somerset and other counties (Lich. Not. vi. and viii.) had the algæ green and Nylander described the gonidia as "viridia" ('Flora,' xlix. 1866, 420). The specimen collected by Leighton at Llanymynech

Hill and the type-specimen from Cader Idris have been examined by Mr. Lamb, who found that the algæ were green.

T. IMPRESSUM (Naeg.) Müll-Arg. On calcareous rock, Loggerheads, near Mold (51), *leg.* D. A. Jones, new to the British Isles. In the size of its spores it is nearest to *T. mesotropum* of any British species, but, whereas its spore coefficient (*i. e.*, length compared to breadth) is 1.7–1.8, that of *T. mesotropum* is 2.6–2.7. Thallus thin, tartareo-farinose. Perithecia black, about 0.3 mm., often apparently truncate. Ascus about $40 \times 20 \mu$. Paraphyses absent or disappearing. Hymenial gelatine wine-red with iodine. Spores $10\text{--}12 \times 6\text{--}7 \mu$, obtuse at both ends, colourless.

Polyblastia theleodes (Somm.) Th. Fr. Glenade (*I. 29).

P. subpyrenophora (Leight.) Th. Fr., Maentwrog (*48), Dugort (*I. 27) is sometimes included in the above-mentioned species, but is kept distinct by Zschacke ('Hedwigia,' lv. 1914). Its thallus is usually thinner and browner than that of *P. theleodes* and its spores are smaller, being $48\text{--}66 \times 28\text{--}39 \mu$ as compared with $60\text{--}84 \times 35\text{--}45 \mu$.

P. Schraderi (Sm.) A. L. Sm. Llandudno (*50).

P. subinumbrata (Nyl.) A. L. Sm. Glen Lochy, Killin (*88, *leg.* W. Smith). There is some confusion between this species and *P. scotinospora*—as, indeed, there is likely to be. In both species the spores are dark, but those of the latter are larger ($26\text{--}40 \times 13\text{--}21 \mu$) and have more than four transverse septa (usually 6–8 irregularly transverse). In *P. subinumbrata* the spores are $20\text{--}30 \times 15\text{--}18 \mu$ and have four transverse septa. In both species there is a dark involucrellum surrounding the ostiole. *P. subinumbrata* has not previously been recorded from Scotland, though *P. scotinospora* has been recorded from Ben Lawers. If the differences are sufficient to warrant the separation into two species then the Killin plant must go with *P. subinumbrata*.

P. armericola, sp. nov. Thallus albidus, leviter flavidus, effusus, crustaceus, tenuis, minute granulatus, gonidiis viridibus (6μ diam.) plectenchymate indistincto hypharum hyalinarum cinctus. Perithecia nigra, parva, semi-emersa ad basin thallo tecta, semiglobosa ostiolo minuto et paraphysibus evanescentibus. Hymenium sine gonidiis, vinosum cum iodo. Sporæ octonæ, hyalinæ, rectæ aut leviter curvatae, uniseptatae demum triseptatae, ultimo 7–8-septatae cum muris longitudinalibus (aut obliquis) paucis aut nullis, $35\text{--}42 \times 9\text{--}11 \mu$. Forming a thin crust on decaying and darkening *Armeria maritima* at the Lizard and collected in 1928 by Messrs. Knight and Jones. During the spring of 1937 I examined thousands of clumps of decaying thrift, but did not find any perithecia, though apothecia of *Lecanora Hageni* f. *graminicola* were common on the clumps.

Acrocordia epipolaea (Borr.) A. L. Sm. Lulworth (*9), Gt. Orme (*50).

Arthopyrenia epidermidis (Fr.) Mudd. New Radnor (*43), near Llanrhaidr (*47), Llangollen (*50), Balmerino (*85, *leg.* W. Smith).

A. punctiformis (Pers.) Arn. New Radnor (*43), Seatoller (*70), Bundoran (*I. 34).

A. analepta (Ach.) Mass. Barmouth (*48, *leg.* Carrington, 1867), near Llanrhaidr (*47), Bundoran (*I. 34).

A. analeptoides (Nyl.) A. L. Sm. A specimen of this was found in a packet, labelled Leigh Wood, among the collections of the late D. A. Jones. Its previous records were Irish ones from Kerry and Galway. Leigh Wood is in Somerset (v.c. 6) and the other lichens in the packet are known from this district.

A. fallax (Nyl.) Arn. New Radnor (*43), Cashelgarran (*I. 28).

A. stigmatella (Sm.) A. L. Sm. Cricklease near Chard (*5), Cashelgarran (*I. 28), Glenade (*I. 29). The Irish plants agree with *A. antecellens*, which A. L. Smith included with *A. stigmatella*.

A. Laburni (Sydow) Leight. Dugort, Achill (*I. 27).

A. leptotera (Nyl.) A. L. Sm. Bundoran (*I. 34).

A. halodytes (Nyl.) Oliv. Lizard (*1), Trearddu Bay (*52, *leg.* D. A. Jones), Bundoran (*I. 34), in the last two localities accompanied with f. *tenuicula* Knowles.

A. marina (Deak.) A. L. Sm. St. Abb's Head (*81, *leg.* D. A. Jones).

A. litoralis (Tayl.) A. L. Sm. On rocks and barnacles, Llandudno (*50); on rocks, Dugort (*I. 27), and Bundoran (*I. 34). The rock plant is f. *saxicola* B. de Lesd.

A. viridula (Sm.) A. L. Sm. Llandudno (*50).

A. Knightii Wats., Lich. Notes.—VI., J. of Bot. 1932, 100. The specimen on which this species was founded was sent to me as a form of *A. saxicola* Mass. Owing to its congregated apothecia it was originally placed under *A. socialis* Krb., a plant which had not been recorded from the British Isles and apparently a rare plant in Europe, having been recorded from Westfalen only. Its spores, however, did not correspond with those described for *A. socialis*. The spore-size was $15 \times 4 \mu$ with a coefficient of 3.7, whilst those of *A. socialis* were $8\text{--}11 \times 4\text{--}5 \mu$ with an average coefficient of about 2.1. Owing to these differences I decided to describe it as a new species. At a later date the specimen

was sent to Dr. Keissler with a note referring to the spore-size. He considered that the plant was very much like the type-specimen of *A. socialis*, which he was able to examine microscopically. He found that the original description of the spores was incorrect, as the spores were $15-17 \times 4-5 \mu$, thus having a coefficient of about 3.5. The other character mentioned as having some significance was the distinctness of the paraphyses. This has little value for specific segregation in *Arthopyrenia* unless other characters are present, and therefore *A. Knightii* must be regarded as a synonym of *A. socialis*, and the latter must be added to the British lichen flora.

Leptorhaphis Garrolii A. L. Sm. On trees near Hayle River (*1, leg. D. A. Jones).

Porina leptalea (D. & M.) A. L. Sm. New Radnor (*43).

P. carpinea (Pers.) Zahl. On trees at Stanner Rocks (*43, leg. D. A. Jones).

THE TRIGGER-MECHANISM IN THE GERMINATION OF THE SEED OF *TAMUS COMMUNIS* LINN.

BY I. H. BURKILL, M.A., SEC.L.S.

IN this Journal (1937, p. 35) evidence was produced that the seed of *Tamus communis*, the Black Bryony, requires six months under moist conditions as a prelude to germination: evidence will now be given that the period of moist conditions suffices only if certain other conditions which assuredly embody suitable temperatures follow it. It will be shown in what way this is a trigger-mechanism—that six moist months cock the trigger and the other conditions, presumably right temperatures, release it. Observations were previously recorded which suggest that should the trigger not be released it slowly runs down and that another six moist months are necessary to cock it again: these observations have been confirmed.

The experiments described in 1937 were incomplete in that the experimental six months had ended at no other times than spring and autumn. They showed that the six moist months might be warm or cold months, *i. e.*, might be in summer or in winter (with protection from frost), for germination was obtained in autumn as well as in spring: and in detailing them it was stated that further experiments would be completed with the intention of showing whether germination could be provoked in summer and winter.

From two liberal supplies of seed collected, the one in October 1936, the other in October 1937, eight samples, each of two

TABLE I.—No. of Seeds germinating in each Half-month, 1938.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total germinated to October 31st.	Still ungerminated on October 31st.
Sown.												
Oct. 1937	5 0	0 6	2 0	2 3	8 6	2 3	1 1	2 1	24 15	22 24	127	34
Nov. 1937	0 0	0 4	3 0	2 1	12 5	4 4	1 3	1 1	28 21	32 19	141	40
Dec. 1937	0 0	0 0	0 0	0 1	6 3	1 2	0 0	0 4	32 18	33 32	132	31
Jan. 1938	0 0	0 0	0 0	0 2	0 3	1 3	1 1	0 2	38 15	28 23	117	42
1936 seed.												
Oct. 1937	0 0	0 0	0 0	0 0	1 1	0 0	0 0	0 1	36 32	78 44	193	2
Nov. 1937	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	27 26	75 58	186	10
Dec. 1937	0 0	0 0	1 0	0 0	0 3	0 0	1 0	0 0	30 30	73 52	190	7
Jan. 1938	0 0	0 0	0 0	0 0	0 0	0 0	0 2	1 1	18 35	68 64	189	10
Monthly total	5	10	6	11	49	20	11	14	187	723		

hundred seeds, were drawn at random. The seeds, as sampled, were set to germinate in pairs. On October 17th, 1937, one sample of 1936 and one sample of 1937 were placed in separate porous earthenware cups, such as I invariably have used, within an enamel glass-covered dish, the cups standing in water; another pair was added on November 14th, a third on December 17th, and a fourth on January 16th, 1938. Assuming germination due at the end of six months, the pairs should have germinated in series in April, May, June, and July. But this is how they germinated, the results combined into half-monthly periods, ending with October 31st, 1938, when the purpose of the experiment was deemed to have been effected.

The table on p. 45 shows that the seeds on the whole waited until autumn for germination. It shows, also, that the new seed behaved in a more precise way than the old seed—*e. g.*, (i.) that the sample of old seed which was started in October actually produced five seedlings in January, six in February, and more distributed over all the months of spring and summer, breaking out into a vigorous germination in September; (ii.) that the sample of old seed which was started in November produced seedlings from the latter half of February forward; (iii.) that the samples of old seed started in December and in January produced seedlings from the second half of April forward. In contrast the samples of new seed produced scarcely any seedlings until, with the month of September, every sample went into fairly vigorous germination.

The bottom row of the table shows the measure in which germination occurred in every month, with the maximum in October and a secondary maximum in May. One may venture to say that had sowing been a little earlier this secondary maximum would have been earlier. Here it is necessary to explain that the experiments were conducted in a room from which frost and also the more extreme temperatures of summer were excluded. A winter temperature below 40° F. was unusual, the winter temperatures being around 50° F.

The slight drop observable in Table I. at the second half of September is not explicable on any supposition but that in some way the changing temperatures of autumn had caused a check; for the periodic examination was regular and the humidity even. However, the January sowing of 1937 seed did not show the check.

The reason why the November and January sowings, as measured by the last column, gave slightly inconsistent results is not apparent.

It will have been observed that the last two columns of Table I. do not account for all the two hundred seeds of each sample; the reason for this is that when a seed became mouldy it was removed—with this result:—

TABLE II.—Account of all the Seeds sown.

Sown.	1936 seed.			1937 seed.		
	Germinated.	Moulded.	Left out-wardly sound.	Germinated.	Moulded.	Left sound.
October	127	39	34	193	5	2
November	141	19	40	186	4	10
December	132	37	31	190	3	7
January	117	39	42	189	1	10

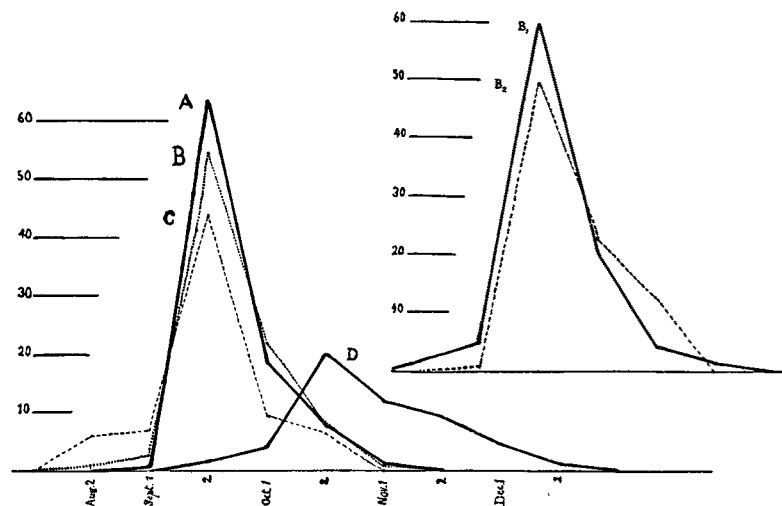
When the observations were closed on October 31st, 1938, all the seeds remaining and in appearance sound were cut in two. Those of the sixth column of Table II. were found completely sound and certainly would have germinated shortly; but it was otherwise with those of the third column, for in about one-third of them the embryo was brown and dead, lying in a nearly normal endosperm—or in a few the endosperm was coloured brown close to the dead embryo and in a very few discoloured under the seed-coat. It is perfectly clear that in regard to the seeds of 1936 the conditions had not seldom been too severe on the embryo for it to survive: it had felt the stimulus for growth of the humidity disjointed from the stimulus of temperature. The irregularity of the germination of the old seed, as seen in Table I., is a circumstance to be kept in mind by the side of this other circumstance of the embryo dying within the old seed. Death had occurred at various stages in growth such as are passed through prior to the bursting of the seed-coat. And the large numbers of seeds removed for mould is a third circumstance—for mould would follow death.

Side by side with the experiment just described another was in progress: it had been started a year earlier with seeds from several sources—four samples in all. Sample A was of about four hundred seeds taken from fresh berries which had been gathered, with the vines carrying them, a few weeks earlier. These seeds were removed from the berries, washed, and without any drying set out in a porous cup standing in water. Sample B was of four hundred seeds which had been removed from the berries six weeks earlier and had been dry meanwhile. They were from berries ripened a little earlier than the berries which gave sample A. Sample C was of about three hundred seeds which had been air-dry for thirteen months, *i. e.*, seed of 1935.

Sample D, of about three hundred seeds, was all I had left of a gathering already thirty-seven months old, from Mudstone Bay in South Devon; the others came from near Leatherhead, Surrey.

On November 24th, 1936, all these samples were placed in porous earthenware cups; but before starting the experiment sample B was divided into two equal parts by transferring all the undersized seeds to one-half and all the largest seeds to the other. These may be called samples B_1 and B_2 .

The best way of conveying the results to the reader is by a graph in which percentages are used to make the samples comparable.



On the left, the percentages of seeds which germinated in samples A, B, C, and D, in half-monthly periods. On the right the percentages which germinated in the halves of sample B, i. e., B_1 and B_2 , in half-monthly periods. The numerals on the left indicate the percentages.

As the experiment was started late in November, the six months under moist conditions did not terminate in time for the spring temperatures, and, save for a few old seeds, there was no germination until autumn. As the graph shows, samples A, B, and C germinated most freely in the second half of September, and they give polygons approaching normal curves of error. Sample D, the very old seed, behaved very differently, giving a maximum in the second half of October and a polygon departing from the normal curve of error. The height of the greatest ordinate of each polygon tells conclusively that the freshest seed was the best. Nearly 64 per cent. of the seed which had never been dry germinated in the second half of September, along with nearly 55 per

cent. of that which had been dry for six weeks (Sample B), and 47 per cent. of that which had been dry for thirteen months. Drying therefore is detrimental to the inevitability of the process of germination. As for the sample which had been dry for thirty-seven months, its late, low and spread-out polygon with the greatest ordinate 20, shows that the inevitability and accuracy of the seeds were greatly impaired. The standard deviation of this polygon (σ of statisticians) works out as 1.3057, the standard deviation of the three others being A 0.6910, B 0.7434, and C 1.0897. The standard deviation is here a measure of the growing inaccuracy of the process, but not of the inevitability, because it is worked out on the seeds that were found viable.

Here the reader may be reminded that ageing plant-tissues are known to require more than the minimum stimulation by auxin for growth (see Du Buy in Proc. Nat. Acad. Washington, xxii. p. 272: 1936), and auxin is to be expected in the cotyledon of *Tamus*.

Turning to the samples B_1 and B_2 , a second graph contrasts the results they gave. This graph is on the right of the other. It shows that sample B_2 germinated less accurately than sample B_1 . Presumably the asymmetry of its polygon arose in chief part, at least, from the transfer of undersized seeds to the sample: for doubtless they proved deficient in some quality and tended to be late.

At the close of the experiment the seeds which had not germinated within the period of the graph and which were still alive had entered into a new period of germinating. Samples A and B had germinated so fully in 1937 that there were hardly any experimental seeds left: but from samples C and D seeds were more numerous. Sample C resumed germinating on October 22nd, 1938; sample D on October 8th, and in a month five seedlings had been produced from this old seed. Sample A had produced one seedling on May 8th, and there were then only two other seeds left, both proving to be dead.

Yet another small experiment remains to be described. Ripe berries were collected in the autumn of 1936 along with the vines bearing them, and were hung in a shed where they were protected entirely from rain, but were neither dried nor broken up by frost. In this way it was contrived that six of them remained with unbroken epidermis and soft flesh through the winter. In early spring the twenty-five seeds were taken from them, washed, and set to germinate. Germination followed thus:—Sept. 30th, 1937, one seed; Oct. 7th, seven seeds; Oct. 16th, seven seeds; Oct. 19th, two seeds; Oct. 21st, three seeds; Oct. 26th, two seeds; Oct. 30th, one seed, and Nov. 3rd, two seeds. And so all germinated, following six months in porous cups. The moisture of the pulp, it seemed, had had no effect in forwarding germination. The result of the experiment

is interesting, for it has been said that enclosure within an apple promotes the germination of apple pips: but the occurrence is one not likely to happen in Nature.

Conclusions.—Slow processes are carried through within the outwardly resting seed of *Tamus communis*, so long as it is kept moist, culminating at the end of about six months, and at that time the embryo seems to require relatively low temperatures to send it into such growth that it will burst its seed-coats. The temperatures appear to range around 45°–50° F. If they do not occur, the seed lapses into a new period of dormancy, or it may die, and often does so. The dormancy may be repeated; but there is always a loss of vital efficiency with it, so that response becomes disorganized. The length of life of a seed in years is small.

A new examination of the climatic factors at the plant's geographic limits is called for, as the conditions which the seed demands probably determine its spreading.

RECENT WORK ON DACTYLORCHIDS.

By H. W. PUGSLEY, B.A., F.L.S.

I HAVE lately had an opportunity of examining the *exsiccate* of this group in the Botanical Museum of the University of Copenhagen, and, as they present a few points of interest, it seems advisable to record these together with other relevant information that has accumulated since my papers on these plants were written in the Linnean Society's Journal (1935) and Proceedings (1936).

The cytology of most of the members of the group has been recently explored, and results have been published during 1938 by Dr. Hagerup, of Copenhagen (Hereditas, xxiv. 258), Mr. Vermeulen, of Amsterdam (Chron. Bot. iv. 107), and Dr. Heusser, of Zurich (Ber. Schweiz. Bot. Gesell. xlviii. 562). These results, independently obtained, are substantially in agreement. It is found that *Orchis latifolia* L. (*O. incarnata* auct.), with var. *ochroleuca* Boll., *O. cruenta* Müll., *O. maculata* L. var. *Meyeri* Rehb. f., and *O. foliosa* Soland. are diploid species, with the chromosome number $2n=40$, while *O. majalis* Rehb., with subspecies *occidentalis* Pugsley, *O. purpurella* Steph., *O. prætermissa* Dr., with subspecies *junialis* Verm., *O. sesquipedalis* Willd., *O. Munbyana* Boiss. & Reut., and *O. maculata* L. var. *genuina* Rehb. f. and var. *elodes* (Grisb.) Camus, are tetraploids ($2n=80$). Different plants referred to *O. Traunsteineri* Saut. give varying results, $2n=40$, $2n=80$, and $2n=122$. In addition I learn from Mr. Vermeulen that he found *O. majalis* subsp. *Traunsteinerioides* Pugsley to be another tetraploid ($2n=80$). Dr. Heusser has further determined the chromosome numbers of the hybrids

O. latifolia × *majalis* and *O. latifolia* × *maculata* as $2n=60$. It may be noticed that the diploid plants (excepting *O. foliosa*) normally bear smaller flowers than the tetraploids.

A feature in this group that is conspicuous from a taxonomic standpoint is the excessive variability of the form of the labellum and of its markings. This is depicted in many existing plates and may often be seen in any large colony of living plants, whether the presence of other species that might give rise to hybridity is a factor, or whether the population can only be regarded as a pure strain. It follows that the descriptions of species must usually be in more or less general terms purporting to specify the essential characters while also covering the range of variation, and they cannot be expected always to fit every individual peculiarity.

ORCHIS LATIFOLIA L. (*O. incarnata* auct. recent.).

An excellent Flora of Oeland, with distributional maps, has lately been published by R. Sterner. This shows that "*O. incarnata*" is common in the island while *O. majalis* Rehb. is absent, and is thus an additional confirmation that Linnaeus's citation "It. Oel. 48" in his original description of *O. latifolia* refers to this species. It might be added that on the sole occasion when Linnaeus mentions the colour of the flowers of *O. latifolia* he terms them "rubris," which often fits those of "*O. incarnata*." One would expect those of *O. majalis* to be referred to as "purpureis."

The examples in the Copenhagen collection (about seventy sheets) are generally fairly large plants, some closely resembling the specimen of *O. latifolia* in the Linnaean herbarium, and there are but few like the small plant, only 8–15 cm. high, which is prevalent in Britain.

O. latifolia varies as much in the colour of its flowers as in the form and markings of the labellum. The usual flesh- or salmon-pink often deepens to a full red or bright reddish purple. White and straw-coloured flowers have been frequently recorded, and forms with lilac-purple flowers as in *O. prætermissa* Dr. are not uncommon. This purple colour characterises var. *cambrica* Pugsley, which grows in Ireland where *O. prætermissa* is unknown. Forms with distinctly three-lobed lips are uncommon, but their existence is clearly recognized, not only by the younger Reichenbach, but by M. Schulze (Die Orchideen Deutschlands, etc.), and Ascherson and Graebner admit a variety *trifurcus* [sic] of this kind (Syn. Fl. Mitteleur. iii. 717). I have Swedish specimens, otherwise typical, in which this character is well shown (Issen, Förlingstad, Ostrog. 1913). The peculiar lined marking of the lip is not often wanting in *O. latifolia*, but some forms show broken lines or fine spots only, and such a plant is figured by Schulze (l. c.) to represent the species.

Of the numerous varieties that have been described by the younger Reichenbach, Ascherson and Graebner, and other Continental authors, some at least probably shade into each other. The variety *Gemmana* Pugsl., published in my earlier paper, is perhaps too near var. *macrophylla* Schur Enum. Pl. Transs. p. 641 (1866). Ascherson and Graebner's *subfoliosus* [sic] (l. c. p. 718) is also somewhat similar, but seems to be definitely separable. Among the Danish material examined are several specimens referred to var. *sublatifolius* [sic] Asch. & Graebn. These are rather low-growing plants, with relatively broad, spreading or recurved leaves, but the normal inflorescence of the species. This variety has not been recognized as British, but it may occur on our coastal dunes.

A notable variety is var. *ochroleuca* Boll, which I have observed *in situ* for three successive seasons in a West Norfolk fen, where it grows in some quantity. In this station it is practically the only form of *O. latifolia* and appears quite uniform. It is distinguished not only by its tall growth and straw-coloured, unspotted flowers, but by its three-lobed labellum, though this latter feature is less marked in young or weak plants. These same characters, which are noted by Fischer and Nelson (Die Orchid. Deutschl. p. 22) though not in Boll's original description, are visible in Continental *exsiccatae* (Brandenburg and Posen in Hb. Kew.), and no analogous red-flowered plants seem to be known. In 1938 the variety was found in a second Norfolk fen, but here it was growing with other forms of the species. It might be thought, from its peculiar features and its occurrence in widely separated stations, that the plant should be treated as more than a variety of *O. latifolia*. But the same colouring of the flowers is known in other forms of the species and Schulze does not admit it even as a variety. In West Surrey similar straw-coloured concolorous flowers may be seen on individual plants growing with red-flowered examples considered to be var. *pulchella* Dr., which they match exactly in everything except colour. The three-lobed lip also is not unique in the species, as already shown, though it is perhaps more pronounced in var. *ochroleuca* than in any other form. Dr. Heusser, who examined cytologically material obtained in Lichtenstein, found that it was a diploid ($2n=40$) and says "Das Chromosomenbild gleicht ganz dem der *O. incarnata* L." The plant thus seems best regarded as a variety of *O. latifolia*. It was first observed in Sternburg, in Mecklenburg, in 1854 by Wustnei, who did not publish a name, and was described by E. Boll in Fl. Meklenburg, p. 307 (1860), as *O. incarnata* β *ochroleuca* (Wustnei). The correct name is therefore *O. latifolia* L. var. *ochroleuca* (Wustnei ex Boll) Pugsl. The citation of *O. ochroleuca* Schur Enum. Pl. Transs. p. 641 (1866), in synonymy seems to be erroneous. Schur's plant is an inhabitant of dry moors and Narcissus meadows, and has spotted leaves.

ORCHIS CRUENTA O. F. Müller.

This species, which I discovered at Zermatt in 1933 as new to the Alps, has now been found in Graubünden and other parts of Switzerland, and has been described and figured from Swiss specimens by Dr. R. Gsell (Jahresb. Naturfors. Gesell. Graubünden, 1936). It has also been discovered in two stations in the French Alps. A specimen at Copenhagen (Vahl, Frideriksgaard og Gröndal, 1850, as *O. incarnata* β *hæmatodes* Rchb.) seems to belong here.

ORCHIS PARDALINA Pugsl. (*O. latifolia* auct. angl. nonnull.).

This is said to be fairly common in Cornwall, growing usually with *O. prætermissa* Dr. and without any form of *O. maculata* (Rilstone in Journ. Bot. 1938, p. 136). It has likewise been recently reported in the same association from a few localities in South Devon, and specimens have been received from the neighbourhood of Taunton, in South Somerset.

It is desirable that the cytology of this British plant should be investigated, especially in view of the existing doubt respecting its identity with *O. prætermissa* subsp. *junialis* Verm.

ORCHIS MAJALIS Rchb. (*O. latifolia* auct. mult.).

The flowers of this species, though more or less uniform in colour, are very variable in size as well as in the form and markings of the labellum. While in many well-grown examples they are only of moderate size, they are frequently nearly as large as those of typical *O. alpestris* Pugsl., not only in the Alps but in Denmark and other lowland stations. Out of thirty-eight sheets in the Copenhagen collection fourteen showed specimens with definitely large flowers, the remainder being smaller and generally in denser spikes. The labellum, as usually described, is broad and obtusely three-lobed, but in any large colony some plants in which its form is quite different may generally be detected. I have seen specimens with the lip narrowly rhomboid and subentire with a long protruding apex. The lip-markings are similarly variable, though nearly always of a variegated character; occasionally an admixture of white, chiefly towards the throat, occurs.

Fischer and Nelson's figure, cited under var. *pinguis* (Asch. & Graebn.) Pugsl. in my synopsis (Journ. Linn. Soc.) more nearly depicts an intermediate form and would be better placed under the typical species.

In some Alpine stations the var. *pinguis* approaches *O. alpestris* in its flowers, but is distinguishable by its taller, stouter, and rather more leafy stem, with more or less ovate and acute (instead of obovate, obtuse) foliage.

Subspecies OCCIDENTALIS Pugsl.

This plant does not appear to vary to the same extent as typical *O. majalis*. Its spikes are always dense and its flowers never very large. While the typical species and its variety *pinguis* are generally readily separable from subspecies *occidentalis* by their taller growth and less spreading foliage, with laxer spikes of normally larger flowers, some northern and central European specimens are scarcely distinguishable in the dried state. There is an interesting account of the Irish forms, and their relationship with *O. kerreyensis* Wilmott, by Mr. P. M. Hall in B. E. C. Report, xi. pt. iii. (1937), with a number of photographic plates; and in the same volume Miss M. S. Campbell has a paper in which *O. occidentalis* is recorded for North Uist, Outer Hebrides, with a good figure.

Subspecies TRAUNSTEINERIOIDES Pugsl.

Further sets of this plant in a living state were received last June from Mr. Brunner from its two Wicklow stations. These specimens showed no material deviation from the original examples of 1935. In 1936 Messrs. P. M. Hall and N. D. Simpson visited Ballyman Glen and collected similar plants. It is clear that this subspecies is a distinct and constant form in these localities.

It now seems possible to deal with *O. latifolia* var. *eborensis* Godf. Mon. &c. Orchid. p. 219 (1933), which is well illustrated by a photographic plate. According to Godfery this is a very dwarf form (12 cm. high), and as such it certainly occurs very sparingly at Helmsley and elsewhere in Yorkshire. But at Helmsley pigmy plants of *O. maculata* grow in company with var. *eborensis*, and, as much larger specimens of this variety have been collected in the vicinity, the dwarf habit is apparently due to some peculiar local soil condition. On 29th June, 1937, I met with a considerable colony (over fifty plants) in a wet field near Hellifield that probably represents the normal condition of var. *eborensis*. These individuals are not readily separable from the subspecies *Traunsteinerioides*, but their habit is, on an average, dwarfer (15–25 cm. high) and the flowers are rather smaller with a less distinctly deltoid labellum. In this latter feature they approach typical *O. majalis*, but they are obviously akin to *Traunsteinerioides*, and it is therefore proposed to place this variety under that subspecies as var. *eborensis* (Godf.) Pugsl., distinguishable from the Irish subspecific type by its dwarfer habit and lip-characters.

Two seemingly allied forms have recently been found in Hampshire. These require further investigation.

The taxonomic position of the two subspecies of *O. majalis*, *occidentalis* and *Traunsteinerioides*, as well as of *O. kerreyensis* Wilmott, is perhaps debateable, for while their points of distinction from the typical Saxon species seem greater than those charac-

terising most recognized varieties of European orchids, all three plants bear such a clear resemblance to *O. majalis* in their foliage and purple flowers with three-lobed labellum, as well as in their early flowering, that it seems unwarranted, remembering the variability of *O. majalis* on the Continent, to regard them as new Irish species distinct from *O. majalis*. There are analogous cases, as in *Euphrasia*, of Central European species occurring freely in Ireland, while they are absent or rare in Great Britain.

ORCHIS ALPESTRIS Pugsl.

During the last two years I have found this plant in numerous stations in the Tirol and in cantons Vaud, Valais, and Graubünden in Switzerland. A very early flowering form was collected at Saas-Fee (6000 feet alt.) on 14th June, 1936, of dwarf habit, only 10–16 cm. high, with leaves up to 10 cm. long and 4.5 cm. wide. A similar plant grows at Mont Louis, in the Eastern Pyrenees. While *O. alpestris* appears to be fairly uniform in most habitats, considerable variation was noticed this last summer (1938) in the Val de Bagnes, not only in the breadth of the foliage, which, however, always tends to be obovate, but in the form of the labellum. Isolated plants were seen that produced the narrow, rhombic, long-pointed lip that occasionally occurs in *O. majalis*. The cytology of this plant presumably agrees with that of *O. majalis*, for among the material tested by Dr. Heusser and found to be tetraploid ($2n=80$) were specimens from Avers-Cresta, where the usual Marsh Orchid is *O. alpestris*.

ORCHIS MACULATA L.

This is another species in which the colour of the flowers is far from uniform and the form and markings of the labellum excessively variable. The flowers of the British forms are distinctly paler in colour, on an average, than those seen in Central Europe.

Of a large number of sheets in the Copenhagen collection (61) about three-fourths showed specimens with the broad lip and slender spur characteristic of the British subspecies *erictorum* Linton. This form is apparently regarded as typical *O. maculata* L. by the Danish botanists. A few other examples were included, which had been referred to var. *Meyeri* Rehb. f. In these the labellum resembles that of *O. Fuchsii* Dr. This form is stated to be rare in Denmark and found only on calcareous soil.

The cytology of *O. maculata* is of special interest. Dr. Hagerup found that var. *genuina* Rehb. f. and var. *elodes* (Grisb.) Camus from Denmark and the Faeroes are tetraploids ($2n=80$), while the Danish variety *Meyeri* Rehb. f. is diploid ($2n=40$). In Switzerland plants from firwoods and damp moors at low altitudes in Canton Zurich, as well as others from alpine meadows

at high altitudes in Cantons Graubünden and Tessin, were determined by Dr. Heusser as tetraploids, while an example from a firwood near Schuls, in the Lower Engadine, proved to be diploid. It seems doubtful whether the Swiss tetraploids are identical morphologically with those of Denmark, for the common *O. maculata* of the Alps, although with more deeply coloured flowers, resembles the British *O. Fuchsii* rather than the subspecies *ericetorum*. Further investigation of these plants is necessary, and it is very desirable that the British forms, particularly *O. Fuchsii*, should be cytologically examined.

STUDIES OF BRITISH POTAMOGETONS.—IV.

By J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

IV. THE IDENTITY OF *POTAMOGETON DRUCEI*.

THE history and taxonomic position of *Potamogeton Drucei* Fryer are matters of great interest to British botanists, as this pondweed has been regarded as a plant endemic to Britain and, furthermore, there has been considerable controversy whether it represents a species or a hybrid. Fryer's original account of *P. Drucei* appeared in 1898 in 'Potamogetons of the British Isles', pp. 31-34, t. 21, the description and plate being based on specimens, both dried and living, of a plant collected by G. C. Druce in the River Loddon, Berks. The botanical history of this Loddon plant began in June 1893 when Druce discovered it growing in the river between Twyford and Loddon Bridge. In the same year he sent specimens to Fryer, but these "were badly dried and wanted roots and lower leaves", and it was not until Fryer had received better material, including living roots which arrived in 1898, that he decided to distinguish the plant under the name *P. Drucei*. Fryer's views varied considerably between 1893, when he first saw a specimen, and the time when he was able to watch the growth of the plant in cultivation, and it is interesting to review his opinions at different dates as recorded in an article published in Bot. Soc. & Exch. Club Brit. Is. v. 713-718 (1920), where his letters to Druce on the subject are quoted. It appears that Fryer's first impression "at a glance" (on 3rd Oct. 1893) was that the plant should not be named $\times P. fluitans$ but was most likely a hybrid between *P. alpinus* and *P. natans* as Druce himself thought. Two weeks later, however, Fryer informed Druce that he could safely refer the plant to $\times P. fluitans$ (*P. lucens* $\times$ *natans*), and this identification was accepted by Druce in his 'Flora of Berkshire' (1898), p. 516 et Add. & Corr., and in Bot. Exch. Club Brit. Is. Rep. 1897, 568 (1898), though he added a query and suggested that the parents were *P. alpinus* and either *P. natans* or *P. polygonifolius*. Mean-

while, in 1896, Fryer wrote that the plant was very doubtful and might possibly be "only a form of *polygonifolius* or perhaps that species and *natans*", adding that it was not like any other *fluitans* form in his herbarium though to him it seemed to "fall under that segregate *". On 1st Sept. 1898, immediately following the arrival of living roots, Fryer stated that he certainly could not refer the plant to any form known to him, the rootstock seeming to remove it from typical $\times P. fluitans$ though probably it would "range itself in or near the *fluitans*-group". The rootstock, together with the structure and venation of the leaves, suggested the hybrid *P. alpinus* $\times$ *polygonifolius*, and he was "strongly tempted to give it a plate after *P. Griffithii* (a probable hybrid of *alpinus*) and call it $\times P. Drucei$ = *alpinus* $\times$ *polygonifolius*". Yet two days later he wrote that the plant was, he feared, "only *polygonifolius*, a most distinct form, however". When the roots had been growing for a time Fryer found that the plant made autumnal growths with winter-buds "more like *alpinus*"; these removed it from *P. polygonifolius* and caused him to revert first to the suggestion of *P. alpinus* $\times$ *polygonifolius* and then to Druce's original proposal of *P. alpinus* $\times$ *natans*. Fryer proceeded therefore, near the end of 1898, to describe the plant as distinct under the name *P. Drucei* (with a $\times$ prefixed), remarking that Druce was probably correct in supposing it to be *P. alpinus* $\times$ *natans*, and adding the following qualification: "Perhaps it would have been better to have delayed the publication of this species until its life-history had been more fully worked out; but both artist and author were unwilling to omit the insertion of so beautiful a plant in its proper place in this work."

The wisdom of this qualification became apparent within a year, for in Journ. Bot. xxxvii. 524 (1899) Fryer reported that during the summer of 1899 the plant flowered profusely in cultivation and that most of the spikes fruited thinly but so regularly as to alter the opinion he had formed as to its being a hybrid. He remarked that the fruit was very unlike that of any European *Potamogeton*, and that A. Bennett had been unable to match it with any extra-European species known to him; further, that the stolons bearing winter-buds, thrown out from the decaying stems, were unlike those of any species known to him. In view of these distinctive characters he now considered that it would be better to omit the sign of hybridity and rank the plant as a "full species".

In Graebner's monograph of *Potamogeton* in 'Das Pflanzenreich', vol. iv. 11 (1907), p. 65, *P. Drucei* was accepted as a species of the subsection *Fluitantes*, with a note that the plant was very similar to the American *P. pulcher* except that the submerged leaves were not crisped. Graebner further cast

* Presumably "aggregate" was intended here.

doubt on the supposed parentage *P. alpinus* × *natans* and added that Fryer now considered the plant to be *P. lucens* × *polygonifolius*. This last statement was confirmed by Bennett in Journ. Bot. liv. 87, 180 (1916), who remarked that *P. lucens* × *polygonifolius* was Fryer's matured opinion in 1907 (and still held in 1910 *) after careful watching of the plant's growth, and that his own opinion concurred with Fryer's. Neither he nor Fryer had succeeded in growing the plant from the fruit.

Hagström (Crit. Res. 146-147) in 1916 returned to the theory that *P. Drucei* was *P. alpinus* × *natans*, opening with the remark: "There can scarcely be any doubt of the hybrid nature of the Berkshire plant named *P. Drucei*". He declared that the large floating leaves distinctly indicated that *P. natans* should be considered as one of the parents, and that a closer investigation of all the organs of the plant did not contradict this supposition. As to the other parent he was not so confident, but thought that Druce's first proposition (*P. alpinus*) seemed "favoured with all probabilities". He rejected the combination *P. natans* × *polygonifolius* on anatomical grounds.

In 1918 J. W. White (in Journ. Bot. lvi. 82) recorded *P. Drucei* from the River Avon at Saltford, North Somerset, where it was first gathered in Aug. 1916 by C. Bucknall in company with Mrs. Wedgwood. White noted, in view of the *P. alpinus* × *natans* theory, that the Avon specimens did not show the red colour said to be present in the Loddon plant †, and that *P. alpinus* had not yet been met with in the Avon.

Pearsall, reviewing Hagström's 'Critical Researches' in Bot. Soc. & Exch. Club Brit. Is. v (1920), remarked of *P. Drucei* (p. 707) that many botanists would accept the view of its being *P. alpinus* × *natans* "only with mental reservations". He went on to enumerate several characters which "combine to leave one in doubt as to whether the plant is not entitled to the specific rank Fryer finally accorded it".

A new suggestion came in 1925 when Bennett (in Journ. Bot. lxxiii. 149) put forward the opinion that the name *P. Drucei* must give way to the much earlier *P. petiolatus* Wulfen (1827), which was based on a plant from south-western Russia. Bennett was unable to say for certainty whether it was a hybrid or

* Yet according to Druce, in Bot. Soc. & Exch. Club Brit. Is. v. 714 (1920), Fryer at their last meeting in 1910 said he felt very doubtful about the plant but thought it must be a good species. Fryer was then 84 years of age.

† Druce in Bot. Soc. & Exch. Club Brit. Is. v. 718 (1920) criticized this statement on the ground that it was based on imagination, no such coloration having been noticed by him in the Loddon plant. White, however, was perhaps referring to Fryer's statement (in his original description of *P. Drucei*) that the plant dried reddish brown and dark green.

a species, though he rather thought the former. Yet later in the same year (in Watson Bot. Exch. Club, iii. 314) he said that he was inclined to call *P. Drucei* a species and not a hybrid!

In Bot. Soc. & Exch. Club Brit. Is. viii. 928 (1929) Druce reported *P. Drucei* from the River Stour near Child Okeford, Dorset, where he had discovered it in June 1928. He noted that the plant was fruiting freely in September, and that there seemed to be no *P. alpinus* in the stream*.

When Pearsall dealt with *P. Drucei* in his account of the larger British species of *Potamogeton*, in Bot. Soc. & Exch. Club Brit. Is. ix. 390-391 (1931), he had an open mind on the question whether the plant was a species or a hybrid, but stressed the points that several of the most constant and distinctive characters of *P. alpinus* which would be expected to make their presence felt in the hybrid were either absent or insufficiently evident in *P. Drucei*, and that the latter possesses a closely intricate and beautiful transverse venation (of the submersed leaves) quite unlike that of any other British species. He mentioned Bennett's reduction of *P. Drucei* to *P. petiolatus* and pointed out, without comment, that Hagström had referred the latter to *P. nodosus* Poir.

Druce in his 'Comital Flora' (1932), p. 312, omitted the sign of hybridity before the name *P. Drucei* but doubtfully suggested the origin *P. alpinus* × *natans*. He gave the distribution as "8, 9!, 22. Rivers Stour, Loddon, and Avon" (the "8" being an error for "6"). More recently the plant has been collected in a fourth river, the Thames, where it was found near Cookham, Berks, by D. M. Heath in 1934; this was recorded by Chapple in Bot. Soc. & Exch. Club Brit. Is. xi. 511 (1938). Hitherto it has been accepted that Druce, in 1893, was the first to find *P. Drucei*, but it should be pointed out that material was collected in the Avon near Brislington by W. H. Painter in 1884. Painter's plant was named *P. natans* and was included under that species in White's 'Flora of the Bristol Coal-field' (1887), p. 208, and in the same author's 'Flora of Bristol' (1912), p. 607. In both these works the record was accredited to Somerset, but the Avon near Brislington is wholly in West Gloucester and the record should be referred to that vice-county; the locality is about six or seven miles downstream from the North Somerset station at Saltford whence *P. Drucei* was reported by White in 1918.

* He added: "It may well be that it is the plant which Pulteney (New Fl. Dorset) called *heterophyllus*." But Pulteney (Cat. Dorsetsh. III (1799)) did not record *P. heterophyllus*; he recorded *P. gramineus* from the R. Stour and ditches communicating with it, and it is clear from his citations that he meant some linear-leaved species. The name *P. gramineus* was formerly applied by British botanists to *P. obtusifolius* and allied species.

Such is the botanical history, summarized, of this interesting British pondweed which is now known to occur in four rivers in southern England. We have seen that before being described under the name *P. Drucei* it was at different times referred, more or less doubtfully, to *P. alpinus* × *natans*, × *P. fluitans* (*P. lucens* × *natans*), *P. polygonifolius*, and *P. alpinus* × *polygonifolius*. Subsequently it has been variously considered as (1) a distinct ("full") species endemic to Britain, (2) *P. lucens* × *polygonifolius*, (3) *P. alpinus* × *natans*, and (4) *P. petiolatus* with status uncertain. The plant is known to produce fruit, and this is against its being a hybrid, as also are the facts that its pollen is normal* and that no satisfactory parentage can be assigned to it, for if it were really a hybrid its parents would surely be obvious among the limited number of possible species. On the other hand, if the plant represented a species endemic to the south of England it would indeed be exceptional in its distribution since all other European species of *Potamogeton* occur over wide areas. What is the truth? The key is provided by Bennett's reduction of *P. Drucei* to *P. petiolatus*, which, as mentioned by Pearsall, was referred to *P. nodosus* by Hagström. If Bennett and Hagström were right it follows that *P. Drucei* must be referable to *P. nodosus*. Recourse to specimens shows that this is certainly the case. *P. Drucei*, like other rare plants in Britain, has received its full share of attention from collectors, and a fine series of specimens showing various phases of the plant is now available for study. Comparison with extra-British material of *P. nodosus* leaves us in no doubt that the British plant is the same species, for we can detect no difference whatever by which to effect a separation. Fryer's statement in 1899 (see above) that the fruit of *P. Drucei* was very unlike that of any European *Potamogeton* and that the stolons bearing winter-buds were unlike those of any species known to him is difficult to understand, as the fruit and stolons agree exactly with those of *P. nodosus*. Further, the anatomical characters given for *P. Drucei* by Hagström (Crit. Res. 146-147) are in full accordance with those contained in his description of *P. nodosus* (op. cit. 183-188).

The problem of *P. Drucei* is in fact so readily solved that we are left wondering at the controversy which has hitherto been waged about the plant without its real identity being established. It is particularly surprising that the truth escaped Graebner and Hagström, both of whom were familiar with *P. nodosus* from extra-British stations. Fryer's failure to identify *P. Drucei* correctly is largely explained by the fact that at the time when he was studying the question *P. nodosus* was confused

* Druce in Bot. Soc. & Exch. Club Brit. Is. v. 718 (1920) stated that the pollen was examined in the Botanical Laboratory at Oxford and found to be normal.

with × *P. fluitans** and not generally recognized as a distinct species. He already knew × *P. fluitans* as the sterile hybrid *P. lucens* × *natans*, and, although he so identified Druce's Loddon specimens in 1893, he naturally could not hold to this identification when further material increased his knowledge of the plant. Graebner (in 'Das Pflanzenreich') placed *P. nodosus* under an aggregate *P. fluitans*, and ought also to have included *P. Drucei*, but as he cited only one gathering of the British plant he was perhaps handicapped by inadequate material. Hagström (Crit. Res.) also cited only a single gathering of *P. Drucei*, but his treatment of the plant as *P. alpinus* × *natans* is nevertheless unaccountable, for it was in this very same work (pp. 183-190) that he published his classic account of *P. nodosus* establishing it as a distinct species and including the statement (p. 186) that "In all its properties it shows a distinct fixedness whether it is met with in Europe or in another quarter of the world". His description of it agrees admirably with *P. Drucei*. Bennett was very near the mark when he reduced *P. Drucei* to *P. petiolatus*, but he found himself unable to come to a decision about the status of the latter, while Pearsall, though going a stage further and drawing attention to the fact that Hagström had referred *P. petiolatus* to *P. nodosus*, was non-committal and retained the name *P. Drucei*. Perhaps a lack of knowledge of extra-British forms, or possibly a disinclination to interfere with the nomenclature, deterred him from displacing that name.

Hagström in his account of *P. nodosus* credited the species with a very wide distribution over the warmer parts of the World. He cited stations in Europe (definitely excluding Great Britain!), Asia, Africa, America, and the Pacific Islands, but it is to be doubted whether all the plants included by him really belong to the species. It is certain, however, that the species encircles the Mediterranean in Europe, Asia, and Africa, extending into the Atlantic Islands (Canary Is., Madeira, and Azores) and into central and western Europe as far north as Poland, Germany †, and southern England which seems to be its north-western limit in Europe. The type came from the Canaries. In Britain the species is so far known only from four rivers, where it grows in deep water as well as in gravelly shallows. Further exploration may possibly lead to its discovery elsewhere in southern England, and it should be looked for in both stagnant and flowing waters,

* The confusion began when Roth described *P. fluitans* in 1788, for though the description appears to have been based on the hybrid *P. lucens* × *natans*, and does not fit *P. nodosus*, the distribution given by Roth includes a station for the latter plant. We consider that Roth's name should be restricted to the hybrid.

† According to Hagström's account the most northern German (and European) station is at Königsberg. The species has, however, been collected at Vilna (in Poland) which is at approximately the same latitude.

as outside Britain it occurs not only in rivers but also in lakes and canals.

The synonymy of *P. nodosus* as a British plant is appended, with references to the literature and a summary of the known distribution.

P. NODOSUS Poir. in Encycl. Méth., Bot., Suppl. iv. 535 (1816).

P. petiolatus Wulfen in J. A. & J. H. Schult. Mant. iii. 352 (1827).

P. natans (non L.) J. W. White, Fl. Bristol Coal-field, 208 (1887) pro parte, quoad pl. ex fluvio Avon prope Brislington; Fl. Bristol, 607 (1912) pro parte, quoad eandem pl.

P. fluitans Roth?—Druce, Fl. Berks. 516 et Add. & Corr. (1898); in Bot. Exch. Club Brit. Is. Rep. 1897, 568 (1898).

P. Drucei Fryer in Fryer & Benn. Pot. Brit. Is. 31, t. 21 (1898); in Journ. Bot. xxxvii. 524 (1899).—Druce in Bot. Exch. Club Brit. Is. Rep. 1898, 589 (1900); *op. cit.* Rep. 1899, 613 (1901); *op. cit.* Rep. 1900, 646 (1901); *op. cit.* ii. 27 (1904); *op. cit.* v. 476 (1919) & 713 (1920); *op. cit.* vii. 786 (1926); *op. cit.* viii. 928 (1929); in Watson Bot. Exch. Club Ann. Rep. 16, 20 (1900); in Journ. Bot. xliii. 24 (1905); Fl. Oxfordsh., Ed. 2, 444 (1927); Comit. Fl. 312 (1932).—H. & J. Groves in Bab. Man. Brit. Bot., Ed. 9, 437 (1904); *op. cit.*, Ed. 10, 437 (1922).—Graebn. in Engler, Pflanzenr. iv. 11, 65 (1907).—E. S. Marshall in Journ. Bot. liv. 37 (1916).—A. Benn. in Journ. Bot. liv. 87, 180 (1916); *op. cit.* lxiii. 149 (1925).—Hagstr. Crit. Res. 146, fig. 66 (1916).—J. W. White in Journ. Bot. lvi. 82 (1918); in Proc. Bristol Naturalist. Soc., Ser. 4, v. 43 (1919); in Bot. Soc. & Exch. Club Brit. Is. vi. 858 (1923).—Pearsall in Bot. Soc. & Exch. Club Brit. Is. v. 707 (1920); *op. cit.* ix. 390 (1931); *op. cit.* x. 111 (1933).—Rendle in Benth. & Hook. Handb. Brit. Fl., Ed. 7, 442 (1924).—H. S. Thompson in Watson Bot. Exch. Club, iii. 267 (1924) & 313 (1925).—Butcher in Butcher & Strudw. Furth. Ill. Brit. Pl. 366, fig. 384 (1930).—Hall & Wallace in Bot. Soc. & Exch. Club Brit. Is. xi. 413 (1937).—Chapple in Bot. Soc. & Exch. Club Brit. Is. xi. 511 (1938).

Vice-county Distribution:—

(6) NORTH SOMERSET. R. Avon in the neighbourhood of Bath and Saltford.

(9) DORSET. R. Stour near Child Okeford and Shillingstone.

(22) BERKS. R. Thames near Cookham. R. Loddon between Twyford and Loddon Bridge.

(34) WEST GLOUCESTER. N.C.R. R. Avon (near Brislington), Bristol, July 1884, W. H. Painter (Herb. Brit. Mus.), named *P. natans*.

NOTES ON OUTER HEBRIDES RECORDS.

By M. S. CAMPBELL, F.L.S.

IN the last issue of this Journal, p. 1, Prof. J. W. Heslop-Harrison, Miss Helena Heslop-Harrison, Mr. R. B. Cooke, and Dr. W. A. Clarke state that "it is proposed to place on record the plants . . . which appear to be absent from published lists for v.c. 110."

The preliminary researches that I have made for my "Flora of the Outer Hebrides" (see Journ. Bot. p. 88, 1937) show that a number of the species so recorded had already been published. They are as follows, the dates given being those of publication:—

Draba incana L. W. Macgillivray, 1830; Arthur Bennett, 1895.
Trifolium procumbens L. W. Macgillivray, 1830; W. A. Shoolbred, 1895.

Crataegus Oxyacantha L. J. H. Balfour and C. C. Babington, 1844 ("planted at Roddal"); W. A. Shoolbred, 1895 ("Near Rodil, S. H.—Probably not native").

Callitriche autumnalis L. Hon. Mrs. G. Baring, 1929. (Specimen in Herb. Druce.)

Drosera longifolia L. W. Macgillivray, 1830.

Epilobium tetragonum L. J. H. Balfour and C. C. Babington, 1844; Ar. Bennett, 1910. (Recent specimens from v.c. 110 in Herb. Mus. Brit. so named, have been determined by Mr. G. M. Ash as *E. obscurum* Schreb.)

Inula Helenium L. Book of Barra, 1936.

Taraxacum laevigatum DC. Proc. Roy. Phys. Soc., 1936.

Campanula rotundifolia L. var. *speciosa* More. W. A. Shoolbred, 1895 and 1899. (Specimens of both gatherings in Herb. Mus. Brit.)

Gentiana baltica Murb. W. A. Shoolbred, 1895 and 1899. (Specimens of both gatherings in Herb. Mus. Brit.)

Calystegia sepium (L.) R. Br., 1936. (See E. V. Watson, Journ. Bot. p. 6, 1939.)

Polygonum aequale Lindman. Ar. Bennett, 1890 (as *P. aviculare* var. *arenastrum*); Mingulay, coll. Finlayson, 1889.

Glyceria fluitans (L.) R. Br. W. Macgillivray, 1830 (*Poa fluitans*); J. H. Balfour and C. C. Babington, 1844; W. A. Shoolbred, 1895; M. S. Campbell, 1937 and 1938. (Specimens in Herb. Mus. Brit.)

[*Sparganium neglectum* Beeby. The specimen in Herb. Mus. Brit. of *S. ramosum* Huds. var. *microcarpum* Newman (W. A. Shoolbred, Journ. Bot. p. 480, 1899. "Plentiful at Balranald Marshes") has been determined by Mr. Wilmott as *S. neglectum*.]

SHORT NOTE.

Crinum Jagus (Thompson) Dandy, comb. nov. *Amaryllis Jagus* Thompson, Bot. Display. t. 6 (1798).¹ *Crinum giganteum* Andr. Bot. Repos. iii. t. 169 (1801); Bak. Handb. Amaryll. 91 (1888) et in Dyer, Fl. Trop. Afr. vii. 404 (1898); Hutch. in Hutch. & Dalziel, Fl. W. Trop. Afr. ii. 372 (1936). This species is widely distributed in Tropical Africa. Both *Amaryllis Jagus* and *Crinum giganteum* were based on plants cultivated in Britain and imported from Sierra Leone. Baker (*locis cit.*) cited the earlier *A. latifolia* Lam. (1783) as a synonym of *C. giganteum*, but Lamarck's epithet cannot be taken into consideration under *Crinum* owing to the existence of *C. latifolium* L. (1753). I am unable to trace the derivation of the epithet *Jagus*.—J. E. DANDY.

REVIEW.

An Ecological Glossary. Compiled by J. RICHARD CARPENTER. London: Kegan Paul, Trench, Trubner & Co., Ltd. 8vo, pp. viii+306+xii. Price 15s.

WHEN Dr. B. Daydon Jackson was compiling the last edition of his Glossary he often complained to me about the still rapidly rising flood of ecological terms which threatened to make completion of his work impossible. Happily the last ten years has not been so prolific and there has moreover been a continuous sifting and attempt at standardization, though unfortunately not with a rejection that would be so beneficial.

The present glossary occupies 287 pages and includes terms from the eighteenth century as well as the most recent; some modern workers seem to be under the impression that a knowledge of vegetation is wholly twentieth century, forgetting that some of the difficulties of ecological terminology are due to the common terms in use from time immemorial, as, *e. g.*, moss, moor. The definitions in the present work are rarely the original ones, but a reference is given to the "author" in whose sense the term is used, though a large number are taken from Jackson. The method sometimes leads to rather strange results, *e. g.*, "Mycorrhiza, Tansley and Chipp '26: 158," a reference to an article by a third author in "Aims and Methods." The book will be useful in biological laboratories and libraries. There is a list of "literature cited" (thirty-four titles) and a fuller "historical bibliography," and an appendix of twelve charts, vegetational and zoological maps, some of which are from works now difficult of access.—J. R.

CORRECTION.—Page 364, December 1938, line 22, for British read Bristol.

FIG. 1.

FIG. 2.

FIG. 3.

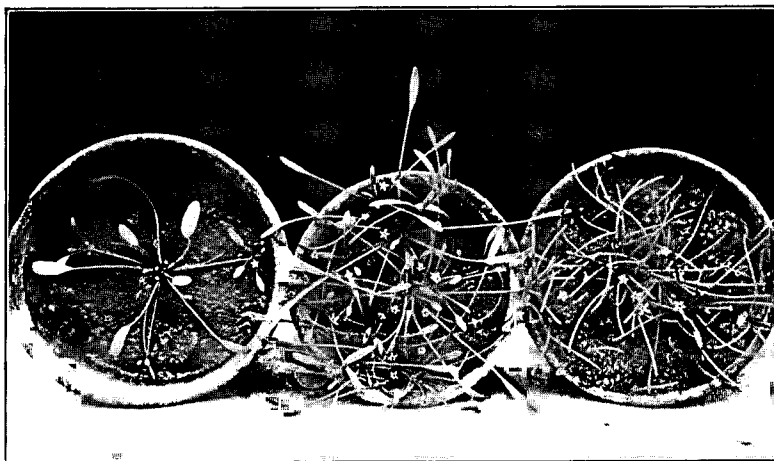
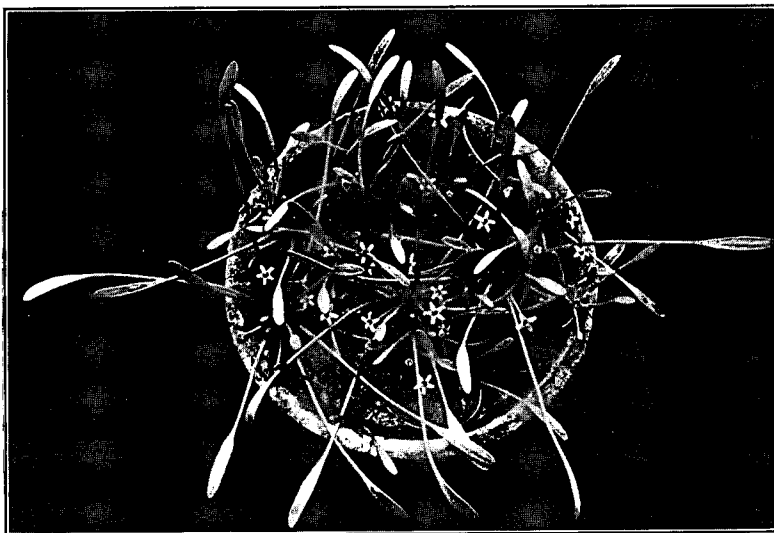


FIG. 4.



LILOSELLA AQUATICA (fig. 1), *L. SUBULATA* (fig. 3),
AND THE HYBRID (figs. 2 & 4).

THE *LILOSELLA* PLANTS OF GLAMORGAN.

(PLATE 616.)

Part I.—THE HISTORY OF THEIR DISCOVERY.

By E. VACHELL.

THE North American species *Limosella subulata* Ives (= *L. tenuifolia* Nutt. = *L. aquatica* var. *tenuifolia* Lej.) was first collected by Professor A. H. Trow, in flower, at Whitsuntide 1897, on the shores of Kenfig Pool, Glamorgan, but, not having collected *Limosella* before, he regarded it simply as *L. aquatica* L. It was subsequently found and recorded from the same place by the Rev. E. S. Marshall and Mr. W. A. Shoolbred in June and July of 1901. They were both of the opinion that it was a species distinct from *L. aquatica* (Hiern, 1901, p. 336). In 1905 it was again noticed in the same place by Professor Trow, in great quantity all round the sandy shores of the pool, with the exception of the north side (Trow, 1909). Subsequently the plant was uncertain in its appearance, and many years it did not appear at all.

In the autumn of 1930, before the publication of his very detailed 'Limosella-Studien' Professor Glück of Heidelberg searched the locality with me, but during a three hours' walk right round the pool no trace of *L. subulata* was found. He discovered, however, a small colony of *L. aquatica* in a roadside puddle about a quarter of a mile from the pool (see Glück, 1934, or the translation by Lady Davy in the B. E. C. Report for 1934, p. 885). This was a new record for v.c. 41. In this habitat *L. aquatica* has appeared every year since its discovery until the present dry season 1938. In 1937 I found it also on mud near a spring in an adjoining pasture field. In this habitat the plant is quite uniform in appearance; the leaves are all spathulate and dark green.

In 1933 *L. subulata* appeared again on the sandy shores of Kenfig Pool in great abundance and has since reappeared annually until this year (1938) when it was searched for on May 8th, after a spell of very dry weather, but no trace of it could be seen. In this habitat *L. subulata* only is to be found. The leaves are all subulate and grass-green and the pure white flowers remain open in the sunshine. Kenfig Pool, though situated among sand-dunes, is freshwater and Prof. Glück (p. 493) gives a list of the plants with which the *Limosella* is associated.

The other habitats given for *L. subulata* in Wales are: (1) The Gluslyn River; (2) Crumlin Bog; (3) Morfa Swamp. The last locality, more properly called Morfa Pools, consists of two fair-sized ponds situated between sand-dunes and a low marshy meadow, about half a mile from the outskirts of Port Talbot, Glamorgan. The southern edge of the western pool is bordered

by Reeds, Sedges, *Rumex Hydrolapathum*, and other tall lacustral species, whereas the north shore is a muddy waste, gradually developing into a marshy pasture field in which *Senecio aquaticus* and *Polygonum Persicaria* are abundant, and *Rumex maritimus* occurs sparingly. During a visit to the pools in 1935 only a few plants, of apparently typical *L. subulata*, was seen on the shallow reed-bordered shore of the eastern pool, while the muddy cattle-trodden north shore of the western pool were found to be practically covered with *Limosella* plants, for perhaps a third of a mile. Thousands of plants were growing so thickly together that from a distance the whole area appeared to be covered with grass. Further examination showed great variety among the plants, some having spathulate leaves, some narrow-spathulate leaves, and others subulate leaves. In 1936 innumerable plants were again found in blossom in the same area and after careful observation it became possible to distinguish the different forms at sight, even from a considerable distance, for the spathulate-leaved plants were dark green and the subulate ones grass-green. Moreover, the flowers of the spathulate-leaved plants were a very pale lilac colour, while those of the subulate-leaved ones were pure white and slightly larger and more wide open in appearance.

The variety of leaf-form in a locality regarded as one of the recognized stations for *L. subulata* was so confusing that I endeavoured to forward specimens by hand to Professor Glück who was attending the International Botanical Congress at Amsterdam. These specimens were unfortunately so long delayed in reaching their destination that they must have been too decayed for recognition, for the answer he sent was that they were all *L. aquatica*. There for some time the matter rested, except that, feeling that things were not quite fully explained, I brought clods of earth full of plants of both kinds from this locality to Cardiff and kept some in a shallow tin and others submerged in a square glass jar. The results were most puzzling: the plants all persisted throughout the winter out-of-doors, proving that they were not, as stated, annual. Plants growing in the jar and just coming into blossom (May 1938) had been planted in the summer of 1936. They bloomed freely under water, the flowers never coming to the surface or opening, but these apparently cleistogamous flowers seeded freely, for the jar remained full of plants, many of which appeared young, though none were seen to decay. Plants started in an open tray last summer blossomed freely in the open until the end of December and began flowering again early in March. In the open tray the narrow-spathulate-leaved plant was dominant; in the glass jar the subulate-leaved one was most conspicuous, but from time to time plants with broad or narrow spathulate leaves, the former with an obtuse and the latter with a sharp pointed apex, appeared amongst the others. The leaf-stalks which were long in these

plants were easily induced, by the addition of water, to lengthen until in one plant they were six inches long, the leaf-blades lying flat on the surface of the water. In the plant with the narrow spathulate leaves with a pointed apex, the first dozen leaves were subulate. Three different types were therefore evidently present in Glamorgan and, in compiling the list of 'Flowering Plants and Ferns of Glamorgan' (Vachell, 1936), it seemed wise to record three forms for the county as follows:—

"*Limosella aquatica* L. Lacustral. Local. Kenfig! Morfa Ponds in great abundance!

"*b. tenuifolia* Hoffm. Under this variety can probably be placed plants with linear leaves abundant with type at Morfa Ponds! also recorded for Kenfig, B. E. C. 1934, p. 887.

"*L. subulata* Ives. Lacustral. Local. Kenfig Burrows!"

The occurrence and behaviour of the narrow-spathulate-leaved plants, which appear to be by far the easiest to cultivate, were nevertheless so puzzling that such living *Limosella* plants as were available and some herbarium sheets were taken to the British Association meeting at Nottingham, hoping that the interest of some competent botanist might be aroused in the *Limosella* problems.

It was my good fortune to enlist Dr. K. B. Blackburn of the University of Durham, who took home specimens to count the chromosomes, in an attempt to throw new light on the problem.

In October 1937 Morfa Pools were revisited; *Limosella* was in full flower, both species were there in great abundance, as well as the intermediate forms, and some of this material was sent to Dr. Blackburn. Detailed comparisons of the types present will be found in the table at the end of Part II. of this paper.

Part II.—CHROMOSOMES AND SPECIES.

BY KATHLEEN B. BLACKBURN.

It will be clear, from Miss Vachell's contribution, that the subject of the interesting *Limosella* population that she discovered at Morfa Pools, Glamorgan, needed to be considered from a new angle for there to be any real hope of determining the number and status of the different forms present. The study of their chromosome numbers seemed to offer a possible method, and the results obtained from investigations on these lines have proved most enlightening.

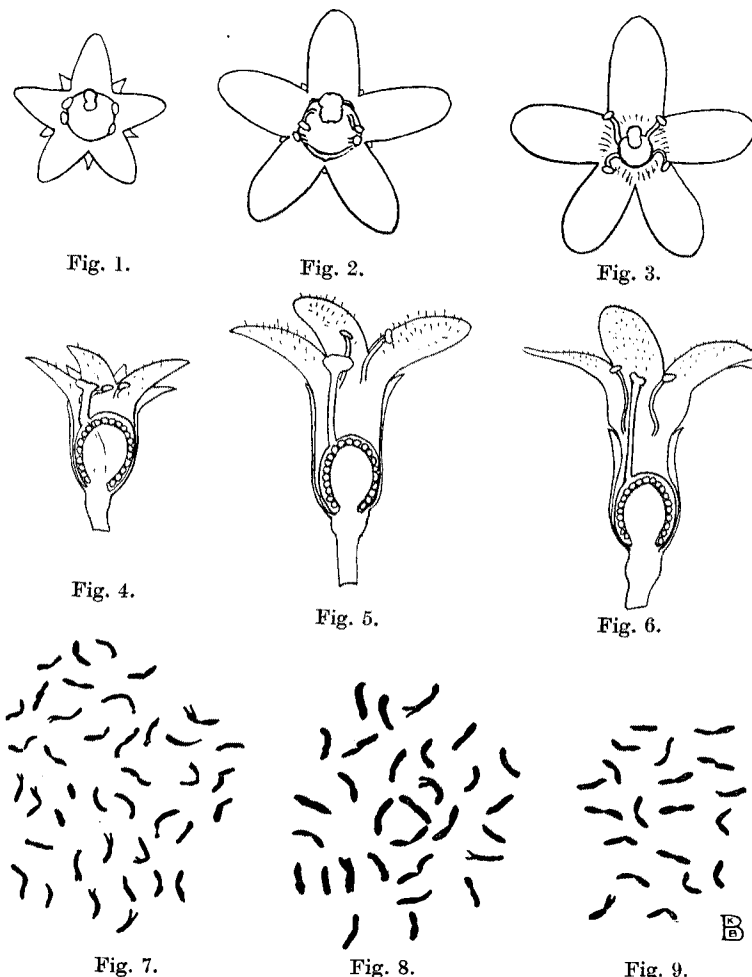
The chief source of material consisted of slabs of mud from Morfa containing what appeared to be two different types of plant in flower. These were sent to me by Miss Vachell in the autumn of 1937, but were found not to be growing sufficiently actively to provide cytological material and all but two of the plants soon lost their leaves.

The mud which contained them was kept in seed-pans standing in water in a cold greenhouse. Seedlings appeared in January, both in pots completely submerged and in those merely standing in water, and chromosome counts were made from root-tips of these. A week or so later leaves of older plants appeared, probably derived from runners from last year's flowering plants, though some might be from seedlings which germinated in the autumn, as they are doing extensively this year. Roots of these were also examined for chromosomes and, to cut a long story short, it was discovered that there were not two but three chromosome numbers represented in each of the pots, proving that they were mixed in the first instance, though this was not obvious. The only possible method of sorting them out was to prick off single plants into small pots and examine the chromosomes of a large number of individuals. Over a hundred plants were grown in this manner. Under these conditions they developed well, and it soon became obvious that there were three clearly marked types represented—not two linked by intermediates as at first seemed probable.

The extreme forms were apparently the two species *Limosella aquatica* L. and *L. subulata* Ives, and their characters were found to agree closely with those given by Pennell (1935) for N. American representatives of the species, except that the style in *L. subulata* is not deciduous nor always bent in *L. aquatica*. It was noticed that almost half of the *L. aquatica* individuals grown in the small pots failed to produce any runners, though they were quite healthy plants producing quantities of seed. The somatic chromosome counts for the two species are *L. aquatica* 40 and *L. subulata* 20; nuclear division takes place at a lower temperature and is usually more active in *L. subulata*.

The third type of plant has 30 chromosomes in the cells of its root-tips and this feature alone raises the question whether it may not be a hybrid between the two species already identified. The characters of leaf and flower are almost all intermediate, sometimes nearer the one species and sometimes nearer the other; the plants show extreme vegetative vigour, rapid growth, and many flowers, but produce empty pollen and no fruit or seed. Taking all these features into consideration, it becomes clear that the plant is a hybrid. A similar sterile hybrid is the classic *Drosera obovata* (Rosenberg, 1909) and here, curiously enough, the chromosome numbers of parents and hybrid are the same as found in the *Limosellas*. The differences between the three types of plant are shown clearly in the photographs (Pl. 616, figs. 1-3). The plants are the same age and it will be noticed that, in spite of the handicap of a smaller pot, the hybrid plant is much the biggest of the three. Differences in flower structure and chromosome complement are illustrated in the drawings in text-figs. 1-9, and full contrasted descriptions are found on the Table. These

descriptions concern only the plants growing in wet soil; the features shown by submerged plants are reserved for a future communication.



Limosella aquatica L. (figs. 1, 4, & 7). *Limosella subulata* Ives (figs. 3, 6, & 9) and the naturally occurring hybrid between them (figs. 2, 5, & 8). Figs. 1-3 are of flowers seen from above, figs. 4-6 are half flowers, $\times 5200$. Figs. 7-9 show somatic chromosome plates from the root-tips, $\times 5200$.

It will be seen from the description of the leaves of *L. aquatica* that it passes through a subulate-leaved stage, which can, with

<i>Limosella aquatica.</i>	The hybrid.	<i>Limosella subulata.</i>
Leaves successively subulate, lanceolate-spathulate, and elliptical with a long petiole.	Leaves successively subulate and lanceolate-spathulate with a long petiole.	Leaves always subulate.
Colour dark green.	Colour dark green.	Colour light green.
Runners at first upright, often producing a flower before becoming horizontal and leafy.	Many quick-growing runners, not usually producing flowers at first.	Runners often arching under the soil and rising again to form leaves before flowers.
Peduncle straight and upright, only curving downwards to the soil in fruit.	Peduncle upright, horizontal in extreme old age.	Peduncle arched, first upwards then downwards, forcing the fruit into the mud.
Flowers few at a time, only opening if the sun shines and lasting, at most, two days. Scent not detected.	Flowers many, remaining open four or five days, not dependent on sunshine. Flowers strongly scented.	Flowers many, remaining open about four days, not dependent on sunshine. Flowers strongly scented.
Corolla campanulate; tube 1.5 mm.; lobes triangular, acute, equally spaced, spread 2.5 mm., colour white or lavender or with purple splashes on the back. The tube not visibly coloured.	Corolla-tube cylindrical, 2 mm. long; lobes lingulate, equally spaced, often reflexed, spread of petals increasing with age to 4 mm., colour white, occasionally with purple marks on the back. The tube greenish yellow.	Corolla-tube contracted below the stamens, 3 mm. long, lobes ovate-lingulate, unequally spaced, often reflexed, spread increasing with age to 4 mm.; colour white. The tube orange-colour.
Hairs on the upper surface of the corolla-lobes few (ca. 25) and long (up to 600 μ), but not conspicuous.	Hairs in larger numbers (ca. 50) of medium length (up to 230 μ) and very noticeable.	Hairs in larger numbers (ca. 100), but shorter (up to 170 μ) and therefore not so striking.
Calyx longer than the corolla-tube and so visible between the petals from above. A purple patch sometimes occurs between the acute segments.	Calyx about the same length as the corolla-tube, segments not so acute, sometimes visible between the petals from above. Purple patches sometimes present on the calyx.	Calyx about two-thirds the length of the corolla-tube, segments blunt, not visible from above. Colour completely green.
Stamens of back pair bend forward and later further bending effects fertilization.	Position of stamens at first intermediate, but the anthers are never bent towards the stigma.	Stamens at first widely spaced, but later effecting self-fertilization by bending on to the stigma.
Style short, stigma of medium size.	Style medium length, stigma large and conspicuous.	Style long, stigma small.
Fruit roundish oval to elliptical, rather variable in shape.	No fruit.	Fruit nearly spherical.
Plant normally a short-lived annual.	Plant perennial if not killed off in winter.	Plant normally annual, but longer lived than <i>L. aquatica</i> . Runners may survive, especially if submerged.

care, be distinguished in the living plant from young *L. subulata*, because the leaves are darker, slenderer, and more acute and very soon show (fourth or fifth leaf) a flattening at the tip: on the other hand, *L. aquatica* is almost indistinguishable from the hybrid until the elliptical adult leaves are formed. It will thus be obvious that it is not easy to identify a young seedling specimen, though small plants on the runners have the adult leaf-form. If a specimen is old enough to have flowers there is little difficulty in recognizing any of the three forms by a combination of leaf and flower characters.

That the hybrid is not the plant referred to as *L. aquatica* var. *tenuifolia* Hoffm. seems clear, since Glück (1934) searched diligently for *L. subulata* on the Continent without success, and without one parent we cannot expect the hybrid. It seems probable, as he suggests, that the name refers only to depauperate and juvenile forms of *L. aquatica*; at Morfa it might have been given to young stages of the hybrid since the two would be indistinguishable.

Considering Pennell's map of the distribution of the two species in North America, it appears that they do not overlap at any point, but, remembering the confusion that has arisen from having the two together in Wales, it may yet be discovered that, somewhere in the region of the Gulf of St. Lawrence; perhaps in Newfoundland or the Gaspé Peninsula they occur together, and then the hybrid should be looked for.

A more detailed study of the cytology and morphology of the hybrid is being undertaken, and if seeds of other species can be obtained it is intended to extend the work in the hope of arriving at a better understanding of the relationships within this puzzling genus.

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EXPLANATION OF PLATE 616.

Limosella aquatica (fig. 1), *L. subulata* (fig. 3), and the hybrid (figs. 2 & 4). Plants 1-3 were grown from seed and were of the same age, $\times \frac{1}{2}$. Fig. 4 is of the same plant as fig. 2, but a few days older, $\times \frac{3}{4}$.

LICHENOLOGICAL NOTES FROM THE BRITISH MUSEUM HERBARIUM.—III.

By I. MACKENZIE LAMB, B.Sc., F.L.S.

INTENSIVE field-work and the study of herbarium material have again disclosed a number of interesting species and novelties to the British lichen-flora. As always, I owe a debt of gratitude to Dr. W. Watson (Taunton) for much valuable advice freely asked and generously given.

A single asterisk (*) indicates a new vice-county record, and two asterisks (**) denote that the entity in question is new to the British Isles.

1. *Thrombium aoristoides* M. Lamb, sp. n.

A *T. aoristo*, cui facie externa similis, peritheciis integris recedit, necnon sporis nonnihil majoribus.

Thallus obsolescens, dissipatus, eximie tenuis, subfurfuraceus, viridis, statu madido vix gelatinosus. *Gonidia* cystococcoidea, læte vel pallide viridia, sæpe in glomerulos aggregata, ± rotunda, 3–9 (–11) μ diam., pariete incolorato 0.6–0.7 μ crasso, guttulas globosas continentia, sed corpore pyrenoideo non manifesto. *Hyphe* inter gonidia parvisime evolutæ aut subnullæ.

Perithecia passim numerosa, sparsa, in substratum sat profunde immersa, tantum summa parte circum ostiolum exposita, 0.2–0.4 mm. diam., nigra, opaca subnitidave, apice ostiolo minuto perforata; sæpe collabentia, cavo hemisphærico intus omnino nigro tum visibili. *Perithecium* integrum, ± sphæricum vel subconicum; paries fuscus, infra lateribusque 18–45 μ crassus, circum ostiolum usque ad 100 μ incrassatus, paraplectenchymaticus, cellulis leptodermaticis angulosis ± isodiametricis (ad ostiolum elongatis subverticalibus) 3–4.5 μ diam. *Asci* incolorati, clavati, long. 90–100, crass. 12–20 μ , pariete lateribus 2–4.5 μ crasso, ad apicem usque ad 13 μ . *Paraphyses* simplices, incoloratæ, laxè intertextæ, 1–1.5 μ crassæ. *Sporæ* 8næ, irregulariter biseriatae vel partim uniseriatae, simplices, ellipsoideæ vel fusiformi-ellipsoideæ, utrinque rotundatæ, incoloratæ, pariete tenui levi 0.6–0.7 μ crasso, protoplasmate guttulam magnam unicam vulgo continenti; long. 21–29, crass. 9–12 μ .—Iodo ascorum parietes cærulescentes, apicibus intensius tincti, plasmate sporisque lutescentibus; paraphyses levissime lutescentes.

E. Cornwall, near Looe (v.c. 2**), on the earth of a roadside bank, leg. *I. M. L.*, 1937 (coll. no. 562).

The external appearance of this plant is similar to that of *Thrombium aoristum* (Nyl.) Arn. (*Verrucaria aorista* Nyl.). In the latter species, however, the perithecia are dimidiate, as recorded by Nylander ('Flora,' xlvii. 355, 1864), whose statement I was able to confirm by examination of the type-specimen preserved at Helsinki.

2. *ENTEROGRAPHA CRASSA* (DC.) Fée, Ess. Cryptog. Ecorc. Offic. xc (1824).

Opegrapha crassa DC. apud Lam. & DC. Flore Franç. ed. 3, ii. 312 (1805).

Var. *GEOGRAPHICA* (Erichs.) Rdgr. in Fedde, Repertorium, xliii. 60 (1938). *Chiodecton crassum* var. *geographicum* Erichs. in Verh. Bot. Ver. Prov. Brandenburg, lxx. 209 (1928).

E. Cornwall, near Looe (v.c. 2**), on beech, leg. *I. M. L.*, 1937 (coll. no. 557). In this variety the thallus is composed of numerous small thalli, each with a surrounding black hypothallus. The following specimens in the British Museum Herbarium also belong here :—

- (1) S. Devon, Berry Castle (v.c. 3**), ex herb. Geo. Davies.
- (2) S. Essex, Hockley Woods, near Rayleigh (v.c. 18**), ex herb. H. Piggot.
- (3) N.E. Yorkshire, Westerdale, Cleveland (v.c. 62**), leg. *W. Mudd* (Mudd, Lich. Brit. Exs. 224).
- (4) Hampshire, near Lymington (v.c. 11**), leg. *J. M. Crombie*.
- (5) Ireland, Glenstale, Tipperary (Ire. v.c. 10**), leg. *I. Carroll*.

3. *LECIDEA* (Sect. *Eulecidea*) *ALPESTRIS* (Smrft.) Smrft. in Kgl. Norske Vidensk. Skrifter, ii. 2. H., 54 (1827). *Lecidea sabuletorum* var. *syncomista* f. *alpestris* Smrft. Suppl. Fl. Lappon. 156 (1826).

Var. *brachyspora* M. Lamb, var. n.

Sporis brevioribus crassioribusque a *L. alpestris* var. *stenotera* Nyl. differt; sporæ 9–12 μ long., 3–4.5 μ crass.

Scotland: Moray, Culbin Sands (v.c. 95**), on dune slacks, leg. *P. W. Richards*, 1938 (the type-specimen); Mid-Perth, Ben Lawers (v.c. 88**), on soil, leg. *H. B. Holl*, 1869 (in Herb. Mus. Brit.).

In the typical form of *L. alpestris* and in its variety *stenotera* the spores are elongate-cylindrical, 13–24 by 3–3.5 μ (or 14–19 by 2.5–3 μ in Greenland specimens, according to Lyngé in Meddel. om Grønland, cxviii. no. 8, 46, 1937), with an average length/breadth-coefficient of 5.8. In our Scottish material, however, the spores are shortly fusiform-ellipsoid, not over 14 μ long and attaining a breadth of 4.5 μ , the length/breadth-coefficient being in the vicinity of 3.0.

The specimens from Culbin Sands and Ben Lawers agree completely both in external and internal characters, and the following description applies equally to both :—

Thallus dark ash-grey (or becoming dull yellowish in the herbarium), warted-granulate, thickish (up to 0.6 mm.), K—, C—, Pd+ orange. *Apothecia* numerous, isolated or often several contiguous and coalescent, large (0.9–1.4 mm. diam.), black, matt or subnitid, not pruinose, hemispherical-convex and

immarginate from the first, sessile, not or only slightly constricted at the base, with smooth or minutely roughened disc. *Excipulum* entirely excluded, lying beneath the apothecium, becoming extenuated and vanishing towards the centre; up to 90μ deep, pallid dull brown, formed of flabellate-radiating, parallel-adnate, conglutinate, palisade-like hyphae $3-4.5\mu$ diam., with indistinct lumina. *Hypothecium* deep (up to 450μ), in upper half pallid dull brown (due to amorphous pigment lying between the hyphae), gradually becoming almost colourless in the lower half; composed of thick-walled gelatinized hyphae $5-8\mu$ diam. running in various directions; in upper subthecial part of finer, thinner-walled hyphae $2-3\mu$ diam. running vertically parallel. *Thecium* about 60μ high, not sharply differentiated from upper hypothecium, colourless and hyaline except for upper $6-8\mu$, where it is aëuginous or blue-green fuliginous. *Paraphyses* concrete, not thickened at tips. *Spores* 8, elongate-ellipsoid to subfusiform, often somewhat tapered at one or both ends. *Thecium* I+blue then sordid reddish brown.

The spores are similar in size and shape to those of *Lecidea assimidata* Nyl., which is readily distinguishable, however, by its smaller apothecia ($0.3-0.8$ mm.) and negative Pd-reaction. It is of interest to note that all the British material of *L. alpestris* in the British Museum Herbarium belongs to var. *brachyspora*. Wheldon and Wilson, in Journ. Bot. xlviii. 129 (1910), have recorded *L. alpestris* from Aberdeenshire, Banff, and Easternness; I have not seen any of this material. Dr. Watson informs me *in litt.* that he possesses material from Ben Lawers and Aviemore (v.c. 96**) which is also referable to var. *brachyspora*; the spores are just as described above ("usually about $10/3-3.5\mu$ "). Perhaps the typical form of the species may not occur in Britain. Two additional specimens from Ben Lawers in the British Museum Herbarium placed under this name belong to a species of *Catillaria* (not *L. alpestris* f. *bilocularis* Zahlbr.). It is interesting to find this normally alpine species descending to sea-level; Th. Fries has recorded a similar instance from the Tyrifjord in Norway (Lichenogr. Scandin. i. 537, 1874).

4. CLADONIA (Subgen. *Cladina*) LEUCOPHAEA des Abb. in Bull. Soc. Sci. Bretagne, xiii. 125 (1936).

New Forest, New Copse Enclosure (v.c. 11**), in open *Calluna*-grass meadow, leg. I. M. L., 1938 (coll. no. 751).

This species, hitherto reported with certainty only from France, is similar in habit to *C. tenuis* (Flk.) Harm., and gives the same red reaction with Paraphenylenediamine, but is distinguished by its ash-grey or whitish ash-grey colour (not yellowish as in *C. tenuis*). Prof. des Abbayes kindly controlled my determination, and states *in litt.* 28. x. 1938: "la touffe est en partie rapportable à la f. *ustulata* des Abb., car les podétions sont assez largement brunis aux extrémités."

5. CLADONIA (Subgen. *Cenomyce*) GRAYI Merrill, apud Sandstede, Clad. Exs. 1847 (1929).

This species, known from N. America, Russia, Germany, France, Belgium, and Sweden, is morphologically indistinguishable from *C. chlorophaea* Flk., but differs in the complete absence of the bitter Fumar-protocetraric acid. Therefore specimens of this species are mild to the taste and give a negative reaction with Paraphenylenediamine. Three specimens were found to be present in the British Museum Herbarium under the name "*Cladonia pyxidata* var. *chlorophaea*," and they may be referred to the following three forms:—

F. SIMPLEX Robbins apud Evans in Rhodora, xl. no. 469, 19 (1938).

Yorkshire, Cleveland, near Redcar (v.c. 62**), leg. W. Mudd.

Podetia simple, without squamules, sterile, the scyphi with entire or subentire margins.

F. PROLIFERA Sandst. apud Evans, *l. c.*

Devon, Hunstor ("Hunter Tor" Cromb.) near Chagford (v.c. 3**), leg. J. M. Crombie.

Podetia proliferous, without squamules, sterile, the primary scyphi bearing secondary scyphi on their margins. The latter may again proliferate.

F. CARPOPHORA Evans, *op. cit.* p. 20.

Channel Islands**: Jersey, St. Ouen's Bay (Larbalestier, Lich. Caesar. et Sarg. 58).

Podetia without squamules, fertile, the apothecia forming on the margins of the scyphi, somewhat aggregated, sessile or stipitate.

6. CLADONIA (Subgen. *Cenomyce*) MACILENTA Hoffm. Deutschl. Flora, 126 (1796).

Var. SQUAMIGERA Wain. Mon. Clad. Univ. i. 109 (1887).

E. Cornwall, Bodmin Moor (v.c. 2), on granite boulder, leg. I. M. L., 1937 (coll. no. 535).

This variety is identical with *C. macilenta* var. *scabrosa* f. *incrassata* Cromb. in Grevillea, xii. 92 (1884), according to the type-specimen of the latter preserved in the British Museum Herbarium. For some reason Crombie subsequently illegally altered the epithet *incrassata* to *intumescens* ('Grevillea,' xv. 46, 1886). In any case the first varietal epithet is that of Wainio, and it remains in use. The podetia are KHO+yellow (not becoming reddish or violaceous, as in *C. flabelliformis*). Morphologically there is a great resemblance between this variety and the form *scabriuscula* (Del.) Wain. of *C. flabelliformis*, and the only reliable distinction lies in the reaction with KHO: persistently yellow in *C. macilenta* var. *squamigera*, and yellow then reddish or violaceous in *C. flabelliformis* f. *scabriuscula*. This

difference between *C. macilenta* and *C. flabelliformis*, also mentioned by Aigret in Bull. Soc. Bot. Belg. xl. 88 (1901), is probably due to the presence in the latter species of a second unidentified lichen-acid in addition to the Thamnolic acid; see Sandstedt in Rabh. Krypt.-Fl. ix. Abt. iv. 2. Hälfte, 121 (1931).

7. STEREOCAULON (Subgen. *Lecidocaulon*) DELISEI Bory apud Duby, Bot. Gall. ii. 619 (1830).

Ben Lawers (v.c. 88), leg. H. B. Holl (in Herb. Mus. Brit., sub "*Stereocaulon denudatum* f. *capitatum*"). This is a new locality, but not a new vice-county record.

The podetia of this species are usually rather short (Frey, in Rabh. Krypt.-Fl. ix. Abt. iv. i. Hälfte, 107, 1933, gives them as "selten bis 2 cm hoch"). In the Ben Lawers specimen they are 1.2-1.8 cm. high, but in the others from Rannoch Moor, Loch Eagh (errore "Loch Eagle" in A. L. Sm. Mon. Brit. Lich. i. 410, 1918) (v.c. 88), they are larger, up to 3 cm.; otherwise typical of the species. Doubtless intermediates will be found to occur. The Ben Lawers specimen has numerous cephalodia, which are white, like phyllocladia, but usually with a darker apical spot, a feature which no doubt contributed to the misidentification as *S. denudatum*. These cephalodia contain *Stigonema*. The dissolute phyllocladia of *S. Delisei* are Pd+(slowly) faint dull yellow.

8. STEREOCAULON (Subgen. *Lecidocaulon*) EVOLUTOIDES (H. Magn.) Frey in Rabh. Krypt.-Fl. ix. Abt. iv. i. Hälfte, 145 (1933). *Stereocaulon paschale* var. *evolutoides* H. Magn. in Göteborgs Kungl. Vetensk.- och Vitterh.-Samh. Handl. xxx. no. 7, 50 (1926).

Aberdeenshire, Ben McDhui (v.c. 92**), on detritus, leg. E. W. Jones, 1938; Inverness, Cairngorm (v.c. 96**), in open grass zone, near late snow-patch, E. aspect, altit. 3600 ft., leg. P. W. Richards, 1938.

Sterile. This species, hitherto recorded only from south and central Sweden and Schleswig-Holstein, is similar in habit to *S. evolutum*, but differs chiefly in the presence of dark greyish tomentum on the under side of the podetia. The Scottish specimens show good agreement with the photograph and description given by Frey, l. c., and with authentic specimens of *S. evolutoides* in the British Museum Herbarium; one of these is Magn. Lich. Sel. Scand. Exs. 158.

The chemical reactions of the phyllocladia of *Stereocaulon*-species, commonly neglected in systematic treatments of this genus, have been shown by Asahina ('Acta Phytochimica,' viii. no. 1, 60, 1934) to be of considerable service in delimiting certain species and groups of species. The present specimens, together with the authentic specimens mentioned above, were found to give reactions of the phyllocladia identical with those shown by reliably-named material of *S. evolutum* Graewe, namely: KHO+intense yellow, Pd+(slowly) sulphur-yellow or pale

ochraceous yellow, Bz +—or+ very faint pale yellow. It may be that these colours with amines are indicative of the presence of lichen-acid in the phyllocladia, but more probably they are merely a discoloration due to the solution itself. If this is so, the Pd reaction of the phyllocladia should be classed as negative.

9. STEREOCAULON (Subgen. *Lecidocaulon*) GLAREOSUM (Sav.) H. Magn. in Göteborgs Kungl. Vetensk.- och Vitterh.-Samh. Handl. xxx. no. 7, 60 (1926). *Stereocaulon tomentosum* f. *glareosum* Sav. in Bull. Jard. Imp. Pierre le Grand, xiv. 121 (1914).

Moray, Culbin Sands (v.c. 95**), on dune slacks, leg. P. W. Richards, 1938.

Fertile. Previously recorded from the Swiss and German Alps, Fennoscandia, N. Russia (Lapland and Kamtschatka), and N. America. It is a terricolous species, distinguishable from *S. tomentosum* and *S. alpinum* by the $\pm$ coralloid, often clavate phyllocladia. The Scottish specimen agrees *ad amussim* with the Scandinavian examples distributed in Magn. Lich. Sel. Scand. Exs. 211, and the reactions of the phyllocladia are the same in both, viz., KHO+intense yellow, Pd+(slowly) sulphur-yellow gradually deepening to pale ochraceous yellow. Exactly similar reactions have been noted in species of the *S. evolutum*-group; see the remarks above on *S. evolutoides*.

10. PERTUSARIA (Subgen. *Ampliaria*) LEIOTERELLA Erichs. in Rabh. Krypt.-Fl. ix. Abt. v. Teil 1, 481 (1935). *Pertusaria communis* var. *leioterella* Nyl. in Flora, lviii. 303 (1875). (Not *Pertusaria leioterella* Müll. Arg. in Flora, lxvii. 285, 1884.)

New Forest, Whitley Ridge (v.c. 11**), on smooth bark of young oak, leg. I. M. L. 1938 (coll. no. 743).

In habit this species is very similar to *P. leioplaca* (Ach.) DC., but differs in the usually two-spored asci and larger spores (104-225 by 40-75 μ , *fide* Erichsen, l. c.); in this specimen they were 135-174 by 57-78 μ . Some spores have the wall ornamented with fine transverse striae.

P. leioterella was previously recorded from Spain, Switzerland, France, Germany, Denmark, Yugoslavia, and Czechoslovakia.

If Körber's "*Pertusaria colliculosa*" (Parerg. Lich. 313, 1863) be regarded as coming within the specific orbit of the present entity, it seems as if, to conform with the International Rules of Botanical Nomenclature, this prior epithet should be employed for the species as a whole.

11. LECANORA (Sect. *Eulecanora*) SUBFUSCATA H. Magn. in Meddel. från Göteborgs Bot. Trädg. vii. 79 (1932).

† Proposed abbreviation for the amine-substance Benzidine, the preparation and use of which are the same as that of Paraphenylenediamine.

W. Sussex, near Hurstpierpoint (v.c. 13**), on an elm, leg. *I. M. L.*, 1938 (coll. no. 651).

This species is distinguished from other members of the *Lecanora chlarona*-group by its elephant-grey (not whitish) thallus, scarcity of Calcium oxalate-crystals in the medulla, and absence of a granulose epithecium. Previously recorded from Sweden, Denmark, Germany, Bohemia, Switzerland, France, and N. America.

12. *LECANIA* (Sect. *Eulecania*) *SPODOMELA* (Nyl.) A. L. Sm. Mon. Brit. Lich. i. 346 (1918). *Lecanora spodomela* Nyl. in Flora, lix. 572 (1876).

E. Cornwall, Bodmin Moor (v.c. 2*), on granite boulder, leg. *I. M. L.*, 1937 (coll. no. 517).

This is the first record for England of this rare Irish species, hitherto known only *e loco classico* in Galway, Connemara, Killery Bay (Ire. v.c. 16), leg. *Larbalestier*, and distributed by him in Larb. Lich. Herb. 218 (errore "*spadomela*"). Its occurrence in England shows that it may be worth while to make special search for it elsewhere, particularly along the western coasts of the British Isles. Its distribution will probably prove to be markedly "atlantic" or western-oceanic.

Outwardly this species has much the appearance of *Catillaria lenticularis* f. *nubila* (Norm.) Arn. The gonidia of the fresh Cornwall material are cystococcoid, easily separable, round, 6-11 μ diam., bright green, with colourless membrane about 1 μ thick; in some a central or excentric spherical pyrenoid-like body 2-3 μ diam. can be distinguished; reproduction is by internal sporulation. Zahlbruckner, Cat. Lich. Univ. v. 802 (1928), lists this species as a *Candelariella*, but it has nothing to do with that genus.

13. *ALECTORIA DIVERGENS* (Ach.) Nyl. was recorded for Britain by Crombie in Journ. Bot. xi. 133 (1873), from Inverness, Cairngorm (v.c. 96), leg. *Crombie*, 1872. The record was taken up in the third edition of Leighton's 'Lichen Flora,' 78 (1879), by Crombie in his Mon. Lich. Brit. i. 210 (1894), and by A. L. Smith, Mon. Brit. Lich. ed. 2, i. 186 (1918). On examination of Crombie's specimen in the British Museum Herbarium, it was found, however, not to belong to this species, but to *Alectoria nitidula* (Th. Fr.) Wain. in Medd. Soc. F. et Fl. Fennic. vi. 116 (1881) (*Bryopogon jubatus* var. *nitidulus* Th. Fr. in Nov. Act. Reg. Soc. Sci. Upsal. ser. 3, iii. 125, 1861), which occurs in the mountains of Scandinavia and in the Arctic (W. Greenland, Franz Josef Land). The Scottish specimen agrees with Havaas, Lich. Norveg. 402 in Herb. Helsinki, and the internal structure and reactions of the medulla (KHO + faintly brownish, Pd + yellow then miniate red) tally well with the description given by Lyngby in Meddel. om Grønland, cxviii. no. 8, 166-7 (1937). As mentioned

above, it was found in Inverness, Cairngorm (v.c. 96**). For the time being *Cornicularia divergens* must be expunged from the British lichen-flora, but it will probably be found eventually at higher altitudes in Scotland.

14. *ALECTORIA* (Subgen. *Eualectoria*) *NIGRICANS* (Ach.) Nyl. Lich. Scand. 71 (1861). *Cornicularia ochroleuca* β *C. nigri. cans* Ach. Lichenogr. Univers. 615 (1810).

f. *GOEMOERENSIS* Gyal. in Nyt Mag. f. Naturvidenskab. lxx. 43 (1932).

"Thallus omnino pallidus vel rubescenti-pallidus, solum apicibus minus nigrescentibus" (Gyelnik, descr. orig., l. c.). Two specimens in the British Museum Herbarium are referable to this form:—

(1) N. Wales**, exact locality not stated, leg. *J. W. Griffiths*.

(2) N. Wales, Carnarvonshire, Glyder (v.c. 49**), leg. *H. Davies*.

15. *BUELLIA* (Sect. *Diplotomma*) *CHLOROPHAEA* Lettau in Hedwigia, lii. 244 (1912). *Lecidia chlorophaea* Leight. Lich. Fl. Gt. Brit. ed. 1, 328 (1871). *Diplotomma porphyricum* Arn. in Verhandl. Zool.-Bot. Ges. Wien, xxii, 300 (1872).

I was able to examine the type-specimen of Arnold's "*Diplotomma porphyricum*" through the courtesy of Dr. v. Schoenau of the Botanische Staatsanstalten, Munich, and found it to be identical with Leighton's plant.

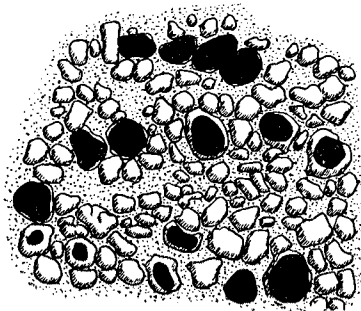
In the typical form of this species the thallus is always neatly areolate (see figure); this distinguishes it from

Var. *tenuis* M. Lamb, var. n. Thallo tenuiori, maculas minutas orbiculares efficienti, tantum irregulariter tenuissimeque rimoso (haud areolato) a forma primaria recedit.

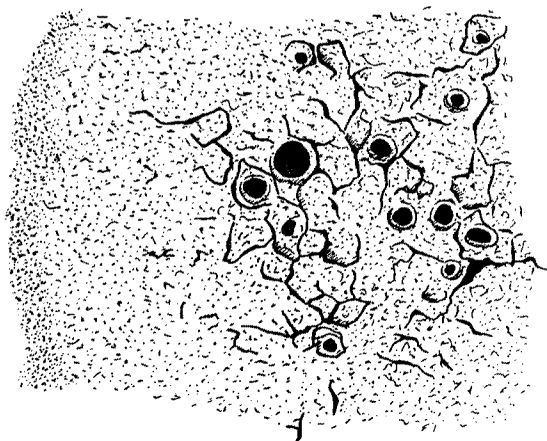
Somerset, Kingston near Taunton (v.c. 5**), on non-calcareous stone of a wall, leg. *W. Watson & I. M. L.*, 1937 (*I. M. L.* coll. no. 466).

Thallus forming small orbicular patches 4-7 mm. diam., in centre about 0.2 mm. thick, becoming thinner towards periphery, which is bounded by a thin, vaguely defined, dark grey or blackish hypothallus; irregularly rimose with very narrow cracks (less than 0.1 mm. across) which run in various directions and may here and there anastomose to form irregular areolae; but the thallus is not as a whole areolate. Surface of thallus smooth, even, pallid dull pinkish brown or yellowish ash-grey, matt, not pruinose, not reacting with CaCl_2O_2 , or with KHO and Pd, if the latter are applied in small quantities; but in large amounts KHO gives a dark blood-red, and Pd a pale lemon-yellow, coloration to the surface of the thallus. Medulla KHO + yellow then bright red, Pd + lemon-yellow, CaCl_2O_2 —, I—. Apothecia numerous, at first sunk in the thallus and of an aspi-ci-

lloid appearance, then becoming $\pm$ emergent, but with a persistent thalline or pseudothalline integument which gives them a lecanorine aspect; 0.3–0.4 mm. diam.; disc plane or rarely slightly



a



b

1 mm.

a, *Buellia chlorophaea* (Leight.) Lettau, typical form; thalline areolae and apothecia. b, var. *tenuis* M. Lamb; portion of thallus with apothecia.

convex, dark brown-black (both wet and dry), minutely roughened, not pruinose.

The internal anatomy of this specimen is in perfect agreement with that of the typical form.

MELAMPYRUM PRATENSE L. RECENT DETERMINATIONS AND VIEWS OF DR. G. BEAUVERD.

By C. E. BRITTON, A.L.S.

It is chiefly owing to the labours of Dr. G. Beauverd of the Boissier Herbarium, Geneva, that British botanists owe the knowledge of the extreme polymorphism characterising *Melampyrum pratense* L. in Britain. In his very learned and comprehensive monograph on the genus *Melampyrum*, published in 1916, Dr. Beauverd was enabled to deal with British representatives of the species owing to having at his command all the material contained in the herbarium of the late Dr. G. C. Druce. Following the publication of the Monograph, Druce extracted accounts of the forms determined by Beauverd as natives of Britain for publication in the B. E. C. 1917 Report (1918). Results of later examinations of British plants appeared in subsequent B. E. C. Reports. In that for 1934, I gave detailed accounts of the various forms, now in the Druce Herbarium, as determined by Beauverd. The author of the Monograph maintains his interest in the genus, and has recently been so good as to examine and annotate a large collection formed by me. Certain plants are considered sufficiently distinct by Beauverd to warrant the application of distinctive names, and others are now recorded for the first time as British plants.

The study of our native material has impressed Dr. Beauverd with the conviction that many of the variations encountered are absent from the European mainland, and, by favour of the author, a communication is here reproduced, in which is set forth the significance of this and other aspects of polymorphism in *M. pratense* :—

“C'est avec un grand intérêt que j'ai pris connaissance de vos matériaux ayant trait aux *Melampyrum* de Grande-Bretagne, matériaux qui présentent effectivement quelques particularités que je n'avais pas encore observées en d'autres contrées dont j'avais cependant analysé le matériel abondant. Plus j'examine les multiples expressions de polymorphisme d'une même entité en divers lieux de son aire et plus il me paraît confirmé que le genre *Melampyrum* constitue l'un des meilleurs exemples botaniques illustrant la théorie géologique de WEGENER. En d'autres termes, le degré de différenciation d'une même et seule espèce donnée de *Melampyrum* comparée à d'autres races, est en raison directe de l'âge géologique (selon WEGENER) des lieux hébergeant les dites races. Prenant par exemple le *M. lineare* Lamk. (considéré par BENTHAM comme simple variété de notre *M. pratense* L.), nous voyons que les affinités entre l'espèce de LAMARCK et celle de LINNÉ sont évidentes. Néanmoins, le polymorphisme du *M. lineare* ne présente aucun point de contact avec les autres

si nombreuses manifestations de polymorphisme du *M. pratense*, si bien que l' 'hiatus' qui sépare ces deux groupes de plantes exprime réellement, malgré leurs affinités effectives ou apparentes, un 'éloignement chronologique' infiniment plus accusé que celui séparant les variétés diverses du *M. lineare* entre elles et, bien qu'à un moindre degré, les différentes races du *M. pratense*.

"L'analyse de vos plantes confirme cependant l'impression que j'avais déjà ressentie lors de l'examen attentif des matériaux britanniques qui me furent communiqués en son temps par le regretté G. C. DRUCE, à savoir que ces matériaux présentent, en regard des matériaux continentaux, un caractère de 'micro-endémisme insulaire' plus accusé que les variétés européennes ont coutume de le présenter habituellement : en d'autres termes, la différenciation entre *M. lineare* et *M. pratense* correspond à l' 'éloignement chronologique' représenté par la dislocation continentale américano-eurasiatique, comme correspondent à l' 'éloignement chronologique' plus récent l'isolement de la Grande Bretagne du continent européen (à la suite de l'immersion de la Manche), lorsque nous considérons le facteur des diverses races du *M. pratense* comparées entre elles.

"Au surplus, il est de toute évidence que ce problème reste des plus complexes et qu'il conviendrait d'indiquer le rôle de première importance joué par l'hémiparasitisme du genre *Melampyrum* dans ses manifestations variées de polymorphisme : le sujet comporte encore nombre de mystères à élucider, et le problème n'en est encore qu'à son stade premier : la documentation !

"Il faut convenir que l'étude de cette question de documentation est actuellement bénéficiaire de notables progrès grâce au tribut d'expériences dû aux travaux de HEINRICHER. Je persiste à croire toutefois que ces progrès seraient plus sensibles encore s'il existait un naturaliste s'adonnant aux recherches susceptibles de jeter quelque lumière nouvelle sur les dernières théories de WEGENER dans leur rapport avec la botanique."

Of the fifteen forms mentioned by Druce, seven are not found on the Continent, and of the twelve names given to my own plants, six more, are, on present knowledge, confined to England. Descriptions of these follow.

A few words may be useful about the status of the forms of *M. pratense* L. Beauverd adopted a primary division into two subspecies, *eu-pratense* Beauv. and *vulgatum* (Pers.) Beauv., under which were grouped varieties, subvarieties, and formæ. Soó, on the other hand, in the Monograph of the genus *Melampyrum* published in 1927, recognized as many as thirteen subspecies with subordinate grades. Of these subspecies, eight are represented in Britain. It is likely that a grouping of the forms under several subspecies will be more agreeable to British

botanists than an endeavour to sink all under two only, although the classification of Beauverd may be in accordance with the characters presented by the plants. All the same, there may be reluctance to accept, in view of the available evidence, the grade of subvariety, or even forma, assigned by Beauverd to native plants that herbarium evidence and present-day observations show to have maintained constant and distinctive characters for the past fifty to seventy years.

The Latin diagnoses have been drawn up by Dr. G. Beauverd, to whom I am indebted for the privilege of publication.

M. PRATENSE L. subsp. *EU-PRATENSE* Beauv.

Var. *ALPESTRE* Beauv. in Bull. Soc. bot. Genève, 2e ser. iii. 312 (1911).

Subvar. *SCOTIANUM* Beauv. Mon. 480, 486.—V.c. 88, Mid-Perth : Sow of Atholl and Yellow Corrie of Glen Lyon (*P. M. Hall*).—V.c. 92, S. Aberdeen ; Inverey, Braemar (*E. C. Wallace*).—V.c. 108, West Sutherland : Tongue (*E. S. Todd*). The two last gatherings are annotated "forma ad var. *paludosum* ± vergens."

Subvar. nov. *elongatum* Beauv.

"A subv. *scotiano* nano subramigeroque differt : internodiis elongatis (±30–40 mm.) perspicue ramigeris, ramis florigeris horizontaliter arcuato-elongatis. Inflorescentiæ initium ad III (–IV) am nodum situm (ut in subv. *scotiano*!).—Hab. Anglia : Surrey, in vaccineti, loci dicti 'Holmbury Hill,' leg. C. E. Britton, 7. vii. 1938.—No. 4430.—Homologue luxuriant méridional du septentrional *M. pratense* subvar. *scotianum* ?"

Besides growing at Holmbury Hill, plants from the neighbourhood of Friday Street and Felday are also assigned to this subvar. by Beauverd. Other characters of this form are : height 25–30 cm., hypocotyl 50–100 mm., branches 15–25 cm., widely spreading or erect-ascending, floriferous or sterile, again branched, 1 pair of cauline leaves, intercalary leaves absent, bracts all entire or the upper with one or two pairs of teeth at base.

Var. *TYPICUM* Beck. Fl. N. O. ii. 1070 (1891); Beauv. Mon. 480, 488.—V.c. 17, Surrey : The Chart, Limpsfield ; includes plants noted "ad subvar. *foliatum* Neum. ± vergens," and, "f. *laxum* Beauv." Pray Heath ; annotated "f. *luxurians* ! ad var. *ericetorum* ± vergens," and, "subvar. *laxum* Beauv. f. *luxurians* f. ad var. *ericetorum* ± vergens !" —V.c. 88, mid-Perth : Black Wood of Rannock and Allt nam Coire Pleiginn (*P. M. Hall*).

Var. *PALUDOSUM* Gaudin, Fl. Helv. iv. 122 (1829).

Subvar. *EU-PALUDOSUM* Beauv. Mon. 480, 489.—V.c. 41, Glamorgan : Gower (Bowen), Porthcawl (*Sherrin*).—V.c. 57,

Derby: Whatstandwell (*E. S. Todd*).—V.c. 58, Cheshire: Wybunbury Moss (*Bemrose*).—V.c. 108; W. Sutherland, Tongue (*E. S. Todd*).

Var. *ERICETORUM* D. Oliv. in Phyt. 678 (1852).

Subvar. nov. *decipiens* Beauv.—“Caulis ± 18 cm. altus, infra ramosus, ramis elongatis (± 20 cm. lg.), flexuosis $\pm$ arcuato-patulisque, folia intercalaria nulla vel par 1 elliptico-lanceolatis integra (rarius basi dentata); inflorescentiæ initium ad IV-Vum nodum situm.—A var. *ericetorum* typicum differt inflorescentiæ initium ad IVum nodum situm, rarius ad Vum forma ad. nov. *alpestrem* $\pm$ vergens!”

V.c. 17, Surrey: Chelsham. Abinger Common. Near Friday Street, Wotton, Felday. Moorhouse near Limpsfield, the latter “forma ad ssp. *vulgatum* f. *lanceolatum* $\pm$ vergens.”

Var. nov. *anglicum* Beauv.—“Caulis ± 25 cm. altus, a basi ad ultra medium ramosus, ramis elongatis oblique erectio, florigeris rarius subramificatis sterilibusque; folia caulina anguste lanceolata (superf. $\pm 45 \times 7$ mm.), intercalaria longiores (0–2 paria), in petiolulum brevem attenuata; bracteæ inferiores integræ (superf. 30×4 mm.), sequentes gradatim minores latioresque basi dentatæ vix profunde pectinato-laciniatæ. Inflorescentiæ initium ad VI–VIIIum nodum situm = subvar. nov. *pseudo-lanceolatum* Beauv., rarius ad Vum nodum situm; caulis ± 30 cm. altus, folia intercalaria nulla vel omnia florigeris = subvar. nov. *pseudo-laciniatum* Beauv.

“*Hab.* Britannia, in pratis silvaticis, comitatu dicta ‘Surrey,’ loca dicta, ‘Kitsmead Lane,’ prope Longcross; fl. mense Junii. A *M. pratense* L. var. *vulgatum* subvar. *lanceolata* differt corolla post anthesin lilacina diluta non nigrescentes? Inflorescentiæ initium ad V–VIIIum nodum situm.”

To var. *anglicum*, Beauverd also referred plants gathered at Pasture Wood, Abinger, Surrey.

M. PRATENSE L. subsp. *VULGATUM* (Pers.) Beauv.

Var. *BRITANNICUM* Beauv. Mon. 482, 497.—V.c. 3, S. Devon; Bovey Tracey (*Stephenson*). The Devon plants referred to have the following characters:—Height 25–30 cm., hypocotyl 5–8 cm., cotyledons and cauline leaves absent at flowering time, 1 or 2 pairs of arcuate-erect branches equalling or falling short of stem, leafy in upper part only, intercalary leaves absent, inflorescence beginning at node 3.

Var. *COMMUTATUM* (Tausch) Beck, Fl. N. O. ii. 1069 (1893); Beauv. Mon. 482, 498.

Subvar. *PSEUDO-NEMOROSUM* Beauv. Mon. 500.—V.c. 16, W. Kent; Trotterscliffe (*A. Beadell* and *C. E. B.*). “Pro Anglia subv. nov. ?”—V.c. 17, Surrey: Ranmore,

Subvar. *CONCOLOR* (Schönheit) Beauv. Mon. 482, 500.—V.c. 18, S. Essex; Epping Forest.

Subvar. *pseudo-nemorosum* is a distinct-looking plant. The lower 2–3 pairs of branches are usually slender, arrested, and sterile, upper branches elongated and flowering, the upper cauline leaves are ovate-lanceolate acuminate, the intercalary leaves are similar, 2–3, rarely 4 pairs, and the inflorescence begins at nodes 8–10. The plants referred to subvar. *concolor* differ in narrower leaves, more numerous intercalary leaves, and inflorescence commencing at node XI.

Var. *VULGATUM* (Pers.) Beauv. Mon. 483.

Subvar. nov. *devonianum* Beauv.—“Herba ± 20 cm. alta, nodis inferioribus tenuiter ramosis, ramis nodum sequentibus gradatim validis longioribusque arcuato-patentibus; folia caulina lineari-lanceolata sub anthesi sæpe desunt; folia intercalaria par 1, caulinis longiores latioresque; bracteæ inferiores integerrimæ, sequentes gradatim breviores, apicales basi tridentatæ vel quinquedentato-palmatæ. Inflorescentiæ initium ad VIum nodum situm.—Herba inter var. *britannicum* et forma *lanceolatum* (Spenn.) intermedium?” V.c. 3, S. Devon: Woodbury (*B. Godfrey*). The plants described present the following features: cotyledons and lower or all cauline leaves absent at flowering time; lower 2–3 pairs of branches slender sterile, succeeding pair of branches robust spreading-ascending and flowering, lower bracts comparatively large, entire, the upper palmatifid.

Subvar. *DIGITATUM* (Schur) Beauv. Mon. 483, 507.—V.c. 16, W. Kent: Shoreham. Plants from v.c. 8, S. Wilts (*Grose*), and v.c. 37, Wores (*Day*) are queried as “formæ.”

Forma *OVATUM* (Spenn.) Beauv. 483, 509. V.c. 17, Surrey: Ranmore. Another distinct-looking plant, known at the Ranmore locality for fifty years past.

Forma *LANCEOLATUM* (Spenn.) Beauv. 483, 510.—V.c. 16, W. Kent: Keston (*A. Beadell*), Wrotham Heath (*A. Beadell*), Hosey Common. V.c. 17, Surrey; Tandridge (*A. Beadell*), Moorhouse near Limpsfield (including “forma ad var. *ericetorum* $\pm$ vergens”). Walton on the Hill, Botleys.—V.c. 18, S. Essex: Epping Forest (“ad f. *divaricatum* area Scandinavica $\pm$ vergens”).—V.c. 20, Herts: near Broxbourne.

Var. *HIANS* Druce in Nat. 35, 1884; Beauv. Mon. 484, 504.—V.c. 14, E. Sussex: Rowfant (*A. Beadell*).—V.c. 49, Carnarvon: Bettws-y-coed.

Subvar. nov. *pallesceus* Beauv.—Corolla pallide lutea non aurea. “Ad var. *britannicum* $\pm$ vergens.”—V.c. S. Devon, collected in many localities by Gordon T. Fraser. This pale-

flowered form of var. *hians* occurs either in homogeneous communities or as solitary plants among colonies of the normal golden-flowered plant.

Var. *INTEGERRIMUM* Döll, Fl. Grossh. Baden, 703 (1857).

Forma *pseudo-silvaticum* (Schur) Beauv. Mon. 484, 517.—V.c. 17, Surrey: Ottershaw. Also from v.c. 8, S. Wilts: Hamptworth (Grose).

Forma *vogesiacum* Beauv. Mon. 484, 517.—V.c. 17, Surrey: Felbridge (A. Beadell).

Forma *pseudo-silvaticum* already on record as a British plant is distinguished by the narrowly lanceolate-linear acuminate leaves, 1-3 pairs of arcuate-erect branches, 2-4 pairs of intercalary leaves, bracts all entire, or, the apical inconspicuously toothed at base; f. *vogesiacum*, an addition to the British list, differs chiefly by reason of the apical bracts having 1-2, rarely 3, pairs of distant spreading or ascending linear lobes. It is widely distributed in Europe, from France to Silesia, Austria, and Switzerland.

NEW SPECIES OF TROPICAL AFRICAN COMPOSITAE IN THE HERBARIUM OF GEORGES LE TESTU.

By W. R. PHILIPSON, B.A.

WHILE naming the Compositae in the herbarium of M. Georges Le Testu the following undescribed species were encountered. The five species are from the Oubangui-Chari district of French Equatorial Africa.

Aspilina Eckendorffii, sp. nov. *Herba* ut videtur perennis usque ad 1.5 m. alta, ramis teretibus superne minute pubescentibus. *Folia* sessilia linearia usque ad 13×0.7 cm., utrinque pubescentia revoluta costis prominentibus. *Capitula* magna radiata ad anthesin 6 cm. lata solitaria ad apicem caulem ramosque; pedunculi usque ad 10 cm. longi. *Involucris squamæ* circa 3-seriatæ imbricatæ exteriores late-ovatæ obtusæ circa 9×6 mm. sub-herbaceæ setis brevibus dissitis vestitæ, interiores lanceolatæ obtusæ membranaceæ glabræ; receptaculi squamæ naviculares 10×2 mm. valide costatæ appendice acuta. *Flosculi* heterogami; corolla neutra ligulata circa 35 mm. longa, hermaphrodita tubulata 8 mm. longa inferne abrupte angustata 5-dentata; antheræ ecaudatæ 3.5 mm. longæ; styli rami 2 mm. longi. *Achenia* oblonga 5×2 mm. nigra pubescentia subcompressa; pappus coronata vel in flosculis neutris minute 3-dentata.

FRENCH EQUATORIAL AFRICA: Oubangui-Chari; road between Bocaranga and Kounnang, swampy plains of the Nyémé,

17 Oct. 1936, *Eckendorff* 41 (Type in herb. Le Testu; duplicate in Brit. Mus. Herb.).

This distinctive species has much the aspect of some species of *Coreopsis*. Its nearest ally is *Aspilina Cortetii* O. Hoffm. & Muschl., which also has entire and narrow leaves and broad involucre bracts, but in that species the bracts bear a striking herbaceous appendage.

Aspilina pallida, sp. nov. *Herba* erecta ut videtur perennis, ramis teretibus valde hispidis. *Folia* sub-sessilia opposita ovato-lanceolata circa 13×3 cm. longe-acuminata utrinque hispida, margine reflexa. *Capitula* ad apicem caulem ramosque in corymbis circa 3-capitulatos aggregata. *Involucris squamæ* circa 3-seriatæ sub-æquales 12 mm. longæ, lineare-lanceolatæ valde hispidæ basi dilatata; receptaculi squamæ naviculares 11×2 mm. prominente costatæ appendice lacerato. *Flosculi* heterogami; corolla neutra ligulata circa 13 mm. longa, hermaphrodita tubulata 7 mm. longa inferne abrupte angustata 5-dentata; antheræ ecaudatæ 3 mm. longæ; styli rami 3 mm. longi. *Achenia* juvenalia pubescentia, pappo coronato fimbriato.

FRENCH EQUATORIAL AFRICA: Oubangui-Chari; near the river Wangra, 7 km. north-east of Moroubas, 5 Aug. 1923, *Tisserant* 1198 (Type in herb. Le Testu; duplicate in Brit. Mus. Herb.).

This species is readily distinguished from both *A. helianthoides* (Schum. & Thonn.) Oliv. & Hiern and *A. polycephala* S. Moore, which also have white ray florets, by the linear and strongly hispid involucre bracts. It grows in wooded thickets (*Tisserant*).

Melanthera Letestui, sp. nov. *Herba* ut videtur perennis erecta ramosa. Rami striati pubescente appresso præditæ. *Folia* opposita petiolata; petiolus usque ad 10 mm. longus; lamina ovata apice angustata basi late-cuneata, circa 6×3 cm. utrinque pubescentia apressa, margine serrata. *Capitula* ad apicem caulem ramosque in corymbis aggregata, globosa circa 8 mm. lata. *Involucris squamæ* exteriores paucae parvæ lanceolatæ, interiores late-ovatæ acutæ, adpresso-pubescentes; receptaculi squamæ naviculares acutæ 3.5 mm. longæ. *Flosculi* heterogami; corolla neutra ligulata flava circa 7.6 mm. longa 2 mm. lata, hermaphrodita tubulata 4 mm. longa inferne angustata; antheræ ecaudatæ 2 mm. longæ; styli rami acuti 1.5 mm. longi. *Achenia* exteriora sterilia pappi setis 5, interiora fertilia pappi setis 3.

FRENCH EQUATORIAL AFRICA: Oubangui-Chari; Upper Kotto Yalinga, 4 Aug. 1921, *Le Testu* 3055 (Type in herb. Le Testu; duplicate in Brit. Mus. Herb.).

This species differs from *M. elliptica* O. Hoffm. in the longer petiolate leaves and the neuter ray-florets.

Centaurea Tisserantii, sp. nov. *Herba* perennis capitulis radicalibus, caulibus lanatis 4 cm. altis basi 4 mm. latis. *Folia*

post anthesin orientia sessilia elliptica circa 12×6 cm. remote et minute dentata, lanata vel demum superne glabrata. Capitula late-ovata 2 cm. longa; pedunculi simplices vel ramosi usque ad 5 cm. alti, bracteis paucis parvis præditi. *Involucri squamæ* imbricatæ ovatæ appendiculatæ, spino terminali robusto spinis lateralibus tenuibus, squamæ intimæ angustæ inermes; receptaculum setosum. *Flosculi* hermaphroditi; corolla anguste tubulata circa 23 mm. longa (extima longiora) superne dilatata profunde 5-lobata; antheræ breviter caudatæ 6 mm. longæ; stylus sub apice dilatatus. *Achenia* glabra; pappi setæ copiosæ planæ obtusæ breves usque ad 2.5 mm. longæ.

FRENCH EQUATORIAL AFRICA: Oubangui-Chari; bambo forest 15 km. north of Moroubas, 6 Feb. 1923 (flowers only), *Tisserant* 975 (Type in Herb. Le Testu); May 1923 (young leaves), *Tisserant* 975 supplement.

This very distinctive species most nearly resembles *C. rhizophala* Oliv. & Hiern and *C. præcox* Oliv. & Hiern, both of which species have precocious flower heads. From each of these it differs in the large elliptic leaves. The flowers are described as lilac.

***Sonchus quercifolia*, sp. nov.** *Herba* perennis humilis, radici napiformi, collo pilis longis fulvis densissime vestito. *Folia* rosulata post anthesin orientia lanceolata usque ad 25×9 cm. glabra profunde et irregulariter pinnatifida apice lobisque obtusis, basi in petiolum angustata. *Capitula* cylindrica circa 15 mm. longa numerosa dense congesta pulvinos ad 6 cm. latos formantia; pedunculi ramosi lanati bracteis obtusis instructi. *Involucri squamæ* multiseriatæ exteriores triangulæ obtusæ, interiores ovatæ marginibus membranaceis latis, apice lanata; receptaculum nudum. *Flosculi* circa 12 flavi; corolla ligulata circa 20 mm. longa, ciliis deciduis prædita; antheræ breviter caudatæ 5 mm. longæ; styli rami 3.5 mm. longi. *Achenia* striata juvenilia ad apicem constricta, matura rostrata; pappi setæ inferne connatæ albo-flavescentes circa 10 mm. longæ.

FRENCH EQUATORIAL AFRICA: Oubangui-Chari; Bozoum region, wooded savannah, 8 Nov. 1931, *Tisserant* 2980 supplement (flowers). (Type in herb. Le Testu.)

This interesting species is allied to *S. lasiorhizus* O. Hoffm. and *S. Ledermannii* R. E. Fries, which are also precocious. The leaves distinguish it from the former, but the foliage of the latter species is unknown. From it, however, the present species may be known by its larger heads, flowers, and in having a pubescent, not glabrous, corolla. The yellow flowers are said to open in the morning and close at night. The ripe achene is truly beaked, a character which shows the close relationship of this group of species to the genus *Lactuca*.

BIBLIOGRAPHICAL NOTES.

CIX. RICHTER AND GÜRKE'S 'PLANTAE EUROPAEAE.'
BY WILLIAM T. STEARN.

KARL RICHTER'S 'Plantae Europaeae: Enumeratio systematica et synonymica Plantarum phanerogamicarum in Europa sponte crescentium vel mere inquilinarum' set out to supersede C. F. Nyman's 'Conspectus Florae Europaeae' (1878-82) and its supplements (1883-90)*, but failed through being never completed. Richter †, who planned it so ambitiously, died in 1891, having brought out in 1890 (probably in October: cf. Friedländer, Nat. Nov. xiii. 449: Nov. 1890) volume 1 (vii+378 pages, 8vo: Paris & Leipzig) comprising from Taxaceae to Orchidaceae. Max Gürke ‡ then took over its completion. Three parts of a second volume, elaborating with great care the families of Engler's system from Juglandaceae to Ranunculaceae, were all that his many activities left him an opportunity of preparing and publishing. Since the title-page and preface of volume 2 are both dated 1897, having been issued in the first part, one might be led to accept the whole of its vi+480 pages as published in 1897. Actually, as internal evidence suggests and original wrappers and contemporary references show, it was published as follows:—

- Vol. 2, fasc. 1, pp. i-vi, 1-160, publ. "1 Juli 1897" (*fide* wrapper), cited in Friedländer, Nat. Nov. xix (12) 324 (end of June 1897); Engl. Bot. Jahrb. xxiv. Litt. 80 (17 Aug. 1897), Bot. Zeit. lv., ii. 288 (Sept. 1897), Just, Bot. Jahreshb. xxv. (1897) ii. 298 (1899).
- Vol. 2, fasc. 2, pp. 161-320, publ. "31 Januar 1899" (*fide* wrapper), cited in Friedländer, Nat. Nov. xxi. (3) 144 (Feb. 1899), Bot. Zeit. lvii., ii. 93 (16 Mar. 1899), Just, Bot. Jahreshb. xxvii. (1899) i. 285 (1901).
- Vol. 2, fasc. 3, pp. 321-480, publ. "8 Dezember 1903" (*fide* wrapper; received at Kew 21 Dec. 1903), cited in Friedländer, Nat. Nov. xxvi. (1) 50 (Jan. 1904), Bot. Zeit. lxii., ii. 47 (1 Feb. 1904), Engl. Bot. Jahrb. xxxiv. Litt. 11 (June 1904).

For the families included, the 'Plantae Europaeae' is a valuable reference work, particularly helpful on account of

* For dates of publication of Nyman's 'Conspectus,' see Stearn in Journ. Bot. lxxvi. 113-114 (1938).

† Karl Richter of Vienna died 28 Dec. 1891 at the age of 36 years (Oest. bot. Zeitschr. xlii. 72: 1892). His herbarium, acquired by Halácsy, is now at the Naturhistorisches Museum (Botanische Abteilung) in Vienna as part of the Halácsy Herbarium Europaeum.

‡ Robert Louis August Max Gürke, born at Beuthen a. O. on Nov. 17, 1854, died at Berlin on March 16, 1911, was from 1893 Kustos of the Berlin Botanisches Museum; for biographies, with a portrait, see F. Vaupel, 1911, in Monatsschr. f. Kakteenk. xxi. (5) 65-67, and Th. Loesener, 1912, in Verhandl. bot. Verein Brandenb. liii. 29-41 (for 1911).

its references to the original places of publication of varietal names, which are often very difficult to trace. The utility of Gürke's incomplete volume is, however, much diminished by its lack of an index; a complete one would probably occupy about a hundred pages; in default of such the following will serve as a guide to the families and genera:—

- ACHYRANTHES, 175. Aconitum, 436. Actaea, 419. Agriophyllum, 155. Agrostemma, 282. Aizoaceae, 177. Aizoon, 177. Alnus, 50. Alsine, 247. Alternanthera, 175. Amaranaceae, 172. Amarantus, 172. Anabasis, 169. Anemone, 455. Aquilegia, 420. Arceuthobium, 82. Arenaria, 266. Aristolochia, 89. Aristolochiaceae, 89. Arthrocnemum, 157. Asarum, 89. Atraphaxis, 111. Atriplex, 139. Axyris, 149.
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LEAF-COLOUR FORMS IN *MYRICA GALE*.

BY B. L. BURTT.

THE Sweet Gale, *Myrica Gale* L., is a species which is remarkably constant over a wide geographical range, and only one named variety, var. *tomentosa* DC., has been traced in the literature. It is, therefore, of some interest to record two variants of this species which have been found in widely separated localities in the British Isles, both variants having as their most distinctive characteristic light yellow-green leaves instead of the usual grey-green type.

One of these light-coloured forms was found on a hillside in Inchnacardoch Forest, Fort Augustus, Scotland, by Sir Arthur Hill in 1936. Here several patches of the yellow-green variant occur scattered amongst the normal grey-green type, some of them in exceptionally wet places, others on drier knolls, so that their occurrence is apparently uncorrelated with details of the habitat. These plants have been under observation by Messrs. J. A. B. Macdonald and A. Grant, of the Forestry Commission, and are quite consistent in their characters year after year. The yellow-green form is a rather taller-growing plant, a fact which is probably accounted for by its continuing vegetative growth later in the season than the grey-green type. Cuttings of both types were tried at Kew in 1936 and again in 1938—on each occasion, however, they failed to take root.

Morphologically this yellow-green form shows only very small differences from the grey-green type from the same locality:

the second-year stems bear rather more numerous lenticels, the hairs on the current year's stems are rather shorter, and the leaves are slightly smaller (3.5×0.9 cm. against 3.8×1.1 cm. maximum). The differences refer only to a comparison of the two forms at Fort Augustus and do not hold when the yellow-green form is compared with the grey-green type from other localities.

The second yellow-green form was found by Miss S. Ross-Craig, J. R. Sealy, and B. L. Burtt on the shore of Muckcross Lake, Killarney. The habitat was at the back of a small *Phragmites* swamp and was occupied by a practically pure association of *Myrica* and tufted *Molinia*. The habitat was almost entirely sheltered from wind and the *Myrica* plants five to six feet high. The population probably consisted of about fifty plants, of which slightly less than half had the yellow-green type of leaf. In this population, however, distinction did not rest on the colour of the leaves alone. The grey-green form had leaves broadly oblanceolate, scattered, spreading at an angle of 45° , whereas in the yellow-green form they were narrowly oblanceolate, congested towards the ends of the branchlets, and suberect. The characteristic crowding of the leaves of the yellow-green form towards the tips of the branchlets was at first sight almost as striking as the leaf-colour, for it gave the whole plant a distinctive twiggy appearance.

There are also significant differences in the actual measurements of the leaves, as is shown by the following figures, which are based on a sample of the fully developed leaves of several plants:—

	Length (incl. petiole).			Greatest breadth.		
	Max. mm.	Min. mm.	Average. mm.	Max. mm.	Min. mm.	Average. mm.
Grey-green . . .	36	28	32.3	12	7.5	10.35
Yellow-green . .	43	37	39.3	9.5	6	7.55

These figures give an approximate length to breadth ratio of 3.1 : 1 in the grey-green form and 5.2 : 1 in the yellow-green form, a difference which cannot be without significance. *Myrica* leaves usually have one or two small marginal teeth towards the apex: it was found that the grey-green leaves tended to produce these more frequently than the yellow-green, the former averaging two each side, the latter only one on the leaves measured.

There seems little doubt that in this Killarney population there are two distinct "strains" growing side by side. Elsewhere in the district normal grey-green *Myrica Gale* is very common, but the yellow-green variant was not seen, in spite of careful search.

Examination of the herbarium material of this species at Kew shows that the Killarney yellow-green form cannot be separated

from specimens from other parts of the British Isles by its leaf-measurements alone. Furthermore, the Killarney form does not agree in this respect with the Fort Augustus yellow-green variant.

So far only vegetative parts have been mentioned. The Fort Augustus plant had ♂ and ♀ inflorescences indistinguishable from those of the normal form, but flowers of the Killarney variant have not yet been examined.

It is somewhat surprising that this yellow-green variation should have been found at Killarney, the first place where it has been sought since Sir Arthur Hill noticed it at Fort Augustus. Admittedly it was not detected until the last day of a stay of several weeks in the Killarney neighbourhood, but the fact that it was found there suggests that it may be discovered elsewhere. More detailed studies are needed before these variations can be satisfactorily explained, but it has seemed worth while drawing attention to their existence. Should any reader of this note discover similar forms elsewhere material would be welcome and should be sent to the Director, the Royal Botanic Gardens, Kew.

REVIEW.

A Flora of the North-east of Ireland. Second Edition. By R. LL. PRAEGER and W. L. MEGAW. 8vo, pp. lix, 472; 3 maps. Belfast (The Quota Press), 1938. 10s. 6d.

SINCE the appearance in 1888 of Stewart and Corry's 'Flora of the North-east of Ireland,' two important Supplements have been published as the results of the activities of the Belfast Naturalists' Field Club, and in 1935 work for a new edition was begun. The brunt of this work has fallen upon Dr. Praeger, except that the Cellular Cryptogams (excluding Charophyta) have been revised by W. R. Megaw. Much time has been spent checking old records, visiting the less known areas, and working out the distributions of segregates distinguished in the last fifty years. The result is a work of the same form but essentially rewritten—a real second edition.

There is a new introduction by Dr. Praeger. After a "Historical" section is a "Topographical and Botanical" one in which the features and special plants of the various areas are well set out. Gains and losses are noted, and references to ecological papers are given. The next section—entitled "Botanist's Guide"—is in Dr. Praeger's well-known style, followed by explanatory "Comments on the Text." The biography of John Templeton—who laid the foundations of our botanical knowledge of the area—is reprinted from the first

edition, and is followed by an account of the Templeton Manuscripts, now fortunately housed together in the Royal Irish Academy, and by a "List of Contributors, and of Works cited."

As stated above, the text has been very completely revised and practically re-written. Space for new notes has been made by the elimination of detailed records of species which are frequent throughout the area, but the full accounts of the interesting plants are retained, verbatim when no emendation is needed. A large number of species has been added, and, although many of these are introductions, there are many more interesting additions.

It would be possible to repeat some of the criticisms which I made in connection with the 'Flora of Westmorland,' and to indicate errors which might have been eliminated had more experts in various groups and in nomenclature been consulted, but as these criticisms were made in relation to the production of local floras in general, and were not intended to minimise the interest and value of the work to which they happened to be applied, there is no need to enlarge on them in detail again. The use of the London Catalogue as a standard for nomenclature is undesirable, since it contains so many errors and departures from the present International Rules. There are slips such as *Stellaria media* L., errors such as the citation of *Alchemilla filicaulis* Buser (instead of Linton, non Buser) as synonym of "*A. minor* Huds.," *Carduus tenuiflorus* Curt. as synonym of *C. pycnocephalus* L. (a distinct plant not occurring in the area), "herb. Smith in British Museum" when it is at the Linnean Society (see *Centaurea Jacea*), *Salix cinerea* still retained instead of *S. atrocinerea* Brot., *Carex inflata* Huds. used as the name for *C. rostrata* Stokes (whereas it is *C. vesicaria* L., since Hudson thought *C. rostrata* to be *C. vesicaria* L.), and so on. But in spite of such errors, which, as in my previous review, I mention only to show the need for a wider cooperation in the production of these useful works (for no one person can hope to be able to eliminate all error), the present Flora, like that of Westmorland, will be an essential aid to botanists visiting the area concerned, both of which still offer a wide field for further critical work. The extraordinary list of Alchemillas recorded for Cave Hill specially invites further investigation, as does the shortness of the accounts of *Mentha* and some other critical genera. Specialists will surely find in these pages matter which would warrant a visit to this interesting area so little explored by botanists from Great Britain.

A. J. W.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on January 5th, Professor T. G. B. Osborn and Mr. C. A. Gardner read a paper on Dampier's Australian Plants. There are occasional references in botanical works to a small collection of plants in the Sherardian Herbarium at Oxford, which were collected by the buccaneer and navigator, William Dampier, on the coast of New Holland in 1699. Dampier was not a botanist, and appears to have picked only plants which were peculiar, such as *Clinanthus* and *Dampiera*, or which had a familiar appearance such as "Rosemary" and grasses; many of the seventeen specimens are scraps. Further, he visited only a few places on the coastal strip during the dry season of the year, in one of the driest parts of Australia. Dampier states that he had a draughtsman with him in the 'Roebuck,' which may account for the quality of the drawings in 'A Voyage to Australia.' The plants were handed to John Woodward. The descriptions are usually attributed to him, but they seem to be merely translations of those of John Ray in 'Historia Plantarum' then in the press. Woodward also gave some other specimens to Plukenet, who described them and figured them in 'Amaltheum Botanicum.' Sherard acquired this collection, and it was he who sent the plants to Ray. Two plants described by Ray and three described by Plukenet are missing.

The authors gave a detailed account of the collection. One genus, *Dampiera* R. Br., and two species, *Diplolaena Dampieri* and *Beaufortia Dampieri* bear the collector's name: unfortunately the most striking plant, *Clinanthus Dampieri* of gardens was first named *Donia speciosa* and is correctly *C. speciosa*.

Dr. F. W. Jane and Miss R. E. Dowling recorded the occurrence of *Mastigosphaera Gobii* Schewiakoff in a small pond in north Yorkshire and gave a detailed description of it. *Mastigosphaera* is a monotypic genus unique among the Volvocales in having uniflagellate cells. The only previous record of this species is the original one from New Zealand by Schewiakoff in 1893.

Mr. I. H. Burkill gave two short papers on Dioscoreas in the Congo. The first dealt with acarodomatia in *Dioscorea minutiflora* Engl. and *D. smilacifolia* de Wild. These structures consist of a shallow pit in the lower surface of the leaf close to the base, bordered on one side by a slightly crested nerve and imperfectly covered on the other by the inrolled and curiously toothed margin of the leaf. Though there is no proof yet that acari are associated with these structures it is advisable to retain the term acarodomatium. Acarodomatia have been described in several additional species from the Congo, but examination of the type-specimens has shown them to be synonymous.

The second paper dealt with twining in both directions in *Dioscorea Baya*. This species is a member of the section *Enantio-*

phyllum which contains numerous species all twining to the right. Apparently, however, every now and then a branchlet of *D. Baya* twines in the reverse direction. It seems as if this species is breaking away from the deeply ingrained character of twining to the right, such as must have occurred in the past when the sections separated.

At the General Meeting on January 19th, Professor R. Ruggles Gates gave an account of a paper by Professor T. S. Raghaven on the Floral Anatomy and some Structural Features of the Capparidaceous Flower. In the common South Indian weed *Gynandropsis pentaphylla* some flowers in every inflorescence have a small sterile ovary without a gynophore. Each carpel is an inrolled foliar organ, the line of fusion being the placenta; the gynæcium is thus normally formed by marginal fusions of the carpellary leaves, in accordance with the classical conception of the carpel. The origin and course of the vascular strands to the various floral organs was traced in *Gynandropsis pentaphylla*, *Euadenia eminens*, *Capparis flexuosa*, *Cadaba indica*, and *Cleome chelidoni*; though the andrœcium varies widely, the gynæcium is bicarpellary throughout. The inrolling and fusion of the carpellary margins is clear only in the very young gynæcium, and the commissure represents, not a solid carpel, but merely the line of fusion of the inrolled margins of adjacent carpels.

Usually each carpel has at first a median vascular bundle representing the midrib and a marginal bundle near each edge. The latter becomes larger to supply the ovules, and when the margins fuse the marginal bundles become closely paired and more or less fused later in the commissure.

PHILIP MILLER'S MONUMENT.—The Monument erected to the memory of Philip Miller (1691–1771) the famous horticulturist and botanist, which is in Chelsea Old Church Yard, is in need of repair. A fund has been opened for this purpose to which the Fellows of the Linnean Society have been invited to subscribe: subscriptions should be sent to the Treasurer. The Royal Horticultural Society, the Chelsea Society, and the Apothecaries' Company have made donations.

ZOSTERA HORNEMANNIANA FROM CARMARTHENSHIRE.—Specimens of *Zostera* recently collected by L. Hugh Milne at Ferryside, Carmarthenshire, are undoubtedly *Z. Hornemanniana*. As Mr. H. A. Hyde, to whom I am indebted for the material, tells me that it is identical with the plant recorded by him as *Z. nana* (Hyde, Journ. Bot. 1934) it seems desirable to record the corrected identification. The collector notes that it is increasing in the locality and that spread by "runners" is much more rapid than by seed. The latter statement confirms previous observations (Tutin, New Phyt. 1938), while the former is of special interest as the only record of the active spread of any species of *Zostera*.—T. G. TUTIN.

STUDIES OF BRITISH POTAMOGETONS.—V.

By J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

V. THE IDENTITY OF *POTAMOGETON SALIGNUS*.

THE name *Potamogeton salignus* Fryer was first published in the 'Victoria History of Devonshire' (1906), p. 129, where it appeared under Torrington District in the Addenda to Hiern's article on the botany of Devon. Though he validated the name by including a brief differential diagnosis, Hiern gave no proper description; nor did he mention specimen, precise locality, or general distribution. For convenience we give a transcription of the protologue* :—

"*Potamogeton salignus*, A. Fryer (probably a hybrid; differing from *P. salicifolius*, Wolfg. by the outermost veins of the leaves starting near the base of the midrib and not from the base of the margins of the leaves)".

In order to typify *P. salignus* it is necessary to consult Hiern's herbarium (now in the Royal Albert Memorial Museum, Exeter), which contains a series of specimens named *P. salignus*. These were all collected in the Torrington District of North Devon during the period 1882–1905, and among them is a sheet of specimens, collected by Hiern in a mill leat by Darkham Wood, St. Giles-in-the-Wood, on 12th Aug. 1905, which bears an annotation by Fryer determining the plant as "*P. salignus* Fryer = *salicifolius* Bab. non Wolfgang!" The sheet is accompanied by a note stating that the specimens were sent to Hunnybun on 10th Oct. 1905 to be forwarded to Fryer for his determination, and also by a letter from Hunnybun to Hiern reporting his interview with Fryer. According to Hunnybun's letter, dated 21st Mar. 1906, Fryer saw the specimens on that day and pronounced them to be his *P. salignus*, of which the only (previously known) British habitat was the River Wye. "He compared it", says the letter, "with Mr. A. Ley's original specimens collected at Carey on the Wye [Hereford] in 1893, also with the drawing prepared for his own Monograph of which the letter press has not yet been written." Fryer went on to explain to Hunnybun that Wolfgang's *P. salicifolius* differed from *P. salignus* in "the exact point where the lowest vein started from—in one case from the very base of the margin of the leaf and in the other case from a point on the midrib immediately above the base of the leaf".

With this evidence from Hiern's herbarium before us, the circumstances surrounding the publication of the name *P. salignus*

* Britten also published a transcription in Journ. Bot. xlv. 212 (1907) "in order that it may be brought to the knowledge of botanists, especially foreign ones, who can hardly be expected to hunt through the history of English counties on the chance that a new species may lurk in some corner".

become clear, and we are able to consider its typification. Fryer proposed the name for a plant from the Hereford Wye which Babington (in Bot. Exch. Club Rep. 1877-78, 10 (1879)) had referred to *P. salicifolius* Wlfg. He intended to publish it in 'Potamogetons of the British Isles' with a plate drawn from Wye specimens, but in 1906, while his account was still unwritten, he was shown Hiern's plant from Devon and identified it with *P. salignus*. He explained to Hunnybun how this differed from the true *P. salicifolius*, and Hunnybun passed the information on in a letter to Hiern, who thereupon published *P. salignus* as the name for the Devon plant, attributing it to Fryer and validating it with a brief differential diagnosis culled from the letter. Hiern's protologue contains no direct reference to the Wye plant, but comparison with the diagnosis shows that the latter applies to this plant and not to the plant from Devon. Indeed, the two plants are taxonomically distinct, and Fryer's error in uniting them must be explained on the grounds that he was then an old man and not so actively engaged in critical study of the genus. Hiern's account of *P. salignus* thus embraces both plants, but as the Wye plant was the one intended by Fryer as the basis of the name, and was also the origin of the diagnosis, it should be considered the (lecto-) typical element of *P. salignus**.

This view of the typification is confirmed by the subsequent history of *P. salignus*. Fryer himself never published the name, but in 1913, the year following his death, an account of *P. salignus*, compiled by A. H. Evans and A. Bennett, appeared in 'Potamogetons of the British Isles', p. 76. In this work the name was published as "*×Potamogeton salignus*, Fryer MS.", with the synonyms *P. salicifolius* Wlfg. and *P. decipiens* var. *salicifolius* A. Benn. No description by Fryer was given (though a transcription of Wolfgang's original description of *P. salicifolius* was inserted parenthetically by Bennett), but the following remarks, taken from Fryer's manuscript notes, were quoted: "I now make it a hybrid species; it is so very distinct from any other *decipiens* form that I think it deserves segregation (although I first suggested its *decipiens* affinity to my friend Bennett). It will be found in the Potamogeton book under the name of *P. salignus*. The same varietal or specific name ought never to be used twice in the same genus." The distribution in the British Isles was given by Bennett as "Herefordshire", and the account was accompanied by a plate (t. 49) drawn from Hereford specimens. There was no reference to the Devon

* Ley first found the plant about 1865, and collected numerous specimens at intervals during the next thirty years. The material named *P. salicifolius* by Babington was gathered at Sellack in 1877, but as the diagnosis of *P. salignus* must have been based on the specimens in Fryer's herbarium (now at the British Museum) which were referred to in Hunnybun's letter as "Mr. A. Ley's original specimens collected at Carey on the Wye in 1893", we take one of these as lectotype.

plant, probably because Fryer had omitted to make any mention of it in his notes*. The citation of the synonym *P. salicifolius* Wlfg. must have been due to misinterpretation of Fryer's intention, for if he had eventually considered the Wye plant to be the same as Wolfgang's (as Bennett suggested) the name *P. salignus* would have been superfluous and he would not have used it. It is clear that the synonym should have been *P. salicifolius* Bab. (non Wlfg.), as indicated by Fryer in his annotation of the sheet in Hiern's herbarium.

It remains to deal with the taxonomic position of the two plants confused under *P. salignus*. The Wye plant, as we have already mentioned, was referred to *P. salicifolius* Wlfg. by Babington, and it appeared under that name in J. D. Hooker's 'Student's Flora of the British Islands', Ed. 3 (1884), p. 433, and in Purchas & Ley's 'Flora of Herefordshire' (1889), p. 285†. In 1894 Bennett (in Bot. Exch. Club Brit. Is. Rep. 1893, 425) said that Ley's specimens from the Wye seemed to him "to represent the plant of Wolfgang, Besser, and Gorski (*P. lithuanicus*)". But Gorski's plant (*P. lithuanicus*) is not the same as that of Wolfgang and Besser (*P. salicifolius*). This was pointed out by Hagström in a note published by Bennett in Journ. Bot. xlvii. 251 (1908), where it was stated that *P. salicifolius* could not be regarded as an independent species. Hagström had seen specimens collected at Vilna (in Poland) by Wolfgang himself, and they were "*P. gramineus × perfoliatus = P. nitens* Weber, belonging to the form called *subperfoliatus*"; while *P. lithuanicus*, which also was described from Vilna, was "*lucens × perfoliatus = P. decipiens* Nolte, and very near the Swedish form named f. *javedsdensis* Tis." The Wye plant, according to Hagström, might perhaps be labelled "*P. gramineus* L. *× perfoliatus* L. (*P. nitens* Web.), *subperfoliata* f. *salicifolia* (Wlfg.)"‡. Here, however, he was in error, for the Wye plant is certainly not *×P. nitens* (*P. salicifolius*). Fryer, as we have seen, realized this and distinguished the plant from *P. salicifolius* on account of the nervation of the leaves; he believed it to be a hybrid allied to *×P. decipiens* but sufficiently distinct to be worthy of segregation. We agree with him that the plant is a hybrid, but we cannot concur that it is worthy of separation from *×P. decipiens*. The Wye specimens do not differ in any noticeable way from narrow-leaved states of the

* A sheet of it in Fryer's herbarium bears no note by Fryer. It is labelled in Hiern's handwriting.

† The *P. salicifolius* of Babington's 'Manual of British Botany', Ed. 7 (1874), p. 372, and Ed. 8 (1881), p. 381, is a different plant from the River Boyne near Navan, Co. Meath. This Irish plant is a riverain state of *P. gramineus*.

‡ In Hagström's 'Critical Researches' (1916), p. 221, *P. salignus* was accordingly referred to *×P. nitens*. Pearsall accepted this in his 'Notes on Potamogeton' in Bot. Soc. & Exch. Club Brit. Is. ix. 394 (1931).

latter hybrid growing in other rivers where the stream is considerable, and it should be borne in mind that Fryer was more familiar with the broad-leaved states found in the English fens. Moreover, *P. lucens* and *P. perfoliatus* (the parents of $\times P. decipiens$) are common in the Wye, and specimens of the former species from the same part of the river as *P. salignus* show correspondingly narrow leaves. It is to be noted that Fryer did not suggest any parentage for *P. salignus**, and when the characters of the Wye plant are reviewed it is difficult to imagine what parents it could have other than *P. lucens* and *P. perfoliatus*.

The Devon plant differs from the Wye plant not only in the nervation of the leaves but also in the ability to develop floating leaves, as shown in a gathering made by Hiern in a pool by the River Torridge at Frithelstock on 25th Aug. 1906. It agrees in every way with $\times P. nitens$, and the specimens in Hiern's herbarium were referred to that hybrid by Pearsall when he examined them shortly before his death†. The occurrence of $\times P. nitens$ in Devon is of special interest because neither of the parent species, *P. gramineus* or *P. perfoliatus*, has been reported from the same district as the hybrid; in fact, there is no authenticated record of *P. gramineus* from the county. It is evident that, unless $\times P. nitens$ was introduced by some unknown agency, both *P. gramineus* and *P. perfoliatus* must have occurred in the Torridge basin.

SUMMARY.

The brief original account of *P. salignus* published by Hiern in 1906 embraced two elements which are taxonomically distinct:—

(1) A plant from the Torrington District of North Devon which is $\times P. nitens$ Weber. This does not agree with the diagnosis of *P. salignus*.

(2) A plant from the Hereford Wye which is $\times P. decipiens$ Nolte ex Koch. This agrees with (and clearly was the basis of) the diagnosis of *P. salignus*, and must therefore be accepted as the (lecto-) typical element. The following references relate to this plant:—

P. salicifolius (non Wölg.) Bab. ex Ley in Bot. Exch. Club Rep. 1877-78, 10 (1879); *op. cit.* Rep. 1893, 425 (1894); *op. cit.* Rep.

* H. and J. Groves in Bab. Man. Brit. Bot., Ed. 9, 439 in adnot. (1904) stated that the Wye plant (from Sellack) was considered by Fryer to be a hybrid of unknown origin.

† He actually determined some of the specimens as $\times P. nitens$, others as $\times P. nitens$ var. *subintermedius*, and others as $\times P. nitens$ var. *subperfoliatus*. Such segregation, however, is unjustified; indeed, the specimens may well belong to a single clone, as the hybrid is sterile and is known only from a limited part of the Torridge in the vicinity of Great Torrington.

1894, 461 (1895).—Hook. f. Stud. Fl. Brit. Is., Ed. 3, 433 (1884).—Purchas & Ley, Fl. Hereford. 285 (1889).—A. Benn. in Watson Bot. Exch. Club Ann. Rep. 15, 19 (1899); in Journ. Bot. xlv. 251 (1908).

P. salignus Fryer apud Hiern in Victoria Hist. Devon. 129 (1906) et in Journ. Bot. xlv. 212 (1907) pro parte, excl. pl. devon.; in Fryer & Benn. Pot. Brit. Is. 76, t. 49 (1913).

NEW BORNEAN MYRSINACEAE.

BY W. R. PHILIPSON, B.A.

THE collections made on Mt. Kinabalu by J. & M. S. Clemens in the years 1931-33 proved to be rich in species of Myrsinaceae. Over thirty species have been determined, and, in addition, seven species are here described from their material. While working on these plants, the Myrsinaceae of other collections made in Borneo by Haviland and Hose, Brooks, Moulton, Grabowsky, and Winkler have been examined. A specimen collected by Haviland and Hose in northern Sarawak is here described as a species of *Tapeinosperma*, a genus previously known from New Caledonia and the Fiji Islands, the mainland of Australia, and Papua. The placentation of all the available species of *Ardisia* recorded from Borneo was examined, with the result that three species are more correctly placed in the genus *Tapeinosperma*, which is therefore strongly represented in the Island. The range of the genus extends to the Malay Peninsula, and it is possible that other species described under *Ardisia* may be found to belong to *Tapeinosperma*. It is probable that the genus *Tetrardisia*, which consists of a single species from Java, will be found in Borneo. Two specimens collected on Mt. Kinabalu by J. & M. S. Clemens have short axillary peduncles bearing umbels of fruit with four calyx lobes. They do not fall into any section of *Ardisia*, and have much the aspect of *Tetrardisia*, but without seeing the placentation generic determination is impossible.

Maesa decidua, sp. nov. Frutex vel arbor parva usque ad 10 m. altus. *Ramuli* graciles striati rufescentes, lenticellis numerosis praediti. *Folia* petiolata; petiolus usque ad 13 mm. longus striatus; lamina anguste vel late elliptica, basi angustata apice manifeste acuminata, glabra, circa 60×25 mm., costa nervisque supra canaliculatis subtus valde prominentibus, margine superne dentibus parvis praedita. *Inflorescentia* simplex racemosa quam folia brevior, in axillis foliorum saepe deciduorum disposita; pedicelli circa 4 mm. longi glabri bracteis longe superantes, bracteolis decurrentibus praediti. *Flores* 5-meri, circa 2 mm. longi; sepala rotundata glabra haud punctata margine

minute crenulata; petala rotundata usque 1/3-connata, vix lineata; stamina in fauce inserta, antheris filamenta breviter subæquantibus; ovarium conicum, stylo brevi, stigmatibus parvo præditum. *Fructus* globosus circa 4×4 mm. striatus, haud punctatus.

BRITISH NORTH BORNEO: Mount Kinabalu; Colombo River basin, Minatuka Spur, at 9000 ft., *J. & M. S. Clemens*, 33800 (type); at base of 2000 ft. cliff, near falls, at 9500 ft., *J. & M. S. Clemens*, 33762; Marai Parai, Kamburanga, at 8000 ft., *J. & M. S. Clemens*, 33107; head of Colombo River in mossy forest at 8000-9000 ft., *J. & M. S. Clemens*, 33914; Gurulau Spur, Pinokok River, at 8000 ft., *J. & M. S. Clemens*, 50933 (all in Herb. Mus. Brit.).

The flowers of this low tree are described as white with a green centre, and were collected in the months of May, June, and July 1933. The prominent mid-rib and primary nerves give to the small leaves a characteristic appearance. The lamina of the leaves which subtend the racemes frequently fall at the junction with their petioles, leaving the flowers exposed. From this character the specific epithet is derived.

ARDISIA PTEROCAULIS Miq. Pl. Junghuhn. 194 (1853).

DUTCH SOUTH-EAST BORNEO: Dussan Timor District; Lihong Bahaija, Jan. 1882. *Fritz J. Grabowsky* s.n. (in Herb. Mus. Brit.).

A species previously recorded from Java, Sumatra, and Celebes.

Tapeinosperma borneense, sp. nov. *Arbor* (ut videtur) ramulis gracilibus minute lepidotis. *Folia* petiolata; petiolus circa 12 mm. longus; lamina anguste oblongo-elliptica vel lanceolata utrinque acutissima, circa 18×4.5 cm., integra, subtus minute lepidota et punctis dissitis prædita; costa et nervis prominulis, reticulis sub lente obviis. *Inflorescentia* terminalis, 14 cm. longa paniculata bi-pinnata; pedicelli agglomerati circa 4 mm. longi. *Flores* 5-meri, 3 mm. longi; sepala late triangulata obtusa, punctata, margine minute ciliolata; petala late ovata acuta superne paucè punctata, glabra; stamina basi inserta; antheris acutis dorso punctatis quam petala paulo brevioribus, filamentis brevissimis; ovarium rotundatum stylo gracillimo præditum; ovula circa 8, uniseriata. *Fructus* ignotus.

SARAWAK: Baram district; Melanaus, Niah, on limestone, *Haviland and Hose*, 3027 (type in Herb. Mus. Brit.).

This species is most like *T. papuanum* S. Moore, from which it differs in having the leaves punctate as well as lepidote. The inflorescence and size of the flowers are also distinctive. The genus *Tapeinosperma* has not previously been recognized in Borneo, but certain species described under *Ardisia* are found

to belong here. The following new combinations are therefore necessary:—

T. crassum (Clarke), comb. nov.—*Ardisia crassa* Clarke in Hook. f. Fl. Brit. Ind. iii. 518 (1882); *Ardisia fortis* Mez in Engler, Pflanzenreich, iv. 236, 114 (1902).

T. lancifolium (Merrill), comb. nov.—*Ardisia lancifolia* Merrill in Philipp. Journ. Sci. Bot. xiii. 112 (1918).

T. synneureum (Scheff.), comb. nov.—*Ardisia synneura* Scheff. Comm. Myrs. Archip. Ind. 80 (1867).

Grenacheria nebulosa, sp. nov. *Arbor* vel liana ramulis gracilis ferrugineo-pubescentibus. *Folia* petiolata; petiolus 4 mm. longus; lamina oblongo-elliptica, basi rotundata apice obtusa, integra, circa 4.5×2 cm., subtus ferrugineo-pubescentibus costa nervisque obviis. *Inflorescentia* terminales et laterales diffusæ paniculatae; ramuli graciles racemos numerosos gerentes; pedicelli tenues 1 mm. longi. *Flores* 5-meri, 2 mm. longi; sepala acuta tomentosa paucè punctata; petala ovata obtusa, usque 1/2-connata, tomentosa, punctis prædita; stamina in fauce inserta, antheris filamenta breviter subæquantibus; ovarium conicum stylo breve et stigmatibus capitato præditum. *Fructus* globosus, circa 4×4 mm., punctatus.

BRITISH NORTH BORNEO: Mount Kinabalu; Dallas, at 3000 ft., *J. & M. S. Clemens*, 26810 (type); 26096; 26613; 27221; Penibukan, at 4000-5000 ft., *J. & M. S. Clemens*, 31331; Kiau, *M. S. Clemens*, 10153 (all in Herb. Mus. Brit.).

This species resembles *G. lampani* (Scheff.) Mez in its leaves, but differs in the very diffuse panicle of small flowers. Young flowers were collected in August and September; fully opened flowers in October, and fruit from October to January. The flower is described as cream, and the fruit as dull reddish or purple.

Embelia (§ *Micrembelia*) *cordata*, sp. nov. *Frutex* scandens ramulis gracilibus ferrugineo-pubescentibus. *Folia* brevissima petiolata; petiolus 2-3 mm. longus pubescens; lamina ovata, basi cordata vel rotundata apice acuminata obtusa, margine superne crenata, circa 5×2.5 cm., utrinque glabra, punctata, subtus minute lepidota; costa prominente, nervis et reticulo obscuris. *Inflorescentia* fasciculata, circa 6-flora; pedicelli circa 6 mm. longi. *Flores* 4-meri, 3 mm. longi; sepala rotundata punctata margine ciliolata; petala anguste elliptica obtusa punctata margine ciliolata; stamina petalis subæquilonga, filamentis basi insertis, antheris brevibus; ovarium conicum. *Fructus* globosus, circa 5×5 mm. punctatus.

BRITISH NORTH BORNEO: Mount Kinabalu; Penataran basin, at 5500 ft., *J. & M. S. Clemens*, 34159; Marai Parai, trail to

Nunkok at 4500 ft., *J. & M. S. Clemens*, 32460; 32493; at 5000 ft., 33040; Gurulau Spur, at 7000-9000 ft., *J. & M. S. Clemens*, 51695; Pinokok River, at 6000-7000 ft., *J. & M. S. Clemens*, 51695 a; Penibukan, at 5000 ft., *J. & M. S. Clemens*, s. n. (all in Herb. Mus. Brit.).

This small climbing shrub is most closely allied to *E. phaeadenia* Stapf, from which it may be most readily distinguished by the cordate leaf-bases. Flowering specimens were collected in December, March, April, and July.

EMBELIA PARVIFLORA (Wall.) A. DC. in Trans. Linn. Soc. Lond. xvii. 130 (1837).

BRITISH NORTH BORNEO: Mount Kinabalu, *J. & M. S. Clemens*, 32031.

A species previously recorded from Assam, Burma, the Malay Peninsula, and Sumatra.

Rapanea aralioides, sp. nov. *Frutex* 3-4 m. altus ramulis crassis glabris. *Folia* brevissime petiolata; petiolus latus circa 4 mm. longus; lamina obovata vel elliptica basi angustata apice obtusa, integra, utrinque glabra, coriacea, circa 14×5.5 cm., punctis et lineis prædita, costa utrinque prominente, nervis supra vix visibilibus subtus deficientibus. *Inflorescentia* multiflora ex ramulis verruciformibus oriens; pedicelli circa 4 mm. longi glabri. *Flores* 5-meri, circa 3 mm. longi; sepala late triangulata obtusa punctata, margine minute ciliolata; stamina sessilia, quam petala breviora; ovarium conicum. *Fructus* globosus circa 4×4 mm.

BRITISH NORTH BORNEO: Mount Kinabalu; Penibukan, at the head of the divide of the Dahombong Creek, at 5000 ft., *J. & M. S. Clemens*, 40664 (type); Table Rock, at 5000 ft., *J. & M. S. Clemens*, 30989; Kamburanga, at 8000 ft., *J. & M. S. Clemens*, 27801; Marai Parai, at 5000 ft., *J. & M. S. Clemens*, 32346; 32612; Gurulau Spur, at 7000-9000 ft., *J. & M. S. Clemens*, 50778 (all in Herb. Mus. Brit.); Marai Parai, at 5500 ft. *Haviland*, 1258 (in Herb. Kew.).

This very distinctive species resembles *R. achradifolia* (F. Muell.) Mez (North Queensland), in habit, but has neither its characteristic staminodes nor hairy petals. Only the type-specimen is in flower; it was collected in October 1933. The stout stems bearing short shoots with umbels of flowers or fruits below large and laurel-like leaves are very characteristic. The umbellate clusters of fruits suggest the Araliaceae. The flowers are described as reddish purple with white pistils and the fruit as purple.

Rapanea salicina, sp. nov. *Arbor* parva usque 10 m. alta ramulis glabris verrucosis. *Folia* glabra petiolata; petiolus 3-6 mm. longus; lamina obovata, basi angustata apice obtusa vel rotundata, coriacea, integra, circa 4×1.5 cm., utrinque

punctata, prominenter costata, utrinque minute reticulata. *Inflorescentia* circa 4-flora; pedicelli 4 mm. longi, glabri. *Flores* 5-meri, 3 mm. longi; sepala late triangulata pauce punctata, margine ciliolata; petala anguste elliptica obtusa pauce punctata, margine ciliolata; stamina sessilia quam petala multo breviora; ovarium conicum. *Fructus* obovatus, 4×3 mm., punctatus.

BRITISH NORTH BORNEO: Mount Kinabalu; Gurulau Spur, at 11,000 ft., *J. & M. S. Clemens*, 50807 (type, in flower); 50808 (in fruit); Paka, at 10,000-10,500 ft., *J. & M. S. Clemens*, 28887; 29913 (all in Herb. Mus. Brit.).

This small tree is closely related to *R. avenis* (Blume) Mez, from which it differs in the smaller and more blunt leaves, and also in the very few dark spots on the corolla and especially on the calyx. The plant has much the aspect of *R. Korthalsii* (Miq.) Mez, which species, however, has tetramerous flowers. Flowering specimens were collected in the months of March, May, and July.

Rapanea cruciata, sp. nov. *Frutex* 4 mm. altus ramulis glabris. *Folia* glabra petiolata; petiolus circa 4 mm. longus; lamina ovata, basi angustata apice obtusa, circa 6×2.5 cm., integra subcoriacea, supra punctata subtus lineolata, costa prominente, utrinque minute reticulata. *Inflorescentia* circa 4-flora; pedicelli 4 mm. longi, glabri. *Flores* 4-meri, 3 mm. longi; sepala rotundata punctata, margine ciliolata; petala anguste elliptica obtusa, punctata margine ciliolata; stamina sessilia quam petala multo breviora; ovarium conicum. *Fructus* ignotus.

BRITISH NORTH BORNEO: Mount Kinabalu; Paka, at 8000-10,000 ft., *J. & M. S. Clemens*, 28941 (type in Herb. Mus. Brit.).

This species is similar in habit to *R. philippinensis* (A. DC.) Mez, and has tetramerous flowers as in that species, and it is from this character that the specific epithet is derived. The flowers in the Philippine species, however, are much smaller and more numerous in the clusters. The glandular lines in the leaves are longer in the present species. The specimen, on which the flowers are just opening, was collected in March 1932.

Rapanea penibukana, sp. nov. *Arbor* circa 20 m. alta, ramulis glabris. *Folia* glabra breve petiolata; petiolus 3-5 mm. longus; lamina elliptica vel obovata, basi breve angustata apice obtusa, coriacea, integra, 7-10×3-4 cm., punctis et lineis prædita, costa prominente, nervis vix visibilibus. *Inflorescentia* circa 5-floræ ex ramulis 5-10 mm. longis orientes; pedicelli brevissimi, glabri. *Flores* 5-meri, 2.5 mm. longi; sepala triangulata pauci punctata, margine ciliolata; petala anguste elliptica obtusa pauce punctata margine ciliolata; stamina sessilia quam petala breviora, ovarium conicum. *Fructus* subglobosus, 5×4 mm.

BRITISH NORTH BORNEO: Mount Kinabalu; Penibukan, flat place on ridge at 4000 ft., *J. & M. S. Clemens*, 20764 (type); 31119; 31319; 50295 (all in Herb. Mus. Brit.).

This medium-sized tree is closely related to *R. capitellata* (Wall.) Mez, of more northerly distribution, from which it differs in having smaller leaves with less prominent nerves on the dorsal surface; in the short shoots being longer and bearing inflorescences with fewer flowers; and in the much shorter calyx. Open flowers were collected in October (the type) and August, and fruit in November. The flowers are described as cream-green with brown anthers. There is a specimen in the Kew Herbarium from Celebes which probably belongs to this species.

NOTE ON THE GENUS *UROGLENA*, WITH THE DESCRIPTION OF A SPECIES NEW TO BRITAIN.

BY EDNA M. LIND.

IN the order Chrysomonadales of the Chrysophyceae are included two genera, *Uroglena* and *Uroglenopsis*, which differ only very slightly from each other.

The genus *Uroglena*, established by Ehrenberg in 1833, forms free-swimming, greenish brown, oval to spherical colonies of ovoid cells. The cells composing the colony are 12μ to 20μ long and 8μ to 13μ broad and contain a curved, plate-like chromatophore with a very distinct eye-spot. They bear two very unequal flagella and are embedded rather loosely in the periphery of a gelatinous matrix. From the centre of this matrix, fine mucilaginous filaments radiate to the bases of the individual cells. In some colonies large spherical cysts are found. Only one species, *Uroglena Volvox* Ehrenb., has been recorded for this country.

In 1899 Lemmermann detached from this genus a new form which he named *Uroglenopsis* (1). The best known species, *Uroglenopsis americana*, was first described by Calkins (2) from American waters in 1891 under the name *Uroglena americana*. It is similar in appearance to *Uroglena*, but forms rather larger colonies, which are said to lack the radiating mucilaginous threads in the centre of the matrix. It has not been seen to produce cysts. Three species of *Uroglenopsis* have been described (3), but only *Uroglenopsis americana* is known in this country, where it was first found in Windermere in 1932 (4).

Recently it has been suggested by Fritsch (5) and Conrad (3) that *Uroglenopsis* does not merit generic rank. Conrad has demonstrated the mucilaginous filaments in the young colonies of *Uroglena*, but he failed to find them in mature colonies or in those which were about to divide or contained cysts. These

filaments are the main criterion on which the separation of the two genera is based. Troitzkaja (6) has shown that in older colonies of *Uroglenopsis* the cells are embedded in the extremities of forked, gelatinous tubes radiating from the centre, structures much more robust than the mucilaginous filaments. Conrad has also demonstrated these tubes in *Uroglena soniaca*. It seems, then, that the separation of the two genera rests on a very slender basis and is no longer justified. It is, however, significant that no cysts have as yet been recorded in *Uroglenopsis*, though this may be due to seasonal or habitat variations.

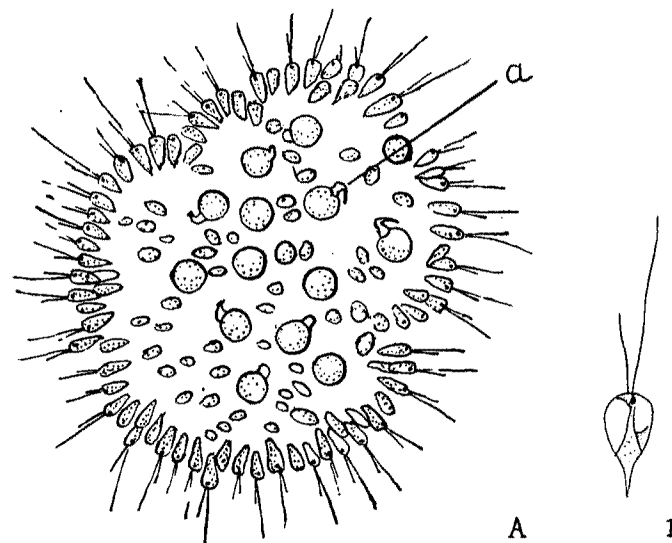


Fig. 1.—A. Colony of *Uroglena soniaca*, $\times 450$: a, cyst with tubular hook. B. Single cell from colony, $\times 1350$.

A NEW SPECIES OF *UROGLENA*.

In the spring of 1938, an organism appeared in a pond near Sheffield bearing a strong resemblance to *Uroglenopsis americana*, but distinguished from it by its rather smaller colonies and by the presence of very peculiar cysts. No radiating tubes or filaments were at first observed in the matrix, and the cysts were quite unlike those described for *Uroglena Volvox* (7). The colonies disintegrate so readily that it is difficult to secure good preservation; but photomicrographs of the living colonies and fixed material in which the cysts at least were preserved were referred to Dr. Conrad of the Belgian Museum of Natural History. He very kindly identified the organism as *Uroglena soniaca*, a new species which he had recently discovered in a pond

in the forest of Soignes, and of which he has published a full description (3).

DESCRIPTION OF *UROGLENA SONIACA*.

Uroglena soniaca, as collected in this country, is composed of somewhat irregular oval to spherical colonies from 80μ to 150μ in diameter. The cells which form the colony are embedded in the periphery of a gelatinous matrix, some held firmly by the jelly and some almost escaping from it (fig. 1, A). This gives to the surface of the colony a very uneven appearance and distinguishes it at once from members of the Volvocales in whose company it is found.

Each cell is roughly pyriform with a broad apical end and a base which tapers to a point directed towards the centre of the colony (fig. 1, B). The chromatophore is variable in form and clear yellowish green, lacking the brownish tinge characteristic of the Chrysophyceae and described by Conrad. At the broad end of each cell is a distinct eye-spot near to which arise two very unequal flagella, the shorter about the same length as the cell

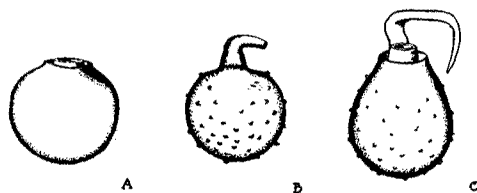


Fig. 2.—A, B. Two types of cyst from Sheffield material, $\times 1100$.
C. Cyst from Belgian material (after Conrad).

and the other at least twice as long. I do not think that the longer is as much as four times the length of the cell as Conrad suggests.

In some of the younger colonies there is an indication of strands of a different consistency running from the bases of the cells towards the centre of the matrix. In unstained material they cannot be traced to the centre, and in older colonies and those containing cysts they are not visible.

CYSTS.

Many of the colonies contain from six to fifteen spherical cysts with silicified walls (fig. 1, A). After centrifuging the material and treating with hot nitric acid only the cysts remain, and their structure can be clearly seen when mounted in Canada balsam. Two distinct kinds of cyst are present in the Sheffield material. In one (fig. 2, A) the globular body is provided with a circular pore which is prolonged into a very short neck and surrounded by a shorter, concentric collarette. The neck and its collar are clearly seen in a surface view of the pore. The walls of this type of cyst are perfectly smooth.

The second kind of cyst is rather smaller and has a wall ornamented with short, pointed projections. Further, its pore is prolonged into a tubular process bent sharply near its extremity to form a hook (fig. 2, B). In the living material there is a further flattened extension of the hook bending back towards the body of the cyst (fig. 1, A, a).

The relation between these two types of structure is not very clear. They are sufficiently distinct to belong to two different species of *Uroglena*. No gradations between them are preserved in the material, and it is difficult to visualize how one can be a developmental stage of the other. But until the growth of the cysts in living material has been studied it is not possible to assign them to their taxonomic position with any certainty.

Conrad had abundant material and was able to make a study of this kind, but my observations on the structure of the mature cyst are not in agreement with his. The cyst described by Conrad has a pore surrounded by a collarette very like that shown in fig. 2, A. But *between* the pore and the collar there arises a flattened, hook-like expansion bending back at its extremity towards the body of the cyst (fig. 2, C). My material differs from Conrad's in two particulars. The hook is always tubular at the base, though a flattened distal portion may have been broken off; and hook and collarette are never present in the same cyst.

These critical observations on the structure of the cyst have been made since Dr. Conrad's identification of my material as *Uroglena soniaca*. Though I have not had an opportunity of examining his material, I now feel doubtful that we are necessarily dealing with the same species. There is, however, such a strong resemblance between the vegetative colonies and between the hooked cysts in both collections that I propose for the present to refer the English material to *Uroglena sonica*.

If the flagellate appears again this year, further observations on the material from both localities may clear up the points of difference as to the origin of the hook. If not, it may be necessary to refer the Sheffield material to one, or possibly two, new species.

ECOLOGICAL RELATIONSHIPS.

The pond where the alga occurred near Sheffield has a bottom of black organic mud supporting a considerable growth of *Elodea* and *Potamogeton natans*. It is fed by a stream, but also receives drainage water from the surrounding farm-land. The pH of the water varies between about 7 and 8. This pond has been under observation at fortnightly or monthly intervals for six years (8), but *Uroglena* made its first appearance in May 1938, when it was accompanied by *Eudorina elegans*, *Trachelomonas volvocina*, *Gymnodinium aeruginosum*, *Synura uvella*, and a few colonies of *Volvox aureus*. With the exception of *Eudorina*

elegans, all the other algæ had been frequently noted in the pond in previous years. Conrad's first collection of *Uroglena soniaca* was made in April 1938, when it occurred along with *Eudorina elegans*, *Synura uella*, *Mallomonas* spp., and *Dinobryon sertularia*.

It is probable that *Uroglena* is not uncommon in English ponds, but that, owing to the spasmodic nature of its appearance, it has escaped the notice of collectors. In 1938 its arrival coincided with an unusually dry, sunny spring which was favourable to the growth of algæ.

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THE CARRISSO BOTANICAL MISSION TO ANGOLA: NEW SPECIES OF *MONOTES*.

By HELEN BANCROFT, PH.D., F.L.S.

DURING the Botanical Mission to Angola undertaken by the late Dr. L. W. Carrisso and his colleagues in 1937*, a considerable amount of material representative of the Monotoideae (Dipterocarpaceae) was collected from various localities; amongst this material the following new species of *Monotes* have been distinguished:—

Monotes Carrissoanus Bancroft, sp. nov., proprietate et distributione indumenti foliorum speciebus sectionis *M. discoloris* affinis, ob irregularitatem nervorum tertii ordinis tamen distinctus.

Arbor 10–15 m. alta; ramuli novi brunnei subtiliter pubescentes, deinde cinerei atque leviter striati. *Lamina foliorum* elliptica, 6–9 cm. longa, longior circiter duplo quam lata, apice

* See Exell, A. W., Journ. Bot. lxxvi. 121–134 (1938).

sæpissime rotundata, nonnunquam breviter mucronata, subinde truncata vel leviter emarginata, raro obtuse angulata, basi rotundata vel angustata, interdum subcuneata, margine leviter et varie undulata; pagina superior opaca pilis resiniferis et sat sparse pilis furcatis simplicibusque instructa, basi glandulam orbiculatam ad ellipticam, fusco-brunneam vel nigram, vix conspicuam ferens, nervis validioribus impressis; pagina inferior indumento sat sparso oblecta, nervis tenuioribus cum rete venarum indumento breve spisso canescente instructis, nervis validioribus prominentibus pallide brunneis; facies nervorum peculiaris: nervi lateralis utrinque 10–13, plerumque 11–12, juxta marginem anastomosantes, antea conspicue contracti, haud infrequenter nervos tertii ordinis irregulares validos emittentes; nervi breves crebri inter nervos lateralis principes adsunt. *Petiolus* 2.0–2.9 cm., vulgo 2.2–2.6 cm., longus, teres, canaliculatus, subtiliter pubescens. *Flores* haud visi. *Infructescentia* axillaris, paniculata; pedunculi graciles 1.2–5.0 cm., pedicelli 0.3–0.6 cm. longi; fructus maturati pro panicula sæpissime 2. *Fructus maturus* sat parvus; alæ coccineæ ad rubido-brunneæ, crebre venosæ, angustæ, usque ad 3.5 vel 4.0 cm. longæ, 1.0 cm. latæ, apice rotundatæ vel acutæ, basin versus sensim angustatæ, usque ad 0.1–0.2 cm. connatæ. *Ovarium* fructus maturi circiter 1.0 cm. diametro, subglobulosum, rugosum, lignosum, subtiliter pubescens; semen pro ovario unum.

ANGOLA: Moxico, *Exell and Mendonça* 1788 (type, BM, Coi*), "between Coxipoque and Munhango," in dry forest at 1400–1500 metres altitude, "tree 10–15 m., fruits red"; *Gossweiler* 11,311 (BM, Coi). "Vila Luzo—Cachipoque," near R. Simogi (Cangongo Forest), at 1200 metres altitude: "a tree of 12 m. height in the hiemisilva of Cachipoque."

This new species falls within the "*Monotes discolor* group" of forms, agreeing with them in type and distribution of indumentum; in general leaf-shape it is similar to *M. oblongifolius* Hutch. of this group. In the relation of the lateral veins to the leaf-margin, it is more similar to *M. angolensis* De Wild. (of the "*M. hypoleucus* group") than to *M. oblongifolius*. *M. Carrissoanus* is, however, outstanding and different from either *M. oblongifolius* or *M. angolensis* in the considerable irregularity of the tertiary venation, in the possession of markedly long petioles, slender infructescences, and slender-winged, crimson to red-brown fruits.

Monotes xasenguensis Bancroft, sp. nov., affinis *M. glabro* Sprague, sed petiolis longioribus, nervis lateralibus pluribus, et glandula foliorum plus minusve cordata differt.

* BM signifies the Herbarium of the British (Natural History) Museum, and Coi the Herbarium of the Botanical Institute of the University of Coimbra, Portugal, to which departments these specimens belong.

Arbor 15 m. alta; truncus ascendens; ramuli satis validi, brunnei vel cinereo-brunnei, sulcati, glabri. *Folia* elliptica vel obovato-elliptica, sæpissime 7-10 cm. longa, longitudine plus quam duplum latitudinis æquante, apice rotundata, obtusa, vel acuta, basi angustata, rotundata vel breviter auriculata, glandulam conspicuam subnigram bilobatam vel cordatam ferente, margine varie undulata; pagina superior glabra, opaca, costa et nervis lateralibus conspicuis, brunneis, haud vel vix impressis, nervis tertii ordinis cum rete venarum manifestis; pagina inferior subbrunnea, glabra, costa et nervis lateralibus prominentibus, nervis tertii ordinis et rete venarum inconspicuis; nervi laterales utrinque 13-18, plerumque 14-15, sat conspicue in costam decurrentes, interdum prope marginem furcati, eodem loco anastomosantes atque antea evidenter contracti; nervi laterales minus validi inter nervos principes adsunt; petiolus late atque leviter canaliculatus, præter pilos sparsos in margine canaliculi glabra, 0.7-1.4 cm., vulgo 1.0-1.2 cm., longus. *Flores* haud visi. *Fructus* in pedunculis gracilibus axillaribus; pedunculi longitudine diversi; alæ fructus pallide brunneæ, usque ad 3.2 cm. longæ, 0.7 cm. latæ; ovarium maturum subglobosum, usque ad 0.9 cm. diametro, uniseminatum, pariete crasso extus dense pubescente.

ANGOLA: Lunda, Xa-Sengue-Caiango, nr. R. Cuango, at 1300 metres altitude, Gossweiler 11,755 (BM, Coi), "a tree of 15 m., with ascending trunk, in hiemisilva."

M. xasenguensis is clearly allied to *M. glaber* Sprague, from which species it differs in the possession of longer petioles, and more numerous lateral veins, and in the more or less heart-shaped outline of the leaf-gland.

NOTES ON BRITISH CARICES.—I.

BY E. NELMES.

A NEW BRITISH SPECIES.

THE Rev. James Dalton (1764-1843) held the living of Copgrove, near Knaresboro, Yorkshire, in the time of Dr. Goodenough, Bishop of Carlisle. They were both interested in the Carices. In 1802 Dalton sent the other a sedge which Goodenough was unable to identify, but decided it was near his *C. stricta* (*C. Hudsonii* A. Benn.), "but," he added, on the letter from Dalton accompanying the specimen, "it will not match with it". The plant is certainly related to that species, but is at once seen to be distinct by its much more slender and thinner-flowered spikes.

Dalton, in the letter accompanying the plant, shows great anxiety to get the species determined. He complains that he sent it to Sir J. E. Smith, but had received no reply. Relhan, at Cambridge, had identified it as *Carex recurva* Huds. (*C. flacca*

Schreb.), which, as Dalton points out, was patently wrong, because the style of his plant bears two stigmas, not three.

Despite Dalton's pathetic appeal for the matter to be cleared up, and his including a Latin description of the plant, the problem of the plant's identity has remained unsolved to this day.

Dalton's plant and his letter to Goodenough are both in the Kew Herbarium. The letter does not state plainly where the specimen was found, but, reading between the lines, one is convinced that it was collected in the north, in or near Dalton's parish.

C. B. Clarke, on the 28th May, 1902, wrote the following comment on the sheet:—"The styles are all 2-fid, as the communicator states. The utricles are covered with glands to the base and nerveless. Goodenough assuming it an English plant puts it near his *stricta*—(rightly)—. I cannot name it if it is indigenous in England. Supposing it introduced the utricles are those of *C. angustata* Boott, a common N. American plant." At an earlier date J. G. Baker had written on the sheet "*panicea*, var. ?," a species which Dalton's plant somewhat resembles. Clarke commented later: "No! Utricle glandular to the base."

I cannot agree that it is *C. angustata*, and I have been unable to match it with any *Carex* or with any description in Kükenthal's monograph of the genus in Engler's 'Pflanzenreich.'

Mr. A. J. Wilmott kindly made a search at the British Museum (Natural History), and discovered a sheet of Dalton's gathering which had apparently been sent to Sowerby. It is labelled, in what appears to be Sowerby's hand, "Copgrove, near Knaresboro, Yorkshire. Revd. J. Dalton." On another label is the printed statement: "Sowerby's Herbarium—Feb. 1859." This strengthens, indeed confirms, the earlier impression I gained from the perusal of Dalton's letter that the plant grew in Yorkshire. These specimens, two good flowering culms, had been mounted a long while ago on a sheet with some of *C. flacca* Schreb., a plant to which the other bears a superficial resemblance.

A third part of Dalton's discovery went to the Hooker Herbarium (now at Kew). It is a more immature specimen than the others. Written on the sheet apparently in Sir W. J. Hooker's hand are the words "Yorkshire. Rev. J. Dalton." Clarke has an opinion on this also: "This one (Dalton's) has the style 2-fid, the young utricles covered with glands and belongs to the caespitose group. But I am afraid to guess the species. *Carex* — C. B. Clarke, 7 May 1901."

Although Dalton told Goodenough that a specimen of his plant had been passed on to Sir J. E. Smith, there is no sheet now in Smith's Herbarium.

I consider that the nearest relative of Dalton's plant is *C. juncella* (Fries) Fries, but that they are specifically distinct from each other. Like this species it differs from *C. Goodenowii*

Gay in having more slender and more distantly placed spikes, the lower with longer peduncles, and a few leafless sheaths at the base of the culm. It differs from both species in the following characters: terminal male spike more dense-flowered with more broadly obtuse obovate glumes, which are bright yellow-brown in colour; female spikes with pale golden brown oblong-elliptical glumes, about equal in length and breadth to the utricles, utricles elliptical, densely puncticulate throughout, very finely 4-nerved on the back and indistinctly 3-nerved on the face, tapering to the base, obconically stipitate, and with a rather longer beak.

A full description follows:—

Carex eboracensis mihi. *Rhizoma* caespitosum. *Culmi* 20–30 cm. alti, erecti, graciles, angulis apicem versus scabriusculis exceptis laeves, basi vaginis aphyllis castaneis paucis obtecti. *Folia* inflorescentia breviora, 1.5–2 mm. lata, planiuscula sed saepe marginibus revoluta, subrigida, sublaevia. *Spicae* 3–4, plerumque 4, subdistantes, superiores 1–2 (raro 3) masculae, lanceolato-cylindricae, densiflorae, 2–3 cm. longae; ceterae (2–3) suprema interdum androgynae excepta femineae, 1.5–3.5 cm. longae, superiores 1–2 sessiles vel subsessiles, inferiores 1–2 pedunculatae (pedunculis usque 2.3 cm. longis) erectae vel subpatentes graciles, anguste cylindricae, subdensiflorae sed inferiores basi laxiores. *Bractae inferiores* foliaceae, inflorescentia breviores, superiores brevissimae basi squamiformes. *Squamae* marginibus haud hyalinae, carinatae, carina pallida haud percursae; masculae obtusissimae, obovatae, flavo-brunneae; femineae oblongo-ellipticae, obtusae, aureo-brunneae. *Utriculi* squamis aequilongi aequilati vel squamis leviter longiores latiores, elliptici, suberecti, dense puncticulati, 2.5–3 mm. longi, circiter 1.5 mm. lati, nervis 1–4 dorso tenuissimis ventre obsoletis percursi, pallide virides, basi obconico-stipitati, in rostrum breve ore integrum vel bidentulum cum cetero utriculo concolor abrupte contracti. *Nux* sublaxe inclusa, obovato-elliptica, longirostrata. *Stigmata* 2.

As the best material of this species is on the sheet at the British Museum, I make it the type.

ON THE IDENTITY OF *SYRINGODIUM* Kütz.

BY J. E. DANDY AND GEOFFREY TANDY.

ROUTINE work in the algal herbarium of the British Museum (Natural History) called attention to a sheet bearing two examples of no. 426 in Hohenacker's 'Meeralgen'. The full title of this set is 'Algæ marinæ siccatae. Eine Sammlung europäischer und ausländischer Meeralgen in getrockneten Exemplaren,'

and no. 426 was in the 'Neunte Lieferung', which was published in 1860 "mit einem kurzen Texte versehen von Professor Dr. Kützing."

The label of no. 426 is valid publication of the generic name *Syringodium* and of the specific name *S. filiforme* as there is a *descriptio generico-specifica* in accordance with Art. 43 of the International Rules. Here is a transcription of the original label:

"*Syringodium filiforme* Kg. n. g. et sp.

"*Phycoma filiforme* teres simplex e stratis tribus compositum corticali e cellularum minutissimarum strato unico, intermedio parenchymatico continuo, medullari parenchymatico cavernoso; cavernis maximis; spermatidis sparsis.—Kg.

"Nisky, St. Thomas, Westindien.

"Hohenack. Meeralgen. No. 426."

De Toni (Syll. Alg. iv. 1870 (1905)) overlooked this publication and for *S. filiforme* cited: "Kuetz. Osterprogr. (1863) n. 42, Tab. Phyc. XIX, p. 36, t. 100." He did, however, put *Syringodium* among his *genera exclusa* and observed: "An, prout sec. structuram in icone Kuetzingiana exhibitam dijudicare licet, pars *Phanogamæ* cujusdam marinæ?"

As one of us had seen vast quantities of similar material cast up on the Florida beaches, it was not difficult to recognize Hohenacker 426 as broken leaves of *Cymodocea manatorum* Aschers., a sea-grass of the family Zannichelliaceae. Examination of transverse sections confirms the identification.

Kützing's specific name *S. filiforme* has priority over *C. manatorum*, which was not published until 1868, but we consider it unnecessary to transfer the epithet *filiforme* to *Cymodocea* König as, in our opinion, *C. manatorum* (together with the Old World *C. isoetifolia* Aschers.) represents a distinct genus for which *Syringodium* stands as the valid generic name. In an account of the genus *Cymodocea* published in Linnaea, xxxv. 160–163 (1867), Ascherson founded a section *Phycoschoenus* based on *C. isoetifolia* and distinguished by the many-flowered cymose inflorescences (spiciform drepania) and the terete leaves, the flowers in *Cymodocea* proper being solitary and the leaves flat. A year later he described *C. manatorum* and correctly placed it as a second species of Sect. *Phycoschoenus*. When he again monographed *Cymodocea* in Engler, Pflanzenr. iv. 11, 146–151 (1907), Ascherson maintained *Phycoschoenus* for the same two species but raised the group to the rank of subgenus. We believe that the characters of this group are distinctive enough to justify its separation as an independent genus. The multiflorous inflorescences are a feature unknown elsewhere in the Zannichelliaceae, and the leaves are so distinct in form that Ascherson (*loc. cit.*) remarked under *C. isoetifolia*: "Inter plantas siphonogamas marinas cum

sequente [*C. manatorum*] foliis apice teretibus junciformibus insignis."

In geographical distribution the genus *Syringodium* is strikingly similar to two other ditypic genera of sea-grasses: *Diplanthera* Thou., which is closely allied, and *Thalassia* Banks ex König, which belongs to the Hydrocharitaceae. Each of these three genera has one species in the Caribbean Sea and one in the Indian and western Pacific Oceans (cf. Ostenfeld in Pflanzenareale, i. Karten 22, 34, 35 (1927)).

The nomenclature of *Syringodium* and its two species is as follows:—

SYRINGODIUM Kütz. in Hohenack. Alg. Marin. Sicc. ix. n. 426 (1860). Typus *S. filiforme* Kütz.

Cymodocea sect. *Phycoschoenus* Aschers. in Linnaea, xxxv. 162 (1867). Typus *C. isoetifolia* Aschers.

Cymodocea subgen. *Phycoschoenus* (Aschers.) Aschers. in Engler, Pflanzenr. iv. 11, 149 (1907).

1. SYRINGODIUM FILIFORME Kütz. loc. cit. (1860).

Cymodocea manatorum Aschers. in Sitz.-Ber. Ges. Naturf. Freund. Berl. 1868, 19 (1868).

2. SYRINGODIUM ISOETIFOLIUM (Aschers.) Dandy, comb. nov.

Cymodocea isoetifolia Aschers. op. cit. 1867, 3 (1867).

A NEW GENUS OF THE CRUCIFERAE FROM ARABIA.

By W. B. TURRILL, D.Sc., F.L.S.

SHORTLY before his death the late Mr. A. R. Horwood was engaged on the determination of specimens collected in Koweit (Kuwait) and other areas of north-eastern and central Arabia by Mrs. H. V. Dickson. In the collection were specimens of a crucifer which Horwood was unable to match and which he tentatively suggested represented a new species and new genus. No description and written notes on this material have been found amongst his papers and a full re-investigation was necessary. This has confirmed the suggestion that the material represents an undescribed species and genus. In order to commemorate Horwood's connection with the original investigation and material (more has been received since) the genus has been named after him, while Mrs. Dickson's valuable contributions to our knowledge of a part of the Arabian Peninsula little-known botanically are acknowledged by the specific trivial. The possible relationships of the new genus are discussed at some length after the descriptions.

HORWOODIA, gen. nov.

Herba annua, leviter hirsuta. *Folia* grosse dentata vel lobata, haud amplexicaulia. *Racemi* multiflori, ebracteati. *Flores* mediocres, purpurei. *Sepala* erecta, basi inaequalia. *Stamina* libera, edentula. *Siliqua* pendula, indehiscens, inarticulata, 4-alata, alis valde inaequalibus, abortu unilocularis, monosperma. *Semen* pendulum, subelongatum, immarginatum; cotyledones concavae vel fere conduplicatae, margine plus minusve inflexae.

Horwoodia Dicksoniae, sp. nov.

Radix fere simplex, 1 dm. longa, annua. *Caules* simplices vel ramosi, interdum a basi, primum prostrati vel subprostrati deinde ascendentes vel erecti, 1.1–3.8 dm. longi, teretes, inferne glabrescentes, superne hirsuti vel interdum fere albo-tomentosi. *Cotyledones* (in planta florifera) subpersistentes, epigeae, latissime obcordatae, apice valde lateque emarginatae, basi in petiolum 2.5–3 cm. longum sensim angustatae, 1.5 cm. longae (petiolo excluso), 1.1 cm. latae. *Folia* oblonga vel anguste oblonga, apice obtusa vel rotundata, basi in petiolum 0.6–4 cm. longum angustata, usque ad 4.5 cm. longa et 2.5 cm. lata sed saepe minora praecipue angustiora, grosse dentata vel lobata, suprema hirsuta vel fere albo-tomentosa, inferiora glabrescentia, costa nervisque vix conspicuis. *Inflorescentia* multiflora (usque ad 50-flora), 1.5–8 cm. longa, hirsuta vel albo-tomentosa, ebracteata, ebracteolata; pedicelli 1–5 mm. longi, plus minusve hirsuti vel albo-tomentosi. *Flores* patuli, saepe fere horizontaliter. *Sepala* erecta, lineari-lanceolata, acuta, 8 mm. longa, 1.5 mm. lata, lateralibus basi saccata. *Petala* spathulata, 1.5 cm. longa, lamina elliptica apice rotundata 5.5 mm. longa 4 mm. lata purpurea. *Stamina* longiora 9.25 mm. longa; breviora 8.5 mm. longa; filamenta anguste membranaceo-alata, edentula; antherae valde apiculatae, post dehiscendum 3 mm. longae. *Nectarium* lateralibus annuliformia vel hippocrepidiformia, abaxialiter vel adaxialiter continua, extremis adaxialibus interdum leviter furcatis; mediana nulla. *Gynaecium* 4.5 mm. longum; ovarium quadrangulare, pilis longis adpressis obtectum, ovulis 2 instructum; stylus circiter 1 mm. longus, leviter compressus; stigma compresso-capitatum, inconspicue 4-lobatum, breviter papillosum. *Infructescentia* valde elongata, usque ad 2 dm. longa; pedicelli primum patuli deinde abrupte recurvi, 5–6 mm. longi. *Siliculae* fere orbiculares, apice truncatae, basi alte cordatae, 1.7 cm. longae, 1.6 cm. latae, alis latioribus valde reticulatim venosis, uniloculares, monospermae, glabrescentes, ima basi leviter hirsutae; stylus (cum stigmate) persistens, vix vel leviter elongatus. *Semen* pendulum, prope apicem fixum, elongato-elliptico-subquadrangulare, 5 mm. longum, 1.25 diametro, pallide brunneum; cotyledones concavae vel leviter conduplicatae.

Arabia : Kuwait, near Abraj al Khaliya (100 miles south of Kuwait), growing in sandy ground in Arafaj growing district, 15 m., 10.1.35, a mauve-flowered plant about 15 cm. high, only just in flower and would doubtless become much taller, eaten by camels, *Mrs. H. V. Dickson* 155 ; Kuwait, Subahayeh wells, growing in close vicinity to the wells amongst many other flowers, also seen at Arak wells, sea-level, 8.2.35, a bright purple flower, the heads only just appearing above the grass etc. as its stems creep until about to flower, eaten by camels, sheep, etc., *Mrs. H. V. Dickson* 162 (typus) ; grown from seed collected in the Dahana, Central Arabia, Red Sands, in Oct. 1937, 300 m., 11.1.38, a single-stemmed plant with a head of many mauve flowers with a darker centre and lemon stamens, has quite a sweet smell, *Mrs. H. V. Dickson* 402.

Subahayeh (Subeihyah) wells are 32 miles south of Kuwait (Koweit) and 20 miles from the coast. Dahana is the desert country forming the hinterland to the west and south-west of Kuwait. Reference : Handbook of Arabia 1, Admiralty, London, no date. The specimens enumerated are now in the Herbarium at Kew.

DISCUSSION.

The family Cruciferae is frequently described as a very "natural" family, in the sense that plants placed in it show a remarkable uniformity in the fundamental structure of flowers, fruits, and seeds, and also in certain anatomical characters. It is also generally recognized that it is difficult to make a satisfactory classification within the family, especially at the tribal and generic levels. It is a fact that published classifications differ from one another very greatly and that most have glaring defects from either the practical or theoretical standpoints or from both. The earlier classifications are conveniently and adequately summarized by Hayek (1), who proposes a new system which purports to be based on phylogeny. Hayek's system has been criticized by Thellung (2), Calestani (3), Manton (6), and O. E. Schulz (4) and it is certainly inferior as a tool for determination of genera to the earlier system of Bentham

EXPLANATION OF FIG. 1.

1. Young flowering plant, showing persistent cotyledons (1 a), $\times 1$.
2. Front view of flower (a) and longitudinal section of flower (b), both $\times 4$.
3. Floral diagram of adult flower.
4. Long stamen (a) and short stamen (b), both $\times 8$.
- 5 & 6. Nectaries, both $\times 20$.
7. Another type of nectary, showing also the orientation of the surrounding parts : position of attachment of short stamen (a), bases of filaments of long stamens (b, b), bases of petals (c, c), parts of bases of median sepals (d, d), attachment of saccate lateral sepal (e), $\times 20$.
8. Gynoecium : dorsal ventral view (a), lateral view (b), transverse section (c), the last orientated as in (a), all $\times 8$.

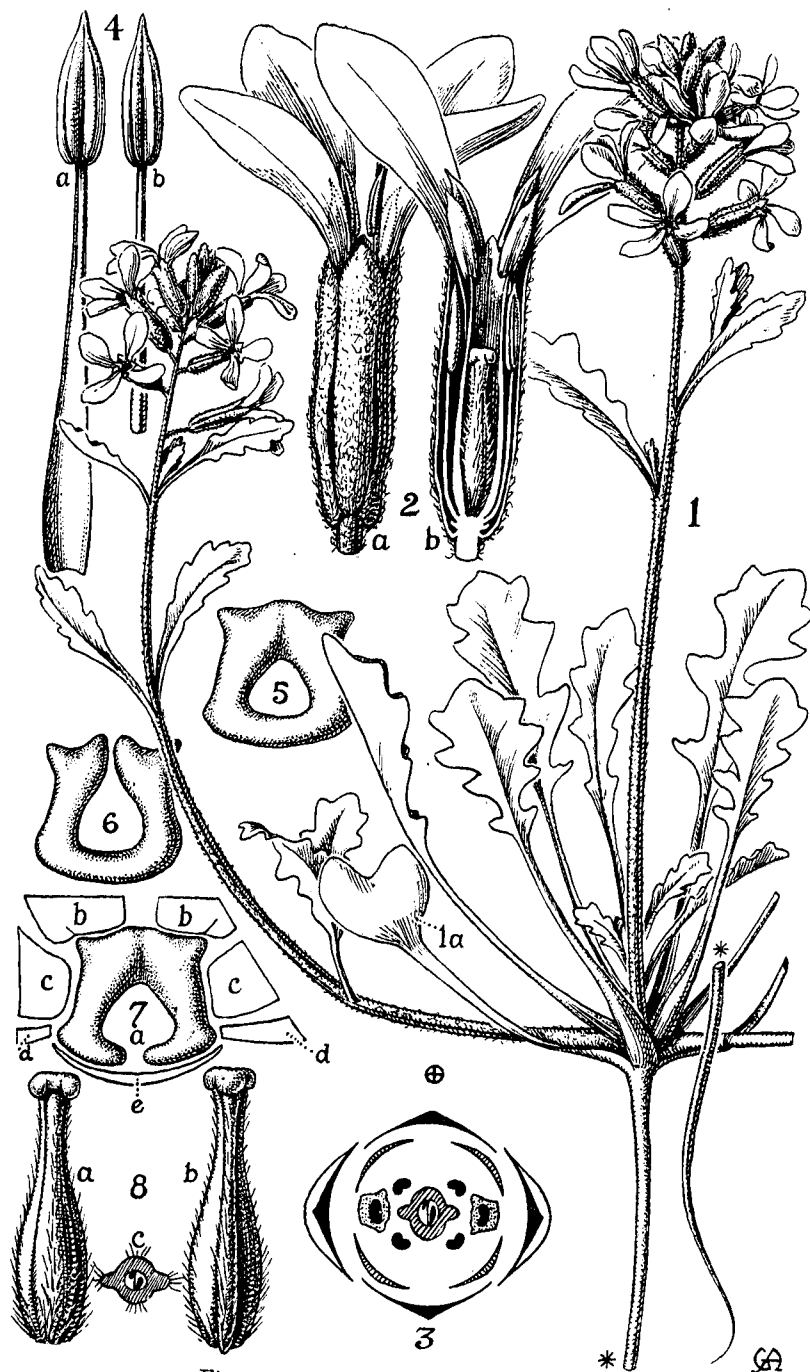


Fig. 1.—*Horwoodia Dicksoniae*, sp. nov.

and Hooker (5) or the later one of O. E. Schulz. This is partly due to its incompleteness (*e. g.*, the absence of an artificial key, the lack of an index, and the failure to number the genera in the "Uebersicht"), partly to printing errors (*e. g.*, the genera from "102" *Lepidotrichum* to "231" *Coelonema* are all wrongly numbered), but mainly to inherent faults in the system due to an exaggerated value being placed on anatomical characters (the distribution of the myrosin-cells) and the structure of the nectaries. The "phylogeny" involved is really meagre and consists of little more than (a) a discussion on the resemblances between the Capparidaceae and the Cruciferae with the conclusion that the Thelypodieae (Cruciferae) have been evolved from *Cleome* (Capparidaceae) and (b) statements that from the Thelypodieae have arisen the Sisymbriinae and other tribes and from derivatives of the Sisymbriinae and Arabidinae the majority of the Cruciferae by reduction particularly of the nectaries. Hayek's diagram (I, p. 323) does not seem to be complete and does not entirely agree with his text or his "Uebersicht." It is very different from the schematic representation of the connections between the tribes given by the much less speculative O. E. Schulz (4, p. 266).

Calestani (3) considers the main characters which can be used in classification especially the anatomical characters. He strongly, and reasonably, criticizes the derivation of the Cruciferae from the Capparidaceae, though whether his derivation of both these families along independent lines from the Papaveraceae is better founded will not be discussed here. His phylogenetic scheme is somewhat complicated and very different from Hayek's.

O. E. Schulz (4) has provided a valuable guide, profusely illustrated, and with numerous keys to the genera of Cruciferae. The classification is based upon a consideration of a wide range of morphological and anatomical characters and, as far as possible, upon their correlation. Phylogenetic assumptions are not given prominence.

The above references to recent literature have been necessitated by the difficulty of tracing the "affinities" of *Horwoodia*. It is quite obvious from attempts to use any one of the systems

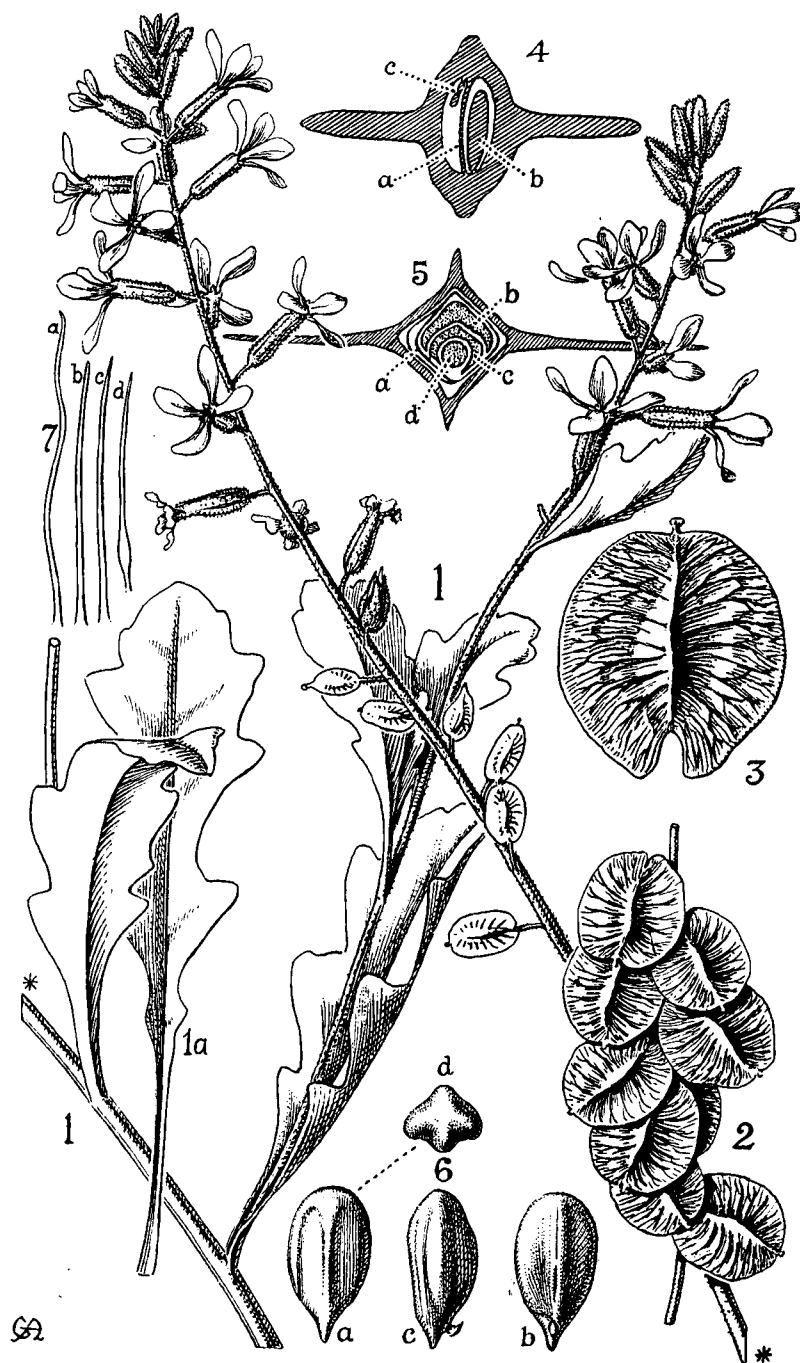


Fig. 2.—*Horwoodia Dicksoniae*, sp. nov.

EXPLANATION OF FIG. 2.

1. Flowering and young fruiting spray from older plant, with basal leaf (1 a), $\times 1$.
2. Fruiting spray, $\times 1$.
3. Fruit, $\times 2$.
4. Transverse section of young (immature) fruit: septum (a), fertile ovule (b), abortive ovule (c), all $\times 16$.
5. Transverse section of mature fruit: septum (a), cotyledons (b, c), radicle (d), $\times 4$.
6. Seed: ventral view (a), dorsal view (b), lateral view (c), from above (d), all $\times 4$.
7. Hairs: from stem (a), from leaf (b), from sepal (c), from ovary (d), all about $\times 50$.

mentioned that the tribes and genera of Cruciferae show in a marked degree similar characters in different combinations. If the principal emphasis be laid on any one character (*e. g.*, indumentum type, nectary form, fruit structure, relative orientation of embryo parts, distribution of myrosin cells) or on any selected group of characters different classifications result and there seems no test as to which gives the best result other than the pragmatic one of use in determination. O. E. Schulz uses a great variety of characters and his practice of emphasizing different characters at different places in the classification has probably given the best results possible within the limits of existing knowledge and present taxonomic convention. Certainly in attempting to place *Horwoodia* relative to other genera the greatest help has been obtained from Bentham and Hooker's 'Genera Plantarum' and from O. E. Schulz's work in the 'Pflanzenfamilien' (ed. 2).

Horwoodia shows an interesting and peculiar combination of those characters emphasized as important by previous workers on the Cruciferae. In Bentham and Hooker's classification it "runs down" fairly easily to the Isatideae and to the genus *Isatis*, which includes a number of genera, such as *Sameraria*, now usually kept distinct. In Hayek's system it is strictly unplaceable, but, except for the stigma characters, might be relegated to the Tribus Lepidieae, Subtribus Thlaspidinae. From O. E. Schulz's key it must certainly be placed in the Lepidieae (a tribe which in important respects is modified from Hayek's concept of it). It is, however, not possible to place it strictly in any of O. E. Schulz's twelve subtribes of the Lepidieae. If the cotyledons were narrow *Horwoodia* could be placed in the Isatidinae, but in the seed they are relatively broad and in the "seedling" decidedly broad.

In considering the "affinities" of *Horwoodia*, attention must be called especially to the following characters:—

Leaves: These are coarsely toothed, or lobed, and stalked.

Indumentum: No branched hairs have been observed in any part of the plant. The indumentum varies in amount in different parts of the plant, at different stages of development of the organs, and from specimen to specimen. The hairs, where present, are rather long, fairly slender, simple, and, from reflection of light, white and somewhat shining.

Petals: These are purple or purplish mauve.

Sepals: The calyx fits closely round the rest of the flower owing to the sepals being erect. The two lateral sepals are slightly but distinctly saccate at the base. This is correlated with the arrangement of the nectaries.

Stamens: These do not long project beyond the petals nor are the filaments sunken deeply in the receptacle. The anthers are distinctly apiculate.

Stigma: The stigmatic tissue is slightly 4-lobed, the lateral lobes being decidedly more strongly developed than the median.

Nectaries: Median nectaries are absent. The lateral nectaries are ring-shaped or sometimes approximately horseshoe-shaped—that is, the arms are united adaxially or abaxially or both. When free "the arms are sometimes shallowly bifurcate."

Ovary: Two ovules are present, one, at anthesis, larger than the other. There is no marked gynophore.

Fruit: The mature silicule is scarcely flattened, but a laterally flattened appearance is given by the outgrowth of two strongly-veined lateral wings. The median (placental) ridges are much less prominently winged—indeed, they could be described as more or less crested keels. The silicule is essentially one-locular (by the second loculus having no seed and the septum being pressed against one "valve") and has only one seed.

Seed: The seed, from the shape of the cavity in which it has developed, is rather elongated and quadrangular and has no marginal wing. The cotyledons are unequal, concave, or with a broad angular fold, the one against which the radicle lies having infolded margins. There is a slight trace of what is probably endosperm around a part of the radicle.

Anatomy: Attention is called to Schweidler's interesting paper (8) and to the earlier references given there. Hayek (I, p. 166) points out that myrosin is soluble in water, but that by plunging dried material into boiling water the contents of the "myrosin-cells" are coagulated and not dissolved. Sections of leaves may then be treated with absolute alcohol followed by Millon's Reagent. The contents of the myrosin-cells are thus stained and it is possible to distinguish them from the ordinary mesophyll-cells or bundle elements. Using this method with leaves of *Horwoodia* it was found that myrosin-cells are scattered in the general mesophyll and that, in any transverse section, two or three can often, but not always, be seen in association with the leptome (phloem) of the bundles (veins).

The particular combination of characters indicated above has not, so far as a careful study of herbarium material and of literature has revealed, been found in any described cruciferous genus. Reference must, however, be made to a number of genera which show certain resemblances to *Horwoodia*. In leaves and habit our specimens strongly recall *Savignya parviflora* (Del.) Webb (*S. aegyptiaca* DC.). The flowers and fruits, however, are very different. According to Hayek's diagrams the genera *Porphyrocodon*, *Syrenopsis*, *Lyrocarpa*, and *Palmstruckia* have somewhat similar nectaries to those sometimes found in *Horwoodia*. These genera are placed in four different tribes by Hayek, though they are all characterized, according to him, by absence of median nectaries and by the lateral nectaries closed abaxially. In addition *Mancoa*, *Agallis*, *Lunaria*, and other

genera scattered in various tribes are shown with more or less annular lateral nectaries. Hayek's general scheme for the morphogenesis of nectaries seems to be that the primitive type was a more or less continuous ring around the whole androecium and that in the course of evolution this ring split up in various ways. If this be a true summary there must have been a considerable amount of "parallelism," since there must have been a great deal of development independently in other organs, especially of the flower and fruit, than the nectaries. It follows that while organogenetic classifications in the Cruciferae are theoretically possible (though probably not in a linear sequence) phylogenetic ones, strictly so-called, are impossible, though certain phylogenetic probabilities may be used as a "background" for parts of a classification based essentially on general coherence of characters, especially in suggesting useful and reasonable starting-points.

There are a considerable number of cruciferous genera with the fruits unilocular and one-seeded, presumably by reduction and abortion. These, in all the classifications mentioned, are more or less scattered in a number of tribes. A few call for special mention. *Boreava* and *Tetrapterygium* are figured by Jaubert and Spach (Ill. Pl. Or. 1, t. 2 and t. 50: 1842-3). The former has spreading sepals, and, according to O. E. Schulz, median circular nectaries with which the lateral nectaries are continuous. The latter is united to *Sameraria* by O. E. Schulz, a genus which is considered below. The Isatidinae are placed in the Lepidiinae by O. E. Schulz, an arrangement so far akin to that of Bentham and Hooker. Hayek, however, places them in the Arabideae, apparently solely on the characters of the nectaries—a very artificial arrangement which appears to be neither logically nor phylogenetically "natural," since other characters of at least equal importance are ignored. The somewhat meagre cytological evidence suggests it may not be phylogenetic to place *Isatis* at least in either the Arabideae or the Lepidiinae (6, 7). As already remarked, *Isatis* in the sense of Bentham and Hooker is modified by later writers especially by the separation of *Sameraria* as a distinct genus. In the sum of its characters this genus comes nearer to *Horwoodia* than any other traced by me. *Horwoodia* differs from it especially in the longer erect sepals, the lateral saccate, in the broader cotyledons, and in the absence of median nectaries. Exactly what value should be attached to these characters it is difficult to say. Schweidler's paper (9) and the references given there may be consulted for the diverse views expressed on the taxonomic and phylogenetic value of the nectaries in the Cruciferae. It may well be that phylogenetically *Horwoodia* is a very specialized derivative of some other tribe or subtribe than those in which

Sameraria has been placed, but further speculation would, in the absence of more evidence, serve no useful purpose.

One other matter, at the species level, must be referred to briefly. In the progress of research on the material of *Horwoodia* at present available, it was found that a certain amount of variation was shown by all the organs. At one time it was thought that there might be two varieties or even two species represented: one with larger flowers, longer anthers, horse-shoe-shaped nectaries, and longer styles; the other with smaller flowers, shorter anthers, ring-shaped nectaries, and shorter styles. Further examination showed that these characters fluctuated, sometimes even on the same plant and independently. This is particularly well seen in the nectaries. In all flowers of the many dissected no median nectaries were seen, but the lateral ones show a wide range of structure, as mentioned above and illustrated in the figures. The sepals are often more or less loosely joined at part of their contiguous margins. The lateral sepals are saccate and, at anthesis, project below the median sepals. As shown in the floral diagram, their edges, sometimes, overlap on the outside those of the median sepals. The ontogeny of the calyx has not been studied and the ontogenetical correctness of the floral diagram must not be assumed; it represents a common condition at full anthesis only.

I wish to express my best thanks to Mr. G. A. Atkinson for the great trouble he has taken in preparing the drawings which accompany this paper.

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SHORT NOTES.

SEDUM ROSEA.—The Rose-root was given the name *Rhodiola Rosea* by Linnaeus in 1753 (Sp. Pl. 1035), the epithet *Rosea* being the former generic name *Rosea* Riv., which Linnaeus had rejected in favour of *Rhodiola* (Crit. Bot. 41: 1737; Fl. Lapp. 304, n. 378: 1737). Hence the correct name under *Sedum* is *Sedum Rosea*, not *S. roseum* as hitherto written. Scopoli (Fl. Carniol. ed. 2, i. 326: 1772) transferred the species from *Rhodiola* to *Sedum* as *Sedum Roseum*, being apparently under the impression that *Rosea* was an adjective agreeing with *Rhodiola*. The corrected name may, however, be cited as *Sedum Rosea* (L.) Scop., since the gender of a specific epithet may be corrected without changing the authority for the binary combination concerned.

The origin of the pre-Linnaean generic name *Rosea* was as follows. During the first half of the sixteenth century the Rose-root was identified by students of materia medica with 'Ροδία ρίζα (*Rhodia rhiza*) of Dioscorides (Mat. Med. iv. cap. 45), which, according to Dioscorides, grew in Macedonia. The Greek name *Rhodia rhiza* was gradually latinized, first as *Rhodia radix* and then as *Rosea radix*, and was finally abbreviated to *Rosea* in the drug shops. Fuchs (Hist. 664: 1542) called the Rose-root 'Ροδία ρίζα and *Rhodia radix*, and stated that its German name was Rosenwurtz. Bock (Stirp. 913: 1552) used the same names. Valerius Cordus (Annot. Diosc. 64 v.: 1561), who independently identified it with *Rhodia rhiza* Diosc., stated that he had bought a root under the name *Rosaria* from a herbalist in the market-place. The first occurrence of the name *Rosea radix* seems to be in Lonitzer (Kreuterbuch, fol. cxliA: 1557). As a generic-specific name, *Rosea* dates from Ruppius (Fl. Jen. 80: 1718), who attributed it to Rivinus (Bachmann) and the drug-shops. As a generic name it occurs in Kramer, Tent. Bot. 19 (1744).

The synonymy of the Rose-root is as follows:—

SEDUM ROSEA (L.) Scop. Fl. Carniol. ed. 2, i. 326 (1772), as "*Sedum Roseum*"; corr. Sprague in Journ. Linn. Soc. Lond., Bot. lii. 50, n. 181 (1939).

Rhodiola Rosea L. Sp. Pl. 1035 (1753).

Rhodia officinarum Crantz, Inst. 191 (1766).

Rhodiola minor Mill. Gard. Dict. ed. 8, n. 2 (1768).

Rhodiola odorata Lam. Fl. Franç. iii. 647 (1778).

Sedum Rhodiola DC. Pl. Grasses, tt. 143, 143*; Lam. et DC. Fl. Franç. iv. 386 (1805).

T. A. SPRAGUE.

REVIEWS.

Moss Flora of North America North of Mexico. By A. J. GROUT, Ph.D. Vol. i. part 3. Published by the Author: Newfane, Vermont. Oct. 1938.

THIS part includes Encalyptaceae, Buxbaumiaceae, and part of Pottiaceae. Encalyptaceae by Seville Flowers, Ph.D., *Tortella* by Mrs. Inez M. Haring, *Didymodon* and *Barbula* by W. C. Steere, Ph.D.

The Encalyptaceae section contains very useful notes on some of the critical species; all the N. American species are also European. *Buxbaumia* includes a new species, which has hitherto been confused with *B. indusiata*, and is more frequent than that species. The large genus *Trichostomum* is represented by three species only, and of these one has been collected only once, in Alaska, and a second, a new species, only once, in Wisconsin.

In *Tortella*, *T. inclinatula* (C. M. & Kindb.) is maintained as a species, and is carefully compared with *T. caespitosa*, but surely is nearer to and probably identical with the European *T. inclinata*. *Barbula* and *Didymodon* are carefully elaborated by Dr. Steere.

The illustrations as usual are good, and in this part many of them are original.

H. N. D.

Vergleichende Morphologie der höheren Pflanzen. Von Dr. WILHELM TROLL. Erster Band. Vegetationsorgane Zweiter Teil: 1. Lieferung. Mit 168 Abbildungen. Berlin: Verlag von Gebrüder Borntraeger, 1938.

THE second part of Professor Troll's monumental Comparative Morphology deals with that of the leaves and will, when complete, consist of four issues, of which the first has just appeared. In the introduction to it the author discusses the views which have been put forward to explain the evolution of leaf-bearing plants from more primitive leafless forms, such as some of the Devonian Psilophytales. He does not agree with the division of the Pteridophyta into microphyllous and macrophyllous forms, the former having developed their leaves by enation and the latter by cladodification, i. e., by the transformation of a shoot system into leaves. Against the enation theory he brings forward the discovery by W. H. Lang and Miss Cookson of plants of Silurian age which had already comparatively well-developed foliage leaves, which those authors conclude give no support to the derivation of simple leaves from emergencies. He is equally sceptical of the development of leaves in the macrophyllous forms from modified branches, and believes that leaves are primary organs of vascular plants like roots and shoots, and, like the latter, capable of endless variations in form and adaptations in function.

The author then proceeds to deal with the development and the growth of leaves in both Pteridophyta and Angiosperms, paying attention both to apical and intercalary growth. A very full account of the venation of leaves is given, accompanied by anatomical details both of the leaf-stalk and the lamina.

Chapter IV. deals with the arrangement of the foliage leaves in the bud. The author uses the term "vernation" to describe the folding in the bud of a single leaf, and the term "aestivation" for the arrangement of the group of leaves found in the bud, and which are the constituent members of the subsequent shoot. The last part of the present issue deals with the formation of adventitious buds, both as a normal development of certain leaves and also during regeneration from cut or wounded leaves.

Like the earlier portions of this Comparative Morphology the present issue is characterized by a very clear, as well as a very complete, treatment of the subject-matter, by a thorough critical discussion of various problems involved, and by a wealth of figures, many of which are original. The book is obviously indispensable to all students and teachers of plant morphology.

F. E. WEISS.

BOOK-NOTES, NEWS, ETC.

THE Annual General Meeting of the Botanical Society and Exchange Club of the British Isles was held in the Linnean Society's rooms, Burlington House, on Wednesday, March 15th. At the conclusion of business, Mr. P. M. Hall read a paper entitled "The British Species of *Utricularia*." After giving a brief survey of the arrangements followed by British authors in recent years, which are based on the account by G. C. Druce after Hugo Glück in the B. E. C. 1910 Rep. 511 (1911), Mr. Hall proceeded to give in detail his reasons for limiting the number of species at present known in Britain to four—viz., *U. vulgaris* L., *U. neglecta* Lehm., *U. intermedia* Hayne, and *U. minor* L.—in place of the six species given in the second edition of the British Plant List and in the eleventh edition of the London Catalogue.

Mr. Hall adopts the epithet *neglecta* Lehmann in place of *major* Schmidel, and gave convincing reasons in support of his view that all the plants named by British authors as *U. ochroleuca* are, in fact, *U. intermedia* Hayne. Neither does he admit *U. Bremii* Heer from Britain on present evidence, and regards the specimen from the Gap of Dunloe, which was exhibited, as merely *minor* L.

The lecture was illustrated by numerous specimens from Mr. Hall's collection and from the Druce Herbarium, Department of Botany, University of Oxford, and by maps showing the British distribution as at present known.

STUDIES IN THE FUCALES OF NEW ZEALAND.

I. THE GENUS *CARPOPHYLLUM* GREV.

BY E. MARION DELF, D.Sc. (MRS. PERCY SMITH).

CERTAIN genera of the Fucales grouped together by de Toni as the Sargassaceae form a natural alliance broadly characterised by the possession of (1) special assimilating organs resembling foliage leaves; (2) receptacles as special short shoots (usually axillary in position); and (3) oogonia, each of which gives rise to only one oosphere.

Of the sixteen genera included in the family, all excepting *Halidrys* are found in the southern hemisphere, some with a sharply limited distribution, such as *Marginariella* (New Zealand) and others like *Carpophyllum* and *Sargassum*, more widely spread but represented in the south by species confined to New Zealand or to New Zealand and Australasia. Within this alliance, the genera *Sargassum* and *Carpophyllum* are certainly closely related. The principal distinction between them appears to be the habit of growth. The former produces a very short axis with very long laterals, the latter a main axis exceeding the laterals in length and clearly dominating them. This difference is probably more fundamental than would appear at first sight, for Setchell (1933) found sporelings of *S. hemiphyllum* (Turn.) Ag. with a short main axis (often not more than a quarter of an inch high), which had an aborted apical portion, below which two or more axes of indefinite growth were already given off.

In *Carpophyllum* (as in many species of *Sargassum*) the minute receptacles are formed in axillary clusters, which may be dense and globular or lax with a short axis or axes (fig. 1), but the leafy appendages, often seen amongst the receptacles of *Sargassum*, are not to be found in *Carpophyllum*.

On December 4, 1936, I received material of four species of *Carpophyllum* through the kindness of Mr. V. W. Lindauer of the Russell School, Bay of Islands, N.Z., namely *C. plumosum* (A. Rich.) J. Ag., *C. maschalocarpum* (Turn.) Grev., *C. Phyllanthus* (Turn.) Hook. & Harv. (= *C. flexuosum* (Esper) Grev.), and *C. elongatum* (Dickie) A. & E. S. Gepp (= *C. angustifolium* J. Ag.). The plants were preserved in 4 per cent. formalin in sea-water*, and Mr. Lindauer informs me that they were placed in the solution immediately after collecting and were transhipped promptly. On arrival they were at once transferred to diluted sea-water and then washed in running water for several hours to remove traces of formalin. They were then transferred to 30 per cent. alcohol and finally stored in 50 per cent. alcohol.

* Commercial formalin (3 or 4 c.c. to 100 c.c. sea-water) is very convenient for preserving marine algae when good fixation and subsequent washing are impracticable. After a time, however, the tissues are apt to disintegrate, especially those which contain much mucilage.

All the plants had unisexual conceptacles, those of *C. plumosum* and *C. elongatum* were male, but those of the other two species were female, bearing extruded oospheres or attached sporelings.

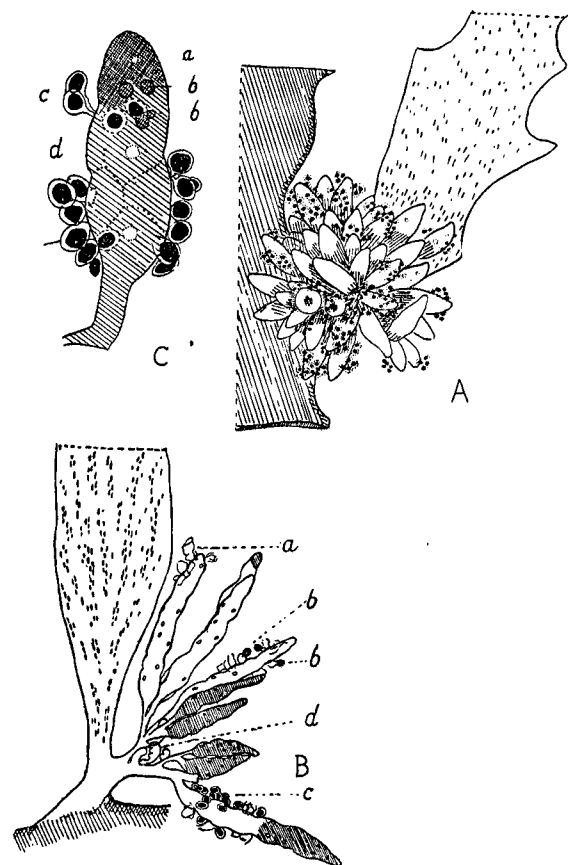


Fig. 1.—A, B, C. Axillary clusters of female receptacles after extrusion of contents of oogonium surrounded by mucilage from the mesochiton and exochiton.

A. *Carpophyllum maschalocarpum*, $\times 10$ (whole cluster). B. *C. Phyllanthus*, $\times 10$ (part of cluster). At (a) empty mesochiton sac; (b) sporeling partly enclosed in mesochiton; (c) contents enclosed in mucilage; (d) rudiments of new receptacles. C. Receptacle of *C. maschalocarpum* after extrusion (contents external to the receptacle shown in black, within cross-hatched as at (d)); ostiole at (a) before extrusion, at (e) enlarged by the forcible extrusion of the contents of the oogonia.

This material, although very valuable for the determination of the main structures, was not so satisfactory for studying the

delicate walls of developing structures or for details of cytoplasm or nucleus. However, in February 1938, some further fixed material was received which Mr. Lindauer had most kindly fixed with Allen's modification of Bouin's solution*. This has been of great value in confirming and extending observations already made on the unfixed material, and may well yield results of interest about nuclear behaviour. The present communication is chiefly concerned with the conceptacles of the two closely related species *C. maschalocarpum* and *C. elongatum*.

The first material of *C. maschalocarpum* to arrive consisted of a single specimen measuring about 80 cm. from tip to base, the latter ending in a slightly branched hapteron which was probably incomplete. The main axis was flattened, bearing alternate lateral branches, crowded above, more distant lower down. In the lower part, the laterals were bare at their base, with leaf-like appendages nearer the tips, but higher up they bore closely set, alternate, leaf-like appendages, in the axils of each of which were dense clusters of minute receptacles borne on very short peduncles; a typical cluster which was dissected under a binocular microscope had 150 receptacles in which oogonia or their extruded contents were visible, and also at least 93 rudiments of receptacles in an unbroken condition. The material had evidently been gathered at about the time of ripening of the oogonia. On close inspection, the receptacles in most of the clusters were seen to be surrounded with glistening drops of jelly each containing a dark body (the oosphere) and each firmly attached to the interior of the receptacle by a stout mucilaginous stalk passing through a neighbouring ostiole (fig. 1 A). Such an arrangement of attached oospheres and their mode of extrusion has already been described in certain species of *Sargassum* (Tahara, 1911-13; Kuneida, 1926; Delf, 1936) as well as in three other genera of the Fucaceae.

For superficial examination, an axillary cluster was first dissected into smaller groups, brought to 70 per cent. alcohol, and then transferred to warm agar or gelatine in a small Petri dish. The receptacles were pushed down to the bottom of the dish so that when cool they could be seen clearly against the glass on inverting the dish. The drawings in fig. 1 B, C, were obtained from such preparations after examination with a binocular dissecting microscope.

The Receptacles.

The individual receptacles varied in length from 0.5 to 2 mm., but nearly all bore oogonia in a fairly advanced condition. Rudiments of future receptacles frequently project from the

* Picric Ac. saturated aqueous solution 75 c.c.; Formalin (commercial) 25 c.c.; Glacial acetic acid 5 c.c.; Urea crystals 2 gm.; Chromic acid crystals 1.5 gm. (Latter, 1926).

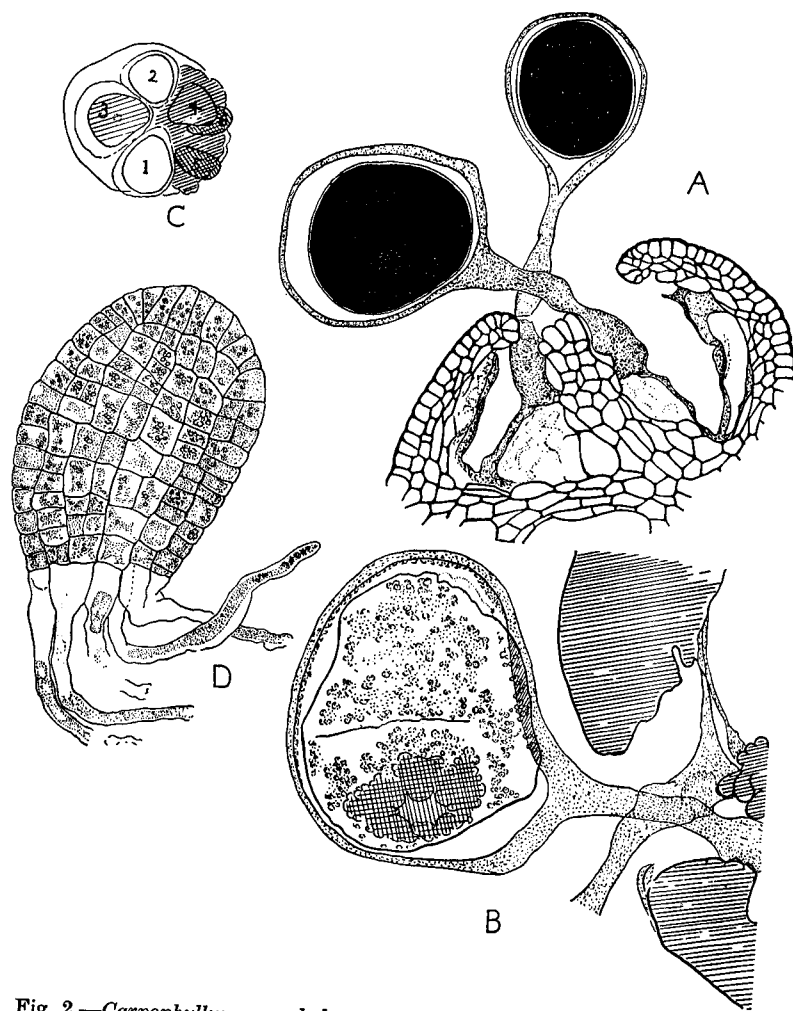


Fig. 2.—*Carpophyllum maschalocarpum*. A, B, X.S. median to conceptacle. In A two oogonia have extruded their contents surrounded by mucilage and attached by hollow stalks to remnants of the exochiton within the conceptacle. In the centre of the conceptacle is a tuft of sterile cells probably concerned with emission. In B from an older receptacle a two-celled sporeling stage is seen, the cell-plate clearly differentiated though incomplete at the periphery. C. Whole conceptacle dissected out and mounted whole with the ostiole downwards to show the successive development of the oogonia.

bases of the short receptacular axes (fig. 1 B, d) so the fertility of one cluster may apparently be considerably prolonged. The lowest conceptacles mature their oogonia first, and their contents are ejected surrounded by mucilage and held in place by a short tenacious mucilaginous stalk passing freely through the ostiole and secured within to the interior of the conceptacle.

A number of receptacles were embedded and examined by means of microtomed sections. For this purpose, receptacles were selected, dropped into 70 per cent. alcohol, and after one to two hours transferred to warm agar (3 per cent.). On setting, this was cut into blocks, dehydrated, and embedded in the usual way, substituting chloroform for xylol to minimise shrinkage. The presence of the agar facilitated handling, protected the projecting oospheres, and did not interfere with staining (C. Madge, 1937). The most useful stains were hæmatoxylin counterstained with erythrosin, or gentian violet fixed with iodine and counterstained with erythrosin. By this means nuclei were clearly differentiated and, in the better fixed material, the delicate walls of the apical regions could also be seen.

In the search for early stages in development of the conceptacles, the apical cell was recognised. In vertical section this is enclosed by two curved walls (fig. 3 A). In cross-section the apical cell is three-sided, resembling that described and figured by Rees (1933) for *Bifurcaria tuberculata*. It is generally accepted that the growth of the Sargassaceae is brought about by means of a three-sided apical cell. This view is founded on the work of Grüber (1896) and Valiante (1883); by the former it was deduced from the study of a number of genera including *Sargassum* and *Carpoglossum*, the latter dealt principally with the genus *Cystoseira*. The genus *Carpophyllum* evidently falls into line, as might be expected. It would be of the greatest interest to know whether this type of apical cell is of secondary origin like that of *Fucus vesiculosus* (Nienburg, 1931). If primary, it must be regarded as a feature of some importance separating the Sargassaceae from the Fucaceae.

Development of the Conceptacle.

The initial stages could be found only in the youngest receptacles about a millimetre in length and showing no external signs of conceptacle development. They were best seen in *Carpophyllum elongatum*, although it was clear that *C. maschalocarpum* was very similar.

The earliest stages recognisable are shown in fig. 3 A, where a slight mucilaginous depression occurs on either side of the apical cell, fortunately also in the plane of the section. The curved wall cutting off a "tongue cell" is quickly followed by vertical divisions in the lower segment, so that a pear-shaped group of cells is seen at the base of a pit filled with mucilage.

In male conceptacles the cavity formed remains for a time narrow, the tongue-like cell still visible in the middle (fig. 3 D), but in the female the floor of the conceptacle soon broadens

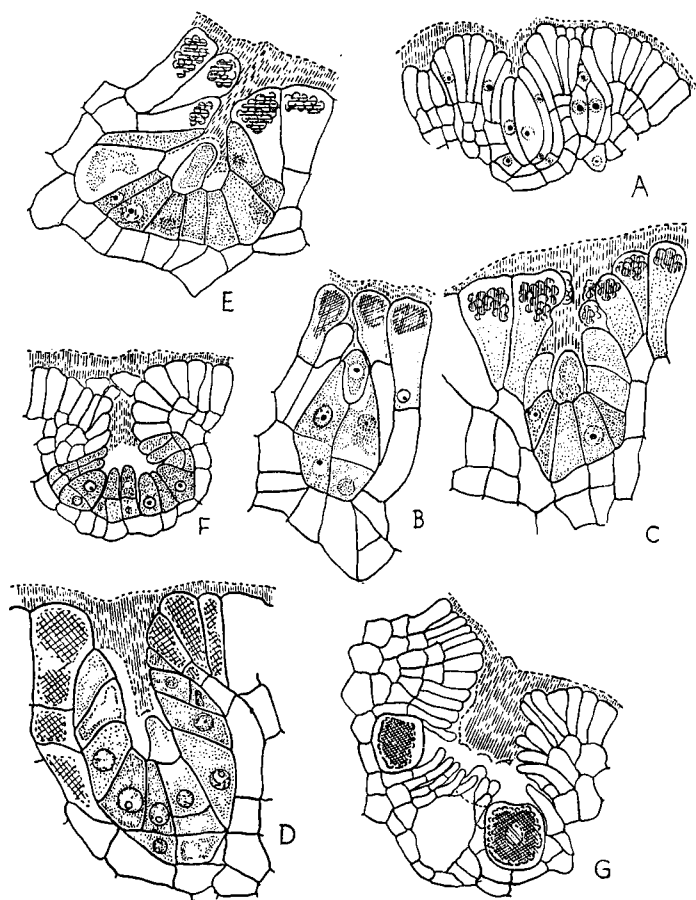


Fig. 3.—A. L.S. apex of receptacle showing apical cell; early division of conceptacle initial on the right. B, C, D, E, F, G. Stages in development of conceptacle. D. Male conceptacle. B–G. Female conceptacles. E, F, G with peripheral oogonial initial cells and central sterile region.
A, G. *Carpophyllum maschalocarpum*, unfixed material. The rest *C. elongatum*, material fixed in Allen's modification of Bouin's solution.

out by the rapid division of the initial cells, until a disc of thin-walled cells is formed (fig. 3 E, G), the edges of which are

upturned towards the ostiole. The oogonial initial cells form early from the cells just within the rim (fig. 3 E, G); the tongue cell persists until the floor of the conceptacle is well defined.

The oogonia appear to differentiate usually without cutting off any basal cell, but occasionally division occurs, the lower cell soon however losing its identity (fig. 3 F, left). The oogonia develop peripherally and successively, the central part of the basal disc remaining sterile. They are not separated from each other by paraphyses, but as they swell they encroach upon the neighbouring cells leaving only thin partitions two or three cells in thickness between them. On examination of a whole conceptacle partly cleared, it can be seen that the oogonia ripen successively, and appear as though spirally placed (fig. 2 C), probably owing to the different levels occupied as each forces its way more deeply into the receptacular tissues.

When fully formed the oogonia are nearly spherical and have a diameter of 60–80 μ . In the great majority examined, the ripe oogonia within the conceptacle have a single large central nucleus surrounded by a clear area, around which many granules and plastids are densely aggregated. This is the appearance well known in the Fucales to precede the process of meiosis*. Just before dehiscence, the wall of the oogonium swells up, and the mesochiton in the upper (or free) part appears to have a thin outer membranous layer in which occasionally a slight fold can be detected (cf. Delf, 1937, fig. 3 a, b, c). The exochiton ruptures and the mesochiton extends into a short tube, formed or at least bounded by the thin membrane which probably unfolds as in *Marginariella* (Delf, 1937). In life the tube may be filled with mucilage, but in formalin material it appears empty, the whole of the contents surrounded by mucilage having passed through it.

At the base the tube is anchored to the remains of the exochiton, shattered as though from a violent explosion, the shreds still adherent to the surrounding cells of the conceptacle (cf. fig. 2 A, where the remains are comparatively intact). Several of these mesochiton tubes may be found to pass through the same ostiole twisted on their own axes or on each other, and as they carry a relatively heavy weight their tenacity must be considerable. It is in fact easier to tear the whole tube from the conceptacle than to break it across during manipulation. The peripheral mucilage is less tenacious (at least after preservation in formalin), and a large number of these potential oospheres were found in the preserving liquid on arrival, presumably detached by shaking during transit. A considerable number were transferred to agar, embedded, and sectioned. The great majority were found to be in the eight-nucleate stage: a few

* In preparations of fixed material it can be seen that the nucleus is actually in prophase.

had only two or four nuclei: others had a few clearly-defined nuclei each surrounded by a region of clear cytoplasm, and one or more smaller granular bodies associated with smaller regions of clear cytoplasm, which after repeated examination always gave the impression of being doubtful (*i. e.*, probably degenerating) nuclei. However this may be, the usual uninucleate condition of the mature oosphere has not been found, and, if it occurs, must be quickly superseded by fertilisation and division. According to Tahara and Shimotai, the nucleus of the oosphere always takes up a peripheral position in *Sargassum tortile*, and Abe (1938) in the same species found that fertilisation occurred in the eight-nucleate condition, to be followed by degeneration of the seven supernumerary nuclei and unification of the cytoplasm around the fertilised nucleus. This was determined by examination of material selected and fixed at very short intervals of time, and would be impossible to determine with certainty from the material of *Carpophyllum* now available. It is, however, not inconsistent with certain appearances in the older extruded oospheres just before the first segmentation takes place.

The late stages of maturation of the potential oospheres and early sporeling development have been seen mostly in unfixed material, and the details are therefore difficult to demonstrate. However, it is clear that early sporeling development occurs *in situ*, the first division being followed by the formation of a more or less perfect cell-plate (fig. 2 B). By clearing in lactic phenol for several days whole receptacles suspected of bearing sporelings, preparations were obtained similar to those figured for *Cystoseira* by Valiante (1883, pl. i. figs. 2, 3). On embedding and sectioning the cleared preparation, however, no corresponding cellulose wall could be found, and the delicate cell-plates which would precede them were difficult to distinguish and were sometimes displaced, possibly by the irregular coagulation of the dense plasma. It is possible that a large number of nuclear divisions occur (with or without the formation of cell-plates between) before the final formation of the cell-walls.

Ultimately, however, a multicellular sporeling is developed much resembling that of *Sargassum* (fig. 2 D). These are infrequent in the available material, but have been detected by careful dissection of the older receptacles in the lower and older parts of the plant. It seems probable that the sporeling remains *in situ* until rhizoids are formed, but that the jelly gradually becomes less coherent until only the outer pectic shell remains. This would be accentuated by the action of formalin, so that a large number would be shaken from their gelatinous stalks during transit. There were, in fact, many hundreds of sporelings in the preserving fluid on arrival, but as the four species were packed in the same container the loosened sporelings could not be assigned to any particular plant.

Summary.

1. The apical structure and development of the conceptacles in two species of *Carpophyllum* conforms closely to that of *Cystoseira*, *Sargassum*, and *Bifurcaria*.

2. The first oogonium initial can be distinguished in the very young conceptacle and sometimes divides, cutting off a basal cell. If formed, the basal cell soon becomes indistinguishable from the neighbouring cells.

3. The oogonium enlarges greatly, but usually remains uninucleate until ready to discharge its contents, which round off and become the potential oosphere encased in mucilage, and attached by a mucilaginous stalk to the interior of the conceptacle.

4. The mesochiton plays an important part in the escape of the potential oosphere; the outer layer of the mesochiton becomes a thin tubular attachment of considerable strength, the rest of the mesochiton and the endochiton contribute to the firm mucilage which encloses the oosphere.

5. Meiosis must be presumed to occur either within or immediately after escape from the oogonium. The eight-nucleate stage is commonly seen in newly liberated potential oospheres. Such further maturation as occurs is external to the conceptacle.

6. Degeneration of seven nuclei probably occurs, but it cannot be determined whether this takes place before or after fertilisation.

7. Early sporeling development occurs *in situ*, the multicellular sporelings ultimately slipping out of their now attenuated mucilaginous covering, leaving the stalk and a broken outer shell of mesochiton still projecting from the ostiole.

8. The sporeling is of the *Sargassum* type, and probably reaches the multicellular condition as in *Sargassum* while still in close relation to the parent plant.

The writer is indebted to Mrs. F. M. Laing for the illustrations and for assistance in other ways during the course of this investigation. Her thanks are also especially due to Mr. V. W. Lindauer for the gift of the material and for the personal attention to the details of fixation.

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CONTRIBUTIONS TO THE STUDY OF BRITISH ELMS. II. THE EAST ANGLIAN ELM.

BY R. MELVILLE, PH.D., F.L.S.

A BOTANIST taking up the study of our native elms finds his path beset with difficulties. Published descriptions of the species are for the most part inadequate for the determination of members of this critical group. Material in our herbaria is generally incomplete, while information concerning the habit of the tree, type of shoot represented, and other important details is usually lacking. It is soon found that the only useful method of studying the genus is to go out into the field and collect suitable material. The problem then arises of distinguishing the species from the welter of varieties and hybrid forms. It is only by making a survey of the distribution and frequency of the more important forms that conclusions can be drawn as to which should be accepted as species. The variability in the foliage of an individual tree is another factor to contend with. This is minimised only by comparing leaves from corresponding positions on similar types of shoot, for which purpose the distal and subdistal leaves of the short shoots of the adult branches of the crown have proved most suitable. When such shoots are out of reach it is advisable to refrain from collecting. Material of this kind of shoot is suitable for critical study, especially if supplemented by collections of the other types—the long shoots of the crown, proleptic shoots, epicormic shoots and suckers. Working on these lines, I have surveyed the elm population of a large part of south England and the Midlands.

In the course of this survey, between Hatfield and Hertford in Hertfordshire, trees were discovered bearing short shoots with symmetrical or nearly symmetrical leaves in addition to the usual kind with asymmetrical leaves. At a later date trees with this character were found to be common between Beccles and Southwold and in other parts of Suffolk. They resembled the Hertfordshire trees very closely in other respects also. The short shoots with equal-based leaves can always be found, though

they vary in abundance, generally forming about 10 per cent. of the total. It must not be assumed, however, that all trees exhibiting this character belong to the species described below. There is strong evidence from field work that it hybridises with other species, and short shoots of the type mentioned are found on some hybrids. Henry's "*Ulmus nitens* var. *betulaefolia*," which occurs sporadically in East Anglia, is apparently a hybrid of this kind.

It is curious that such a striking character as the presence of shoots with equal-based leaves should have been overlooked for so long. Possibly these shoots have been observed, but disregarded on the supposition that they were abnormal. In one instance, at least, they were observed, since Sowerby's illustration, T. 1886, in Sowerby and Smith, 'English Botany' (1808), depicts a short shoot with equal-based leaves. According to Garry (*Journ. Bot. Suppl.* 168, 1904) the material for this figure was provided by Mr. Crowe, who lived at Lakenham near Norwich, where he owned an estate. Crowe was a keen botanist, particularly interested in willows, and it is probable that the specimens he supplied to Sowerby for T. 1886 came either from his estate or from somewhere in the neighbourhood. This would extend by a few miles the area of distribution as at present known to me, though it is probable that the species exists in territory not yet surveyed to the north of Norwich. The originals of Sowerby's drawings and such material as was preserved from the specimens he used are housed in Herb. Mus. Brit. The short shoot illustrated in T. 1886 is missing, and was probably not considered by the artist to be worth preserving, but the sheet bears a good spray of foliage with asymmetrical leaves except for a diminutive short shoot retaining a single equal-based leaf. The asymmetrical leaves resemble very closely in shape the leaves of the species described below. They are much rougher, however, than normal foliage, and no doubt formed part of an epicormic shoot of this species.

Sowerby and Smith identified their Norfolk elm with *U. campestris* L., a name that cannot be used for reasons already enumerated (Melville, *Journ. Bot.* 261, 1938). Under synonyms they quote *Ulmus vulgarissima folio lato scabro* of Goodyer, which is the *U. campestris* of Linnaeus's 'Flora Anglica,' now identified with *U. procera* Salisb. Evidently they were none too certain of their identification, for later under *U. glabra* Mill. T. 2248 occurs the statement: "Mr. Forster is of the opinion that our *campestris* is the *U. minor folio angusto scabro* of Goodyer and Ray." This, again, was another misidentification, as the elm in question has been shown to be a variety of *U. stricta* Lindl. (*Journ. Bot.* 185, 1938). Gilmour and Stearn identified T. 1886 with *U. minor* Mill. sec. Henry (*Journ. Bot. Suppl.* 21, 1932). An examination of material of "*U. minor*" at Kew identified

by Henry suggests that he did include this East Anglian elm under *U. minor* Mill. Several other authors have made different interpretations of Miller's elm and the name is both a *nomen dubium* and a *nomen ambiguum*. The case for its rejection under the International Rules of Nomenclature will be published elsewhere. Our East Anglian Elm is therefore without a valid name. The name here proposed for it is given on account of the different kinds of foliage it bears.

Ulmus diversifolia Melville, sp. nov. Arbor erecta usque 20 m. alta, ramis patentibus, ramulis gracilibus 1-2 mm. diametro tenuiter pilosis demum glabris. Folia distalia et subdistalia ramulorum brevium basi inæqualia vel æqualia: ea basi inæqualia 3-8 cm. longa et 2-4 cm. lata, elliptica vel obovata-acuta, nervis lateralibus 8-11; ea basi æqualia elliptica, acuta, basi cuneata, nervis lateralibus 5-9; omnia supra minute scabra, infra pilis brevibus sparsis et glandulis numerosis induta, marginibus dupliciter serratis serraturis obtusis, petiolis 5-10 mm. longis supra dense infra tenuiter pubescentibus. Flores 15-25 fasciculati, perianthio infundibuliformi, lobis 4-5, staminibus 4, antheris purpureo-rubris, lobis stigmaticis ovario dimidio brevioribus roseis vel albis. Fructus elliptici vel obovati, apice rotundati, basi late cuneati, semine uno triente longitudinis ab apice distante. (Typus in Herb. Kew. Melville no. 36.265, near Hatfield, Herts.)

An upright tree up to about 20 m. in height with spreading branches and rather slender wiry branchlets. First year branchlets of the short shoots 1-2 mm. diameter, at first hairy becoming nearly glabrous by the autumn, lenticels elliptical, inconspicuous. Short shoots of three kinds, the majority with distal and subdistal leaves with asymmetrical bases, about 10 per cent. with all the leaves with bases equal or nearly so and a few with both types of leaf together. Asymmetrical distal and subdistal leaves elliptical to obovate acute, base tapering on the short side, usually semicordate on the long side, occasionally $\pm$ tapering; midrib straight or slightly curved at the tip, usually curved at the base; main lateral nerves on long side 8-11, mean of distals 10, of subdistals 9. Symmetrical distal and subdistal leaves elliptical acute, base cuneate to blunt and symmetrical or nearly so; midrib straight; main lateral nerves 5-9, mean 7. Lamina length of distal leaves, 5.5-8.5 cm., of subdistal leaves 4-7 cm., slightly scabrid above with minute forwardly directed hairs; with a short and soft pubescence, rather numerous glands, and $\pm$ prominent axillary tufts below; margin biserrate, serrations at 1/3 of the lamina length from the apex, rather blunt, with 2 or occasionally 3 subsidiary teeth; petiole about 5-10 mm. long, densely pubescent above, sparingly below. For coordinates of mean shapes see below. Stipules caducous, linear, blunt, about 8-15 $\times$ 1-2.5 mm., thinly fringed with shaggy hairs,

numerous red glands on both surfaces. Leaves of proleptic shoots varying in shape from that of the distal leaves of the short shoots to suborbicular with cordate base, 4 lateral nerves, and few very blunt rounded serrations. Sucker shoots hairy, leaves 1-7 cm. long, elliptic acute or acuminate, base cordate or subcordate, roughly scabrid above, rather softly pubescent below. Vegetative buds ovate acute, 2-3.5 mm. long, bud-scales 4-5, imbricate, fringed, and minutely scabrid. Flower-buds broadly ovate, inner bud-scales orbicular, fringed with simple colourless hairs and occasional glandular hairs, bracts elliptic fringed, bracteoles elongate-elliptic, strongly keeled, fringed. Flowers 15-25 together, perianth funnel-shaped, pale green with 4-5 fringed white or pink lobes 1/3-1/2 of its length, stamens usually 4, anthers purplish red, filaments tinged with red, ovary included in the perianth with 2 stigmatic lobes nearly half its length, stigmas pink to white. Fruit 14-20 mm. long and 8-13 mm. broad, elliptic to obovate, apex rounded, base broadly cuneate, centre of seed about 1/3 of the fruit length from its apex. Stigmatic notch generally open, forming an angle of about 90°.

The mean shapes of the distal and subdistal leaves of the short shoots can be accurately defined by rectangular coordinates following the method previously described (Ann. Bot. n.s. i. 4, 1937). Outline shapes plotted from such coordinates are shown in fig. 2, F & G. The mean coordinates, derived for each from ten leaves of the type tree, no. 36.265, are as follows:—

A. Short shoots with asymmetrical leaves.

Distal leaves.

Short side.—8/0, 10/2, 20/13, 30/20, 40/25, 50/27, 60/25, 70/20, 80/12, 90/5, 100/0.
Long side.—2/0, 0/3, 10/13, 20/19, 30/23, 40/26, 50/27, 60/26, 70/23, 80/15, 90/6, 100/0.

Petiolar ratio 11.

Mean length of lamina 6.7 cm.

Mean no. of lateral nerves, long side, 10.

Subdistal leaves.

Short side.—9/0, 10/3, 20/16, 30/23, 40/27, 50/28, 60/26, 70/21, 80/14, 90/6, 100/0.
Long side.—3/0, 0/5, 10/17, 20/22, 30/26, 40/29, 50/30, 60/28, 70/24, 80/16, 90/7, 100/0.

Petiolar ratio 13.

Mean length of lamina 5.5 cm.

Mean no. of lateral nerves, long side, 9.

B. Short shoots with symmetrical leaves.

Distal leaves.

Short side.—2/2, 10/8, 20/14, 30/19, 40/22, 50/23, 60/22, 70/18, 80/12, 90/5, 100/0.
Long side.—2/3, 10/9, 20/15, 30/19, 40/22, 50/24, 60/23, 70/19, 80/12, 90/5, 100/0.

Petiolar ratio 15.

Mean length of lamina 5.8 cm.

Mean no. of lateral nerves, long side, 7.

Subdistal leaves.

Short side.—2/4, 10/11, 20/17, 30/22, 40/24, 50/24, 60/22, 70/18, 80/13, 90/6, 100/0.
Long side.—2/5, 10/13, 20/19, 30/23, 40/25, 50/24, 60/22, 70/18, 80/12, 90/6, 100/0.

Petiolar ratio 17.

Mean length of lamina 4.9 cm.

Mean no. of lateral nerves, long side, 7.

The coordinates are all given in terms of percentages of the lamina length, so that any measurement, including the

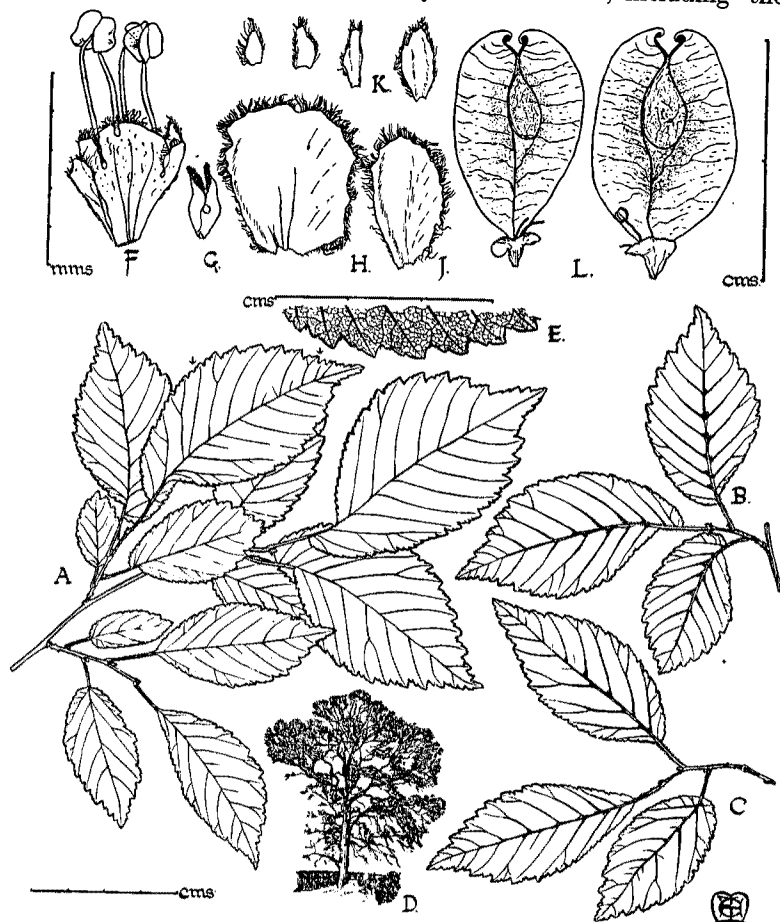


Fig. 1.—A. Normal adult shoot, upper surface. B. Short shoot with asymmetrical leaves, lower surface. C. Short shoot with symmetrical leaves, lower surface. D. Habit drawing from a photograph of a tree near Bramfield, Herts, No. 36.16. E. Portion of lower surface of the leaf marked by arrows enlarged to the scale above. F. Flower, with a bracteole, showing two of the four anthers. G. Ovary. H. Inner bud-scale. J. Bract. K. Bracteoles. L. Two fruits. All except D. are drawn from the type tree; No. 36.265.

petiolar ratio, can readily be converted into absolute figures. The petiolar ratio is the ratio of the petiole length to the lamina

length expressed as a percentage. It is noteworthy that the petiole is relatively much longer in the symmetrical than in the asymmetrical leaves and at the same time the number of main lateral nerves is reduced. Perhaps the two characters are connected in some way with the mode of development of the leaves. The longer petiole combined with the smaller number of nerves suggests that the usual asymmetrical base has been suppressed, the expansion of the lamina then beginning further up the midrib. Clearly, here is a problem in the physiology of development awaiting investigation before a satisfactory explanation can be given of the curious dimorphism of the leaves of this elm.

Certain features of the leaf shape also call for special comment. The shapes of the distal and subdistal leaves on the short shoots illustrated at B & C in fig. 1 are very similar to the average outline shapes shown at F and G in fig. 2. No very distinctive variation occurs in the shape of the leaf tip of the asymmetrical leaves, but the shape of the base varies considerably. In the type tree (No. 36.265) the base on the short side of distal leaves is either slightly convex or straight, or occasionally concave and tapering gradually into the petiole—see the short shoot on the left of A, fig. 1. The concave tapering base is much less common in the subdistal leaves of this tree. In other trees, especially those growing between Beccles and Southwold and about Diss, a base of this kind is frequent and the convex base much less so. A typical example is depicted at E, fig. 2, which shows a short shoot from a tree near Diss (No. 37.163). Parallel variations occur in the shape of the base on the long side. In the type tree, it is generally more or less rounded and semicordate in the subdistal leaves, but in the distal leaves the margin often meets the petiole nearly at right angles or sometimes tapers to a wedge shaped base. Here, again, the wedge shaped base is more frequent in the Suffolk trees mentioned above in which the short side is concave and tapering and it is commonest in the distal leaves. These features are apparent in fig. 2, E. The mean outline shapes (fig. 2, H) from the same tree (No. 37.163) represent commonly occurring shapes.

On account of the variation in leaf shape referred to above, it seems probable that there are two strains of *U. diversifolia*. Usually, however, all the variations in shape can be found on one tree, and it does not at present seem advisable to distinguish varieties. The mean coordinates for asymmetrical distal and subdistal leaves of a tree near Diss, No. 37.163, are given here for comparison with the figures for the type strain from near Hertford. This tree is representative of the Suffolk strain and will serve to indicate the extent of variation in the mean shapes.

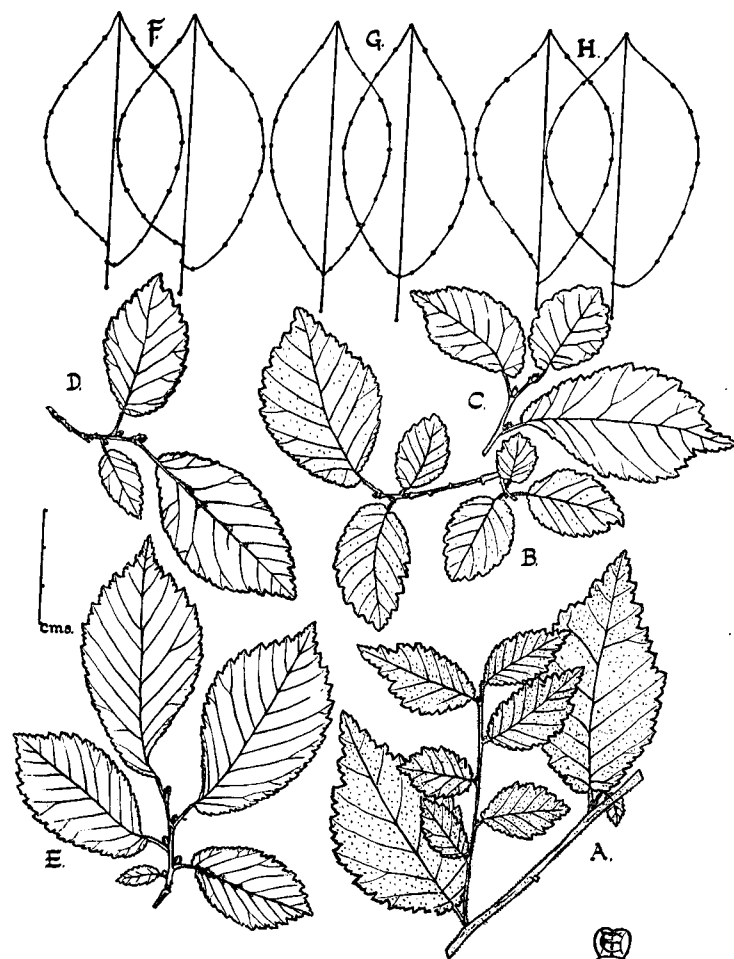


Fig. 2.—A. Portion of a sucker shoot. B. An epicormic shoot. C. A proleptic outgrowth from a short shoot. D. Short shoot with asymmetrical leaves, Suffolk strain. E. Short shoot with asymmetrical leaves, Suffolk strain. F, G, & H. Mean outlines each derived from ten leaves from short shoots. F. Asymmetrical leaves of type tree, left distal, right subdistal. G. Symmetrical leaves of type tree, left distal, right subdistal. H. Asymmetrical leaves of Suffolk strain, left distal, right subdistal. A, B, F, & G. From the type tree, No. 36.265. C. From a tree at Felixstowe, No. 38.134. D, E, & H. From a tree of the Suffolk strain, No. 36.163.

U. diversifolia, No. 37.163, South of Diss, Suffolk.

Distal leaves.

Short side.—6/0, 10/3, 20/11, 30/19, 40/25, 50/27, 60/27, 70/23, 80/16, 90/6, 100/0.

Long side.—0/0, 10/10, 20/16, 30/21, 40/25, 50/27, 60/27, 70/24, 80/18, 90/7, 100/0.

Petiolar ratio 11.

Length of lamina 6.0 cm.

Mean no. of lateral nerves, long side, 9.

Subdistal leaves.

Short side.—7/0, 10/3, 20/15, 30/23, 40/27, 50/29, 60/28, 70/24, 80/16, 90/7, 100/0.

Long side.—1/0, 0/4, 10/17, 20/21, 30/26, 40/29, 50/30, 60/30, 70/27, 80/20, 90/8, 100/0.

Petiolar ratio 14.

Length of lamina 5.4 cm.

Mean no. of lateral nerves, long side, 9.

The type tree, No. 36.265, is situated on the south side of the Hatfield to Hertford road about three miles east of Hatfield. It is one of a rather isolated group of roadside trees, the first on the western side being an *U. procera*, then an Ash, followed by the type tree and a row of *U. diversifolia*. The road at this point is due to be widened and the trees will then be removed. On this account the tree typified would not have been chosen if complete material of another had been available. It is not always easy to time visits to outlying trees to enable flowers and fruits to be gathered in good condition, even if fruits are formed, and to complete collections from another might take some time. However, rooted suckers were taken from the type tree and transferred to the Arboretum nursery at Kew, where they have made good progress. A clone from it will be planted in the Arboretum in due course. The habit sketch, fig. 1, D, was not made from the type tree which had been spoilt by crowding on one side and lopping. The tree depicted, No. 36.16, belongs to the same strain as the type and is situated about a quarter of a mile along a turning off the Welwyn-Hertford road leading to Bramfield. The shoots illustrating the Suffolk strain are from a hedge row tree about a mile from Diss just within the borders of Suffolk. The proleptic shoot is from a tree, No. 38.134, on the outskirts of Felixstowe.

The distribution, so far as it has been determined, is as follows: in Hertfordshire between Hatfield, Hertford, and Watton-at-Stone; in Suffolk common along the coastal plain from Ipswich and Felixstowe to Lowestoft and Beccles, extending inland at least as far as Diss and Debenham. It probably extends further north into Norfolk and southwards towards Colchester.

I am greatly indebted to my wife for the drawings used to illustrate this and the preceding article of this series. The drawings were made by using a photographic enlarger to project an image of suitable dried material on to Bristol board. The outline was then drawn, together with the midrib and main nerves. Drawings made in this way are accurate in detail and exactly to scale. The dissections of the flower were made with a Swift-Ives camera lucida.

NOTES ON THE FLORA OF ANGOLA.—IV.

By A. W. EXELL, M.A., F.L.S.

1. COLLECTIONS FROM ANGOLA IN THE SLOANE HERBARIUM.

In the Introduction to the 'Conspectus Floræ Angolensis' (1937), Sr. F. A. Mendonça, from information supplied by me, stated*:—"In 1824 *Maerua angolensis* DC. was described from an Angolan specimen in the Paris Herbarium. The name of the collector is unknown. Apart from this the first collection which we know from Angola was made by Dr. Curror, about 1840, at Elephants' Bay." This statement I must now correct, as there are four small collections from Angola belonging to a much earlier period preserved in the Sloane Herbarium in the Department of Botany, British Museum.

Petiver was in the habit of persuading surgeons on British ships, or stationed at British posts abroad, to make Natural History collections for him and all four Angolan collections were probably obtained in this way.

The first collection was by a Mr. Mason and was dated 1669 by Petiver. We find in 'Musei Petiveriani, p. 22 (1695)' under no. 176 the reference "*Conyza Angolensis serratifolia*. This and the last, with several others, my kind Friend Mr. Mason, Surgeon, gathered at Angola." There are in all about thirty-six specimens (some very fragmentary) in Herb. Sloane, vol. 32, fol. 99-118 (incl.).

The species at present identified are *Cleome ciliata* Schumach., *Sida rhombifolia* L., *Sida cordifolia* L., *Melochia corchorifolia* L., *Fagara* † sp. nov., and *Arachis hypogoea* L. ‡. No doubt most of the others will be nameable as the work on the 'Conspectus Floræ Angolensis' proceeds.

Although the specimens are unlocalized it is probable that most of them, at least, were collected in the district of Luanda or possibly near the mouth of the Congo. In 1648 Luanda was recaptured from the Dutch by a force from Brazil under Correia de Sá, and by the year 1669, when Mason made his small collection, the main districts occupied by the Portuguese were roughly three: (1) the mouth of the Zaire (Congo); (2) Luanda and its hinterland at least as far inland as Ambaca; (3) Benguela and inland from it to Caconda. The *Fagara* sp. nov. collected by Mason is of especial interest, as it is only known from the Cazengo

* I quote from my English translation of his Introduction (*loc. cit.* p. xx).

† This species, later collected by Welwitsch and Gossweiler, was misidentified by Hiern in Cat. Afr. Pl. Welw. i. 113 (1896) as *Zanthoxylum rubescens* Planch. It will shortly be described.

‡ If, as is generally believed, *Arachis hypogoea* L. is a native of Brazil and introduced in Africa, this early record is interesting (see Ficalho, Pl. Ut. Afr. Port., 133 (1884)).

forest region, except for one specimen collected at Sumba, Peco, in the Zaire district. Mason, presumably, collected it either in the lower Congo region (Zaire district), or else, which is by no means impossible, he landed at Dondo, the old slave-trading port on the R. Cuanza, only a comparatively short journey from the Cazengo forest region along one of the oldest of the African slave-routes.

At about the same date (1669) Petiver also received plants from John Kirkwood, Surgeon, collected at "Cabenda" (probably *Cabinda* in the Cabinda Enclave, north of the R. Congo). Petiver refers to him in "Musei Petiveriani, pp. 21-22 (1695)" and in "Gazophyl. Nat. Art., pp. 9, 11, and 15 (1702)" under nos. 155 and 167, the two references being:—No. 155, "*Bromos e Cabenda*, polyspermos utriculatus. Gathered at Cabenda by my kind friend Mr. Kirkwood, Surgeon"; No. 167 "*Clinopodium e Cabenda* Parietariæ folio. Mr. Kirkwood, Surgeon, gathered this at Cabenda near Angola." This latter specimen (Herb. Sloane, vol. 265, fol. 83) is a species of *Hyparrhenia*. Further specimens collected by Kirkwood at Cabenda are in Herb. Sloane, vol. 255, fol. 64-68, an aroid and a grass.

Petiver also received Angolan plants from a Mr. Gladman, of whom we have no further information. These are in Herb. Sloane, vol. 154 (1), fol. 8, 20, 21, 25, and 101, and vol. 255, fol. 70, 72. The specimen in vol. 154, fol. 25, which has been named *Pteris atrovirens* Willd., also has a label "Cape 3 Puntas Wat & Skeen." It may be mentioned that the "Wat (Watt) & Skeen" specimens were collected at Cape Three Points (originally named "Cabo Tres Puntas" by the Portuguese) in the Gold Coast and not at "Cabo Tres Pontas (or Puntas)" in Angola.

The largest Angolan collection of all in the Sloane Herbarium also came through Petiver, but was apparently a little later than the others. It was made by William Brown (or Browne), Surgeon, who also collected at Gibraltar and the Cape, round about 1706-07. Brown's Angolan specimens are all in the Sloane Herbarium, vol. 154 (i & ii) and are labelled "Angol. W. Br." by Petiver. Among them are:—*Cleome ciliata* K. Schum., *Sida cordifolia* L., *Grewia carpinifolia* Juss., and *Clappertonia ficifolia* (Willd.) Decn. Others will be identifiable as the work on the Angolan flora progresses.

2. THREE NEW SPECIES FROM ANGOLA.

Antizoma angolensis Exell & Mendonça, sp. nov. (Menispermaceae).

Planta rhizomatosa multicaulis, caulibus prostratis porcatis gracilibus annuis vel perennibus ad 70 cm. longis et 2 mm. in diam. primo tomentosis demum pubescentibus. *Folia* petiolata, petiolo usque 2.5 cm. longo pubescente, lamina cordiforme apice leviter emarginata apiculata vel mucronata margine integra basi

profunde cordata 5-7-nervia usque 5.5×5.5 cm., glabrescente, minute reticulata, reticulatione supra subtusque conspicua. Flores ♂ ignoti, ♀ pedicellati, pedicello usque 2 mm. longo apice articulado in foliorum axillis 2-4-fasciculati, delapsi. Drupæ obovoideæ compressæ vel subglobosæ compressæ, ad 6×5 mm., dorso 3-costatæ et transverse costulatæ pubescenti.

BENGUELA: Nova Lisboa, alt. 1650 m., J. Gossweiler 11962 (Typus in Herb. Mus. Brit.; Herb. Conimbr.).

This species, which is the first of this genus to be found in Angola, was collected in 1938 (after the publication of the Menispermaceæ in "Consp. Fl. Angol. i, fasc. i (1937)") in the remarkable ecological formation which Mr. Gossweiler calls "Rhizomatofruticeta" and to which M. Léemann has recently given the name "Cryptodrymum" (see Bull. Soc. Bot. Genève, sér. 2, xxix. 82 (1938)). It consists of numerous species, belonging to diverse genera and families, which agree in their general habit. They have woody rhizomes, often very thick and frequently considerably branched, which send up annually numerous shoots which are usually burnt off in the dry season.

A. angolensis agrees with *A. capensis* (L. f.) Diels in having no spines and suborbicular leaves, all the other known species of the genus being more or less spiny and with lanceolate, elliptic, or linear leaves. It can be at once distinguished from *A. capensis* by the deeply cordate leaves.

[A. W. E. & F. A. M.]

Triumfetta Gossweileri Exell & Mendonça, sp. nov. (Tiliaceae).

Herba perennis, caulibus erectis c. 25 cm. altis dense setoso-hirsutis. Folia petiolata, petiolo 2-2.5 cm. longo setoso-hirsuto, stipulis lineari-lanceolatis 7-10 mm. longis setoso-hirsutis, lamina late elliptica vel late oblongo-elliptica apice rotundata vel fere retusa margine serrata basi late cuneata, $4.5-2 \times 3.5-3.8$ cm., supra dense appresse setoso-pilosa subtus fulvo-tomentosa. Inflorescentiæ terminales paniculatæ. Flores delapsi. Fructus globosus setis debilibus plumosis plerumque spinula unica terminatis, 2 cm. in diam. (setis inclusis).

BRÉ: Vila da Ponte, J. Gossweiler s.n. (Typus in Herb. Conimbr.).

In the absence of flowers we cannot say much about the affinity of this species except that it belongs to Sect. *Lasiothrix* Sprague & Hutch. It can be distinguished from all the other Angolan species of the genus by its broadly elliptical or nearly suborbicular leaves which are setose-hirsute above and fulvous-tomentose below.

[A. W. E. & F. A. M.]

Triumfetta Youngii Exell & Mendonça, sp. nov. (Tiliaceae).

Planta (verisimiliter herba) prostrata, caulibus stellato-hirsutis. Folia petiolata, petiolo 2-4 cm. longo stellato-hirsuto, stipulis palmatifidis ad 2 cm. longis, ambitu suborbicularia

digitatim profunde 3-7-lobata, lobis anguste ellipticis ad 6×1.5 cm. apice acutis margine serratis utrinque dense stellato-pilosis. Flores magni lutei in cymas congestas oppositifolias vel terminales conferti. Sepala lineari-spathulato-oblonga extus dense stellato-hirsuta intus glabra, 25×5 mm., apice appendiculam 8-9 mm. longam instructa. Petala obovata ad 25×13 mm. basi glandulifera pilosa ceteroque glabra. Stamina filamenta 8 mm. longa, anthera 1.5 mm. longa. Ovarium subglobosum tomentosum. Fructus globosus haud lignosus setis debilibus plumosis munitis, 3-4 cm. in diam. (setis inclusis).

LUNDA: between Vila Henrique de Carvalho (Saurimo) and Dala, R. G. N. Young 1293 (Typus in Herb. Mus. Brit.).

"Sand veld with sparse savannah and scrub. Flowers yellow; procumbent, trailing 5-8 ft."

This species belongs to Sect. *Lasiothrix* Sprague & Hutch., Subsect. *Digitatae* Sprague & Hutch., and is near to *T. heptaphylla* Exell and *T. macrocoma* K. Schum., from both of which it differs by its much larger flowers and palmatifid stipules.

The ovary is apparently originally 5-locular, but by abortion ovules develop in only one or two loculi.

[A. W. E. & F. A. M.]

RUMEX AQUATICUS L. AS A BRITISH PLANT.

By J. EDWARD LOUSLEY.

It is seldom possible to add a new species to the British list without the addition of a new name, and the discovery of *Rumex aquaticus* L. in Scotland is therefore of exceptional interest.

There can be little doubt that Linnaeus confused the plant now known as *R. Hydrolapathum* Huds. with *R. aquaticus*, for the former, which must have been known to him, was omitted from his works and is more deserving of the specific epithet "*aquaticus*" than the plant to which he gave the name. His brief description of *R. aquaticus* (Sp. Pl., 1, 337, 1753), however, includes the words "*valvulis . . . nudis*" which excludes the tubercled valves of *R. Hydrolapathum*, and the specimen in the Linnean Herbarium represents the plant we now know as *R. aquaticus*.

Hudson evidently appreciated that the Linnean description of *R. aquaticus* did not apply to the British Great Water Dock, and hence he established his *R. Hydrolapathum* (Fl. Anglica, ed. 2, 154, 1778), selecting an epithet well known to pre-Linnean authors. Unfortunately in the previous year Lightfoot (Fl. Scot., 190, 1777) had applied the name *R. aquaticus*, together with an inapplicable Linnean description, to the Great Water Dock, and for nearly fifty years most British authors followed his

erroneous example (Smith, Fl. Brit., 1, 394, 1800; Relhan, Fl. Cantab., ed. 2, 144, 1802, and ed. 3, 149, 1820; Hooker, Fl. Scot., 112, 1821). Hull at first followed Hudson (Brit. Fl., ed. 1, 77-78, 1799), but later bowed to the general consensus of opinion (Brit. Fl., ed. 2, 1, 102, 1808).

Smith, having the advantage of possession of the Linnean Herbarium, made a belated correction of the error in 1824 (English Fl., ed. 1, 2, 196), and there appears to have been no confusion by later authors with *R. Hydrolapathum*.

The name *R. aquaticus* was not, however, allowed to disappear from the British list, and six years later it was applied by Hooker (Fl. Brit., 168, 1830) to the plant we now know as *R. domesticus* Hartm. (*R. longifolius* DC.?). The name became firmly established in Britain on the publication of E. B. S. t. 2698 in 1831, although the synonymy there given would have revealed the misapplication of the name on very slight examination. Notwithstanding the common character of grainless valves, there can be no justification for confusion of *R. aquaticus* L. with *R. domesticus* Hartm., since the affinity of the latter is with *R. crispus* L., while the former is more likely to be mistaken for *R. Hydrolapathum* Huds. The error made in Britain first by Hooker has, however, not yet completely died out (e.g., Clarke, W. A., First Records of Br. Fl. Plants, ed. 2, 124, 1900; Young, Wm., Flwg. Pl. & Ferns Fife & Kinross, 126, 1936; Lee, J. R., Fl. Clyde, 66, 1933: etc.).

It is therefore advisable to state that *R. aquaticus* L., *R. domesticus* Hartm., and *R. Hydrolapathum* Huds. are three perfectly distinct species, recognized as such by all modern authors of northern Europe. Owing to the repeated misapplication of Linnaeus's name, not only in this country, but also abroad, it appears advisable to cite *R. aquaticus* as "*R. aquaticus* L.; Murbeck" based on a clear account of the three species given by Murbeck in Bot. Not. 7, 1899. A further account of these plants in Britain will be included in a paper which the writer has in preparation.

In 1935, Mr. R. M. Mackechnie sent me specimens from Stirlingshire (v.c. 86) labelled "*Rumex longifolius* DC." which clearly did not belong to that species. In response to my request he sent excellent additional material gathered on September 3rd, 1938, which proved beyond doubt that the plants were *R. aquaticus* L.; Murb. The distribution of this species abroad strongly suggests that it is likely to prove native in Britain, but in view of the small quantity in which it occurs in the station discovered by Mr. Mackechnie it is advisable to exercise caution. The precise locality is deliberately withheld in this paper for obvious reasons, but I hope to make a search this summer in the belief that its distribution on the shores of Loch Lomond may be less local than at present known.

The plant under consideration may be described as follows:—

Rumex aquaticus L., Sp. Pl., 336, 1753; Murbeck, Bot. Not., 7, 1899; Ascherson & Gr., Synopsis, iv. 734, 1908-13; Rouy, Fl. France, 12, 71, 1910: *Lapathum aquaticum* Scopoli, Fl. Carniolica, ed. 2, 1, 263, 1772; *R. Hippolapathum palustris* Fries, Nov. Fl. Suec., ed. 2, 106, 1828; *R. Hippolapathum* Fries, Mantissa, III, 28, 1842; *R. Friesii* J. E. Areschoug, Pl. cot. Gothoburgensis, 100, 1842—non Gren. & Godr.

Type. Specimen in Herb. Linn. labelled "*aquaticus* Fl. Suec. 14" by Linnaeus. This is immature, and there is no leaf, but it represents the plant considered here. The specimen was probably added to the herbarium between 1755 and 1767.

Icones. Svensk Bot., iii. t. 209, 1804: Drejer in Hornemann Fl. Dan., t. 2288, 1840: Beck in Reichb. Icones, xxiv. t. 160, figs. 1-7, 1903-6: Heukels, Plantenatlas, fig. xxxvii, 5, 1925: Coste, Fl. France, iii. fig. 3136, 1904: Hegi, Fl. Mitteleuropa, 3, t. 91, fig. 1, 1912.

Exsicc. Ehrhart, Pl. Off. no. 104, as *R. acutus* (Hb. Smith); Fries, Herb. norm. f. V. no. 55 ex "Upland, Upsalæ" (Hb. Kew, Hb. Mus. Brit.); Fl. Ingricæ, iv, 533 (Hb. Mus. Brit.).

A tall (80-200 cm.), stout perennial plant. Lower leaves (c. 35×20 cm.) cordate-ovate or triangular, $1\frac{1}{2}$ -2 $\frac{1}{2}$ times as long as broad, broadest near the base; base usually cordate, rarely truncate; apex rounded-obtuse or somewhat acute. Peduncles of fruit with a scarcely thickened, almost imperceptible articulation near the base. Fruiting valves (5-8.5×4.5-7 mm.) ovate-triangular, truncate at the base, the apex usually rather drawn out, membranous, entire, always without tubercles. Nut (3.2-3.7 mm. long), brown, broadly trigonous.

Distribution.—Northern Asia; throughout Europe with the exception of the southern part of the Balkan Peninsula and Italy south of the Tyrol, less frequent in S.W. Europe. The statement given by many authors that the species occurs in N. America is incorrect, an allied species, *R. occidentalis* Watson, having been mistaken for it (Rechinger fil., Field Mus. Nat. Hist., Bot. series, xvii. no. 1, 105, 1937). In Britain known only from Stirlingshire (v.c. 86), shore of Loch Lomond, *R. M. Mackechnie*.

Ascherson and Graebner (Synopsis, iv. 735) include the British Isles in the distribution of this species, but apparently they base this statement on *R. paludosus* Huds. (Fl. Angl., ed. 2, 154, 1778), which they include in the synonymy of the species. Hudson's description does not precisely agree with any known British Dock, but in all probability he had in mind a tall specimen of *R. conglomeratus* Murray. His statement that "*Valvula exterior florum granum magnum rubrum habet*" clearly shows that he cannot have been describing a plant of *R. aquaticus* L.

R. aquaticus L.; Murb. may be distinguished from *R. Hydrolapathum* Huds. by the absence of tubercles on the fruits and by

the leaves being usually conspicuously broader at the base and hence triangular in shape. From *R. domesticus* Hartm. it is easily known by the leaf-shape, less congested panicle, usually rather pointed valves, and the less evident articulation of the peduncle, which in *R. domesticus* is thickened into a prominent ring.

NOTES ON BRITISH CARICES.—II.

By E. NELMES AND T. A. SPRAGUE.

CAREX DIOICA.

THE name *Carex dioica* L. (Sp. Pl. 972) was published with the following diagnostic phrase and synonymy:—

1. CAREX spica simplicis dioica. Hort. cliff. 438. Fl. suec. 746.

Cyperoides parvum, caulibus & foliis tenuissimis triangularibus, spica longiore (& subrotunda), capsulis oblongis, Mich. gen. 56. t. 32, f. 1. 2.

Gramen cyperoides minimum, spica simplicis cassa. Moris. hist. 3, p. 244, s. 8. t. 12, f. ult. (mas). Scheuch. gram. 497, t. 11.

Gramen cyperoides minimum, ranunculi capitulo simplici asperiore rotundo. Moris. hist. 3, p. 245. s. 8. t. 12. f. 36.

Habitat in Europæ pratis humidis.

The evidence as to the identity of *C. dioica* L. may be arranged under three headings: diagnostic phrase, type-specimens, and citations.

A. Diagnostic Phrase.

- (1) The diagnosis, *Carex spica simplicis dioica*, applies equally well to the two species commonly known nowadays as *C. dioica* L. (*C. laevis* Hoppe, *C. Linnaeana* Host.), and *C. Davalliana* Sm. (*C. scabra* Hoppe).

B. Type-specimens.

- (2) The material of *Carex spica simplicis dioica* in the Clifford herbarium consists of three culms of a dioecious *Carex*, two male and one female. The two male culms cannot be identified with certainty. The female culm is *C. Davalliana* Sm.

- (3) The material of *C. dioica* in the Linnaean herbarium consists of two male and two female culms, all of which are *C. laevis* Hoppe.

C. Citations.

- (4) *Carex spica simplicis dioica* Hort. Cliff. 438 (1737). This covered both *C. Davalliana* and *C. laevis*: Mich. Gen. t. 32, fig. 1 is the former, and Moris. Hist. iii. sect. 8, t. 12, fig. 36 is the

latter. The geographical distribution given by Linnæus indicates that he included *C. laevis*.

(5) *Carex spica simplicis dioica* Fl. Suec. 268, n. 746 (1745). Linnæus stated that this occurred everywhere in watery meadows in Sweden. The Swedish plant can only have been *C. laevis*, since *C. Davalliana* is unknown from that country. Both *C. laevis* and *C. Davalliana* are represented in the citations.

(6) *Cyperoides parvum*, caulibus & foliis tenuissimis triangularibus spica longiore (& subrotunda) capsulis oblongis Mich. Gen. 56, t. 32, fig. 1, 2 (1729):—This represents a combination of two diagnostic phrases of Micheli, namely:—

1. *Cyperoides parvum*, caulibus, & foliis tenuissimis, triangularibus, spica longiori, capsulis oblongis, in angustum collum, vix bifidum, attenuatis. Tab. 32, fig. 1.
2. *Cyperoides parvum*, caulibus, & foliis tenuissimis, triangularibus, spica subrotunda, capsulis oblongis, in angustum collum, vix bifidum, attenuatis. Tab. 32, fig. 2.

The former represents *C. Davalliana* and the latter *C. laevis*.

(7) *Gramen cyperoides minimum*, spica simplicis cassa Moris. Hist. iii. 244, sect. 8, fig. ult. (mas) [fig. 22] (1699). This cannot be identified with certainty: the caespitose habit excludes *C. dioica* and suggests *C. pulicaris* L., of which it may be an immature state.

(8) [*Cyperoides monostachyon*] Scheuchz. Gram. 497, t. 11, fig. 9, 10 (1719), is *Carex Davalliana*. Scheuchzer stated that it was abundant in wet places near Zürich.

(9) *Gramen cyperoides minimum ranunculi capitulo simplici asperiore rotundo* Moris. Hist. iii. 245, sect. 8, t. 12, fig. 36 (1699), is *Carex laevis* Host.

Summary of the Evidence.

1. *Carex dioica* L. Sp. Pl. 972 (*C. spica simplicis dioica* Hort. Cliff. 438) covered two species subsequently described as *C. laevis* Hoppe (*C. Linnaeana* Host) and *C. Davalliana* Sm. (*C. scabra* Hoppe).

2. The diagnostic phrase of *C. dioica* applies equally well to *C. laevis* and *C. Davalliana*.

3. The specimen representing *C. spica simplicis dioica* in the Clifford herbarium is *C. Davalliana*; the specimens of *C. dioica* in the Linnaean herbarium are *C. laevis*.

4. The citations given under *Carex dioica* in Sp. Pl. 972 represent both *C. laevis* and *C. Davalliana*.

It is reasonable to assume that the plant which Linnæus had chiefly in mind under *Carex dioica*, when he wrote the 'Species Plantarum,' was the Swedish species, *C. laevis* Hoppe, which

represented *C. dioica* in his own herbarium. The name *C. dioica* L. has been generally applied to this plant, and should be retained for it.

Under Art. 52, when a species is divided into two or more species, the specific epithet must be retained for one of them. The only exception to this rule is where a name becomes ambiguous owing to its use with different meanings (Art. 62). This is not the case with *C. dioica*.

The principal references are given below. Others are given by Kükenthal in Engler's 'Pflanzenreich,' iv. 20 (Cyperaceae-Caricoideae):—

CAREX DIOICA L. Sp. 972 (1753) pro parte; em. Smith, Brit. Fl. iii. 1004 (1804).

C. laevis Hoppe, Bot. Taschenb. 1800, p. 242.

C. Linnaeana Host, Gram. Austr. iii. 51, t. 77 (1805); Schkuhr, Riedgr. ii. 3 (1806).

C. Linnaei Degl. in Loisel. Fl. Gall. 627 (1807).

THE ADAMS COLLECTION OF DIATOMS.

THE Department of Botany has recently had bequeathed to it the remarkable collection of Diatoms formed by the late Frederick Adams of Jersey. A few details of the life of the donor and of the collection will be of interest to Diatomists.

Frederick Adams was born on January 30th, 1867, and came of a family with a great record as engineers and he continued the family traditions. He started work at the age of seventeen at Newport Docks and two years later was engaged on railway construction in Venezuela. In 1888 he went to Mexico as engineer in charge of the construction of the Inter-Oceanic Railway and afterwards joined the staff of Messrs. Pearson & Sons, Ltd., and undertook the building of many public utility enterprises including the Vera Cruz and Salina Cruz Harbour works. He continued his connection with Mexico until 1931 when he settled in Jersey. He died on November 14th last.

Frederick Adams was a patron of a type, alas! all too rare in botany. He was keen and alert as a business man and equally so in the pursuit of his hobby. Generous and hospitable he leaves a precious memory behind with those less fortunate than himself who received his help and encouragement—both diatomists and their relatives: he never regarded the purchase of a collection as a bargain to be driven and the payment he made for collections was always such that he had the market.

Throughout his life he was greatly devoted to microscopical science. In youth he was keenly interested in pond-life, but later he applied himself to the serious study of Bacteriology. Finally, diatoms claimed his entire devotion, and he made

frequent journeys in California and elsewhere in search of the deposits from which the earlier workers obtained their material.

The Barbados deposits always fascinated him, and in 1936 he visited that island and during a period of several months examined the various sites from which diatomaceous earth had been obtained, and about which there had always been a great deal of ambiguity and vagueness. Among the many places from which he obtained material were Bissex Hill, St. Mark's Conset, Clarke's Cliff, Newcastle, Gagg's Lane, Joe's River, and Mount Hillaby, and on the study of this material he was almost exclusively engaged, as much as failing health would permit, right up to the time of his death. In this work he greatly added to the number of genera and species previously recorded from Barbados, and also found a considerable number of hitherto unnamed or entirely new forms.

The Adams collection of Diatoms consists of about 23,000 slides packed in rack-boxes containing twenty-five each. The collection was assembled from various sources and almost all the chief diatomists and professional mounters are represented. The most important individual collection is that of F. W. Mills which comprises several thousand slides. In this are included about 700 slides made by E. Grove including 178 from the Oamaru fossil deposit in New Zealand. This deposit was first described by Grove and Sturt, and these slides contain the types of some of the new species described by them. Others, contained in Sturt's collection, are already in the Museum. There is also the collection of J. B. Bessell; these are all selected slides, many mounted by Bessell himself and others by F. W. Payne, many of them from Hardman's material which Bessell obtained. In the collection there are about 1250 "type slides" by various mounters. Amongst these are fifty made by A. Truan y Luard which include the types of the species described in Truan and Witt's account of the fossil deposit found at Jeremie in Haiti.

The collection consists mainly of marine forms, both fossil and recent, and in these it is outstanding. Freshwater forms are less well represented.

Accompanying the collection is the microscope by the mechanical stage of which the positions of forms on strewn slides is fixed. There are also card indexes to the species in the collection and also to the geographical distribution of the slides, and a register of the slides. Detailed lists of the forms on the "type slides" are also included.

The presentation includes the album of Diatom Figures compiled by F. B. Taylor. This comprises almost all the figures of diatoms published in important works up to about 1925 cut out and pasted into the fifteen volumes of the album. These are arranged according to De Toni's 'Sylloge Algarum,' vol. ii. There are also a geographical and an alphabetical index to the

published figures of Diatoms in Mr. Adams's extensive library. These are bound, typewritten volumes compiled by Miss A. M. Mainland, Mr. Adams's cousin, who assisted him in his diatom work. There is also a collection of seventy volumes of bound pamphlets with a card index of authors. The whole represents the most important single increase to the national collections in this group and very considerably enhances their value.

Mr. Adams's duplicate books were deposited at Kew in 1932 to be lent to responsible persons "who cannot afford to buy them" (see Bull. Misc. Inf. 1932, p. 250). The remainder of his extensive library, apart from those dealing directly with the collections, has for the most part been presented to the Public Library at Jersey.

I am indebted to Miss A. M. Mainland for some of the above information and also to my colleague Mr. R. Ross.

J. RAMSBOTTOM.

REVIEWS.

German-English Botanical Terminology. An Introduction to German and English Terms used in Botany, including Plant Physiology, Ecology, Genetics, and Plant Pathology. [Title and subtitle repeated in German.] By H. and E. ASHBY, H. RICHTER, and J. BÄRNER. Pp. xi+175. 8vo. London: Thomas Murby & Co. 1938. Price 10s.

THE title of this book is misleading, for it suggests a technical dictionary of a type of which there are already two or three on the market. Instead of this, however, there is a synopsis of botany written in such a way that a large number of botanical terms are used and explained, the English text and the German on opposite pages; the terms are printed in italic. For many such a method is the most convenient for learning to read German, and it is most gratifying to have a botanical text in the series which already contains Geology and Chemistry with a promise of Physics and Zoology.

The book is divided into eight chapters, two on Morphology, two on Classification and Phylogeny, and the others on Cytology and Genetics, Physiology, Ecology, and Plant Pathology. There are three appendixes—names of common plants, common names of plant diseases, and abbreviations commonly used in English and German botanical literature; also an English and a German index. The authors are to be congratulated on having compressed so much information in so small a space. The book will be useful not only to examination candidates, but to those who for other reasons desire facility in translating German botanical papers into English or vice versa.

Alpine Flowers. Thirty-six Colour Plates from Watercolours specially prepared by PAUL A. ROBERT, with introductory text by CARL SCHROETER. Large 8vo. London: B. T. Batsford, Ltd. Price 10s.

PROBABLY of all floras in the world that of Switzerland stands highest in popular estimation. Certainly this is so for most people of this country, both those who have been fortunate enough to see the flowers growing and those who have formed their ideas from books and picture postcards. Consequently an illustrated book on alpine flowers is always certain of a public. The present volume is one of the best of its kind that we have seen. The thirty-six plates showing forty-five species by the well-known botanical artist Paul A. Robert are characteristic. To some, perhaps, the attempt to show the plants in natural groupings may not always appear satisfactory, but here, as in other works of this artist, the compromise necessary between perspective and the clear depicting of the plants is on the whole remarkably successful. The amount of "body" used also may be criticized, but it results in a more realistic representation of the plants than is usual in popular books.

The introduction and the short descriptions of the plants are by the lately deceased Carl Schroeter, one whose knowledge of the flora of his country was equalled only by his keen desire to preserve a priceless heritage from senseless vandalism. The introduction is as interesting as it is concise. Both introduction and descriptions are adequate.

The general format is pleasing, but the light blue boards will soon soil when the jacket is removed.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the general meeting on Feb. 2nd there was a discussion on "Subspecies and Varieties," in which Messrs. M. A. C. Hinton, W. B. Turrill, A. J. Wilmott, H. W. Parker, and B. P. Uvarov were the principal speakers. At the general meeting on Feb. 16th the following motions regarding National Parks were passed:—

The Linnean Society of London accepts the definition employed in the African Fauna Convention* as an ideal for the preservation of Nature; but it knows that the term "National Park" has been given to areas which for various reasons are unsuitable for inclusion within the definition,—e.g. too limited or situated too near populated areas. For such it recommends the setting apart within each Park of special nature reserves under proper control; and it would like all authorities with power over Parks to seek advice from such bodies of naturalists as are competent to give it,

Appended to the Resolution as a reference :

* This definition reads as follows :—

"1. The expression 'national park' shall denote an area (a) placed under public control, the boundaries of which shall not be altered or any portion be capable of alienation except by the competent legislative authority, (b) set aside for the propagation, protection, and preservation of wild animal life and wild vegetation, and for the preservation of objects of aesthetic, geological, prehistoric, historical, archaeological, or other scientific interest for the benefit, advantage, and enjoyment of the general public, (c) in which the hunting, killing, or capturing of fauna and the destruction or collection of flora is prohibited except by or under the direction or control of the park authorities.

"In accordance with the above provisions facilities shall, so far as possible, be given to the general public for observing the fauna and flora in national parks." (International Convention for the Protection of Fauna and Flora . . . London, November 8, 1933. Treaty Series No. 27. London, H.M. Stationery Office, 1936.)

Capt. C. Diver gave an account of the scheme for a National Atlas of Great Britain and Northern Ireland (or of the British Isles) proposed at the Cambridge meeting of the British Association. The proposed atlas aims at a strictly objective and scientific presentation of the physical geography (including geology, climatology, and hydrography), bio-geography, economic geography, and human geography (including prehistoric and cultural geography).

The Rev. J. E. Holloway then gave a lecture on "New Zealand Pteridophyta." The account was general and concerned chiefly with distribution. Though Pteridophytes play a notable part in the vegetation of New Zealand, *Equisetum* and *Selaginella* are absent. The early Mesozoic Fern families are strongly represented, including several species of *Gleichenia* and *Schizaea*, *Lygodium articulatum*, three Osmundaceae and one *Marattia*. Two species of *Ophioglossum* occur and one *Botrychium*. In the heavy wet mixed forests there is a luxuriant and varied display of the more modern fern types; there are eight species of tree-fern. Blechnums and Hymenophyllaceae are the dominant fern-types, the filmy ferns comprising *Hymenophyllum* (18 spp.), *Trichomanes* (6 spp.), and *Cardiomanes reniforma*. Lycopods are represented by *Lycopodium* (12 spp.), *Isoetes* (2 spp.), and *Phylloglossum Drummondii*. The Psilotaceae have the two genera each with one species—*Tmesipteris tannensis* and *Psilotum triquetrum*.

Over a period of thirty years Dr. Holloway has discovered the gametophytes of nine species of *Lycopodium*, and also those of *Tmesipteris* and *Psilotum*, but only one in *Phylloglossum*. His experience has been that continued field-work is bound to develop a facility for recognizing gametophyte localities; the rest is confined to an appropriate method of soil-sifting, combined with patience.

The meeting on March 2nd was devoted to exhibits. The botanical ones were :—The President showed a selection from over 300 botanical drawings recently presented by Miss Beatrice

O. Corfe to the British Museum (Nat. Hist.), and a number of miniature models of garden plants made from painted brass and other metals by Miss Beatrice Hindley. Mr. A. H. Bunting exhibited some South African species of *Aristida* with observations on the ecology and taxonomy of the twenty species which have been found there. Mr. M. B. Ellis exhibited variations in the ribbing of seeds of *Taxus*: 1054 seeds collected from a single tree showed that 668 were mid-ribbed, 302 three-ribbed, 76 four-ribbed, and 4 five-ribbed; the four remaining ones were two-ribbed, but each bore a few small additional ridges. Mr. A. H. Bullock exhibited Linaloe Heartwood (*Bursera fragrantissima* Bullock) from Mexico. This wood is extraordinarily odoriferous and is apparently valued highly in Mexico for the manufacture of ornaments, trinket-boxes, etc. Mr. S. Savage exhibited some books of Linnaeus with annotations showing his geographical interests. There are comparatively few annotations of this kind, and they usually consist of habitats of plants and animals. The main part of the exhibit referred to the locality known as Hortus Dei, situated about twelve leagues to the north of Montpellier, mentioned by several of the older writers. Linnaeus wrote a manuscript *Iter ad Hortem Dei*, and this imaginary journey was indicated on Cassini's map of the district dated 1744. Dr. V. J. Chapman had three exhibits—photographs illustrating three main types of British Salt Marsh, a fruiting specimen of *Halimeda*, and a new *Monostroma* from New Zealand. Dr. M. T. Martin showed a number of interesting Marine Algæ from South Africa. Mr. A. D. Cotton exhibited a living specimen in flower of *Notholirion Thomsonianum*. Mr. K. V. Srinath showed slides illustrative of the development of *Calceolaria* and Dr. N. Polunin gave an analysis of the Arctic element in the British Flora which showed that the overwhelming majority of the British Vascular Plants which reach high latitudes grow chiefly in the absence of competition. Those which are truly arctic are rare alpine of rock crevices or other "open" habitats.

At the general meeting on March 16th, Dr. Winifred E. Brenchley gave a lecture on the vitality of weed seeds, in which she commented on the work which she has been carrying out at Rothamsted. It was calculated from the number of seedlings obtained in certain experiments that the original weed seed population on one plot was over 300 million per acre, of which 260 million were poppies.

At the general meeting on April 13th, Miss F. R. Shove described her experiments on the viability of the spores of *Funaria hygrometrica*. Spores collected in 1927 have been cultivated continuously since 1930. In the earlier cultures on unsterilized soil the spores germinated freely and the plants developed sporogonia in the years after sowing. Later cultures on sterilized sand and soil produced thinner protonemal layers. The spores

sown in the autumn of 1938 formed no visible protonema until the spring of 1939 when a few protonemal filaments were seen. All the spores on filter paper and sand failed to germinate.

THE periodical 'Mycopathologica' with its fourth number completes its first volume. It is perhaps a matter of surprise that an annual volume of 316 pages could be written on so specialized a branch of mycology as that of human and animal diseases, but the Editors seem to be having no difficulty in obtaining contributors. The six papers in the present number cover a wide range. Perhaps those of most general interest are "*Mycotorula albicans* associated with a Disease of Carrots" by O. Verona and R. Ciferri and "*Aspergillus stellatus* forma conidica dell' *Emricella varicolor* o *Inzengaea asterosperma*" by R. Ciferri.

ROYAL SOCIETY.—The names of Dr. E. J. Maskell and Sir R. G. Stapledon figure in the recent list of those elected Fellows of the Society.

'BORBÁSIA.'—The first number of a new Hungarian botanical periodical, 'Borbásia,' has just appeared, devoted to floristics, systematics, and phytogeography; special attention being paid to cryptogamic botany. Articles will be published in English, French, German, and Latin, only articles of purely local interest being in Hungarian, but with a *résumé* in one of the other languages. The parts will be published at convenient intervals, each part of sixteen pages costing one Pengö; there will be ten parts to a volume. The editor and publisher is Dr. V. Köfaragó-Gyelnik, Akadémia-utca 2, Budapest V.

LINNEAN GOLD MEDAL.—The many British friends of Dr. Elmer Drew Merrill, the eminent American botanist, will be pleased with the announcement that he is to be the recipient of the Linnean Gold Medal at the Anniversary Meeting of the Society.

LINNAEAN COLLECTIONS.—As a precautionary measure the Linnaean collections and library have been moved from Burlington House to Woburn Abbey where H.G. the Duke of Bedford has made special arrangements for their safe custody. It is not possible at present for any of them to be consulted.

THE University of London calls special attention to the fact that it has just instituted a Certificate of Proficiency in Natural History, which is designed for teachers who require a Certificate testifying that they have a practical knowledge of the subject such as will be of special value in teaching it to children up to the age of fifteen. Candidates must hold a recognized Teacher's Certificate, or must have been approved by the University as having had adequate practical experience in teaching. In addition they will be required to produce evidence of having attended a suitable course of study.

STUDIES OF BRITISH POTAMOGETONS.—VI.

BY J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

VI. THE IDENTITY OF *POTAMOGETON BABINGTONII*.

(PLATE 617.)

JUST under a century ago Babington, in Suppl. Engl. Bot. iii. sub t. 2847 (1840), reported *Potamogeton longifolius* of Gay * as a "new" British species. "This curious species", he wrote, "was accidentally gathered in August, 1835, in Lough Corrib, Galway, Ireland, by my friend Mr. John Ball; and during the summer of 1838 the same gentleman detected it, in deep water, near the larger island in Rydal Water, Westmoreland." The plate illustrating his article was drawn from a flowering specimen found floating loose in Lough Corrib by Ball and preserved in Babington's herbarium.

In Hooker's 'British Flora', Ed. 5 (1842), p. 341, and in Babington's own 'Manual of British Botany' (1843), p. 324, the dual record of *P. longifolius* from Galway and Westmorland was repeated, but in 1846 Borrer (in Phytologist, ii. 426) published a note stating that the plant from Rydal Water had proved to be *P. heterophyllus* (= *P. gramineus*) †. Thus the identity of the Westmorland "*P. longifolius*" was early established, and Rydal Water ceased to be cited as a locality for Gay's species. The Lough Corrib "*P. longifolius*", on the other hand, remained to become a controversial plant about whose identity various suggestions have been made, and which, according to general belief, has not been re-collected to this day ‡.

* *P. longifolius* Gay ex Poir. in Encycl. Méth., Bot., Suppl. iv. 535 (1816).—Gaud. Fl. Helvet. i. 473 (1828); Synops. Fl. Helvet. 123 (1836). The type came from the River Juine in the neighbourhood of Paris and is now generally regarded as a form of *P. lucens*. Babington cited the Gaudin references, not the original place of publication.

† Borrer's note ran as follows: "I sought twice, June and July, 1844, for *P. longifolius* in Rydal Water, Mr. John Ball having given me a barren specimen so named, of his own gathering in that place. I found a great quantity of *P. heterophyllus*; and upon subsequent examination, with Mr. Babington, Mr. Ball's specimen proved to be, in fact, of the same species. I am not aware that the true *P. longifolius* (Mr. Ball's Irish plant) has been observed in England." We have examined the specimens collected by Ball and Borrer in Rydal Water, and agree that they represent *P. gramineus*. They are preserved in Borrer's herbarium at Kew.

‡ In 1853 T. Kirk visited Lough Corrib and gathered specimens which he thought were *P. longifolius* and distributed under that name, but these are not the same as Ball's plant and were correctly referred to $\times P. sparganifolius$ (*P. gramineus* $\times$ *natans*) in the later editions of Babington's 'Manual'. Kirk's material, which actually came from the Bealanabrack River flowing into Lough Corrib, formed the basis of a record of *P. longifolius* in Phytologist, v. 49 (1854), and of the remarks on that species attributed to Kirk in Hooker & Arnott's 'British Flora', Ed. 7 (1855), p. 482.

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M

Holotype specimen of *Potamogeton Babingtonii* A. Benn.(= $\times P. Zizii$ Koch ex Roth).

Apparently Babington himself was the first to question whether the Lough Corrib plant was the same as Gay's *P. longifolius*, and in the fourth edition of his 'Manual' (1856), as also in the three succeeding editions, he included it as "*P. longifolius* (Gay ?)", though in a note published in Journ. Bot. x. 229 (1872) he expressed the belief that his original identification was correct. In Ed. 8 of his 'Manual' (1881), however, the designation of the Irish plant was still further modified to "*P. longifolius* (Bab. not Gay)", implying that he now regarded its identity as problematical. This treatment was repeated in the two subsequent editions of the 'Manual'.

Bentham in his 'Handbook of the British Flora' (1858), p. 493, quoted the plate of the Lough Corrib plant under *P. lucens*. Hooker and Arnott, however, in the eighth edition of their 'British Flora' (1860), p. 482, retained "*P. longifolius* Gay", though adding a query and remarking: "What the Irish plant may prove to be, when found in other localities, it is impossible to say." They further pointed out that the "foreign and true species of the same name" did not appear to differ from some forms of *P. lucens*.

Dealing with *P. "longifolius"* in the third edition of 'English Botany', vol. ix (1869), p. 40, t. 910, Syme stated that he had never seen British specimens of the plant. Judging from the plate he had been inclined to believe it to be a form of *P. praelongus*, but Babington had examined the specimen and written that he did not think it was that species. Syme finally remarked that *P. longifolius* of Gay had the leaves more narrowed towards the base than in the plate but was probably the same, and that he had little doubt about its being merely a variety of *P. lucens*.

J. D. Hooker, in his 'Student's Flora of the British Islands' (1870), p. 372, mentioned the Lough Corrib plant casually under *P. lucens*. In the third edition of the same work (1884), p. 433, the plant received similar non-committal treatment under *P. lucens* subsp. *Zizii* (= *× P. Zizii*).

In an article on *× P. decipiens* (*P. lucens × perfoliatus*) in Journ. Bot. xxviii. 137-139 (1890) Fryer stated that he had been able to examine carefully and repeatedly the unique specimen of "*P. longifolius*" in Babington's herbarium, and had come to the conclusion that it was certainly a *decipiens*-form though one that was decidedly more towards *P. lucens* than any other he had seen. "While the leaf-structure is that of *decipiens*", he observed, "the peduncle and flower-spike are like those of *lucens*, but the flowers seem imperfect, and suggest that they are barren." Fryer must have changed his opinion later, for according to H. and J. Groves in Babington's 'Manual', Ed. 9, p. 441, published in 1904, Fryer then referred the plant to *P. lucens*. Whether this was his final opinion we do not know,

as the plant was not dealt with in the parts of 'Potamogetons of the British Isles' issued during his lifetime, nor, for some unexplained reason, was it mentioned in the parts (containing *P. lucens* and *× P. decipiens*) which appeared after his death.

A. Bennett, in Journ. Bot. xxxii. 204-205 (1894), remarked that the specimen of "*P. longifolius* Bab. (non Gay)" had been some trouble to deal with at all satisfactorily. From its appearance he had little doubt that it had been floating in the water for some days, and a slender shoot (not the one shown in Babington's plate) had evidently—certainly in part—been produced while the specimen was detached. He thought that the peduncle was certainly a "crux", being characteristic neither of *P. lucens*, *P. praelongus*, nor *× P. decipiens*, but he suspected that the floating had unduly inflated it in the upper part, and that the decay of the flowers had arrested growth beyond the base of the spike. The slender shoot had led him at first sight to think of *P. praelongus*, and on the whole, notwithstanding the "*lucens*-like look" of the specimen, he was inclined to think that it really might have been a hybrid between *P. lucens* and *P. praelongus*, two species of which he had specimens from the same lough as the "*P. longifolius*". He accordingly proposed for the latter plant a new name, *P. Babingtonii*.

Bennett's view was adopted by Ascherson and Graebner, Synops. Mitteleur. Fl. i. 332 (1897), who treated the Lough Corrib plant (together with a plant from Germany) as *P. praelongus × lucens* f. *Babingtonii*. Subsequently Graebner, in 'Das Pflanzenreich', vol. iv. 11 (1907), p. 138, raised this to varietal rank as *P. lucens × praelongus* var. *Babingtonii*. Hagström, in his 'Critical Researches' (1916), pp. 246-247, also accepted Bennett's view of the Irish plant, and adopted the name *P. Babingtonii* for the hybrid *P. lucens × praelongus*. He divided *P. Babingtonii* into two forms: f. *longifolius*, based on the original specimen from Lough Corrib, and f. *danicus*, based on specimens from Denmark which he considered to represent the hybrid *P. lucens × praelongus*. Pearsall, in his 'Notes on Potamogeton' (in Bot. Soc. & Exch. Club Brit. Is. ix. 398 (1931)) retained *P. Babingtonii* without discussing the status of the plant.

The fragment of pondweed about which these varying opinions have been expressed is now preserved with the rest of Babington's herbarium at the Botany School of Cambridge University, and for the convenience of those who have no access to the specimen we reproduce a photograph (Plate 617). It consists of a flowering branch with the lowest axil bearing an elongated lateral shoot which may, as Bennett suggested, have grown out after the specimen had become detached. Apparently very few of the various authors who have published opinions on the plant ever saw the actual specimen, and there can be little doubt that the others were to some extent misled by Babington's

plate which is clearly a reconstruction and not a true representation of the plant as it must have looked when alive. Babington himself, as we have seen, first identified it with Gay's *P. longifolius*, later doubted this determination, and finally left the status of the plant open as "*P. longifolius* (Bab. not Gay)". Others who actually studied the specimen were Fryer, who first referred it to $\times P. decipiens$ and then to *P. lucens*, and Bennett, who thought it might be a hybrid between *P. lucens* and *P. praelongus* and named it *P. Babingtonii*. We in our turn have examined the specimen, and are left in no doubt that it is referable to $\times P. Zizii$ (*P. gramineus* $\times$ *lucens*)*. The material has its deficiencies—presumably it received a certain amount of buffeting while floating in the lough—and is not easy to identify at first sight, but when studied critically it is enough to show that its characters agree with $\times P. Zizii$ and not with any other species or hybrid known from the British Isles. The form and venation of the leaves are alone sufficient to identify the plant with $\times P. Zizii$, while the elongated peduncle, swollen upwards, points to the same conclusion. Notwithstanding Bennett's opinion, there is nothing about the specimen to suggest a hybrid of *P. praelongus*.

At the time when Ball collected his material in Lough Corrib $\times P. Zizii$ was not recognized as a British plant, but specimens subsequently gathered in the same lough, on the West Galway side, by T. Kirk (7th Sept. 1853), E. S. Marshall (5th July 1895, Ref. 1468 and 1472), and W. A. Shoolbred (5th July 1895) have been correctly referred to $\times P. Zizii$ ("*P. angustifolius*"). Comparison of these with Ball's specimen (the holotype of *P. Babingtonii*) confirms our identification of the latter with $\times P. Zizii$. The parent species, *P. gramineus* and *P. lucens*, have both been collected in Lough Corrib.

EXPLANATION OF PLATE 617.

Holotype specimen of *Potamogeton Babingtonii* A. Benn. (= $\times P. Zizii$ Koch ex Roth). The elongated lateral shoot, arising from the lowest axil, can be seen curving round the base of the sheet from left to right. Higher up the specimen are two peduncles, the lower one complete with spike, the upper one broken off short.

* The name *P. angustifolius* Bercht. & Presl (1823) is often used for this hybrid, but, as pointed out by Hagström (Crit. Res. 211–212), Berchtold and Presl's description suggests rather a form of *P. gramineus*. We therefore retain the name $\times P. Zizii$ [Mert. & Koch, Röhl. Deutsch. Fl. i. 845 in obs. (1823), *nomen synonymum*] Koch ex Roth, Enum. Pl. Phaenog. German. i. 1, 531 (1827).

SOME NEW SPECIES OF *DOMBEYA*, *GREWIA*, AND *COMBRETUM* FROM TROPICAL AFRICA.

By A. W. EXELL, M.A., F.L.S.

THE specimens on which the following new species are based were mainly collected by my friend Bernard D. Burt, whose untimely death last year in an aeroplane accident in Tanganyika Territory robbed us of a most excellent collector, whose careful ecological notes were always of the greatest value. His cooperation in studying the relationships of difficult species of *Combretum* was always of great help and interest to me. Only a few weeks before his death he was complaining jokingly that he never seemed able to find a new *Combretum*. I now describe a number of species which we were in process of studying, but which now, unfortunately, he can no longer investigate in the field.

Dombeya Burtii Exell, sp. nov. *Frutex* 0.6–1.3 m. altus, ramulis $\pm$ appianatis glabris vel fere glabris. *Folia* haud lobata longipetiolata, petiolo ad 7.5 cm. longo primo stellato-puberulo tandem glabrescenti, stipulata, stipulis lanceolatis vel ovato-lanceolatis ad 10 $\times$ 6.5 mm., stellato-pubescentibus demum glabrescentibus, lamina ovata vel obovata vel rotundato-ovata, 4–10 $\times$ 3.5–8 cm., acuta sed vix acuminata margine crenato-dentata basi profunde cordata 7-nervia, supra subtusque dense molliterque stellato-velutina subtus pallidior, costis et reticulatione subtus prominulis. *Flores* magni rosei in pseudo-umbellas multifloras axillares congesti; pedunculo 6–9 cm. longo primo stellato-pubescenti mox glabrescenti, medio bi-bracteato, bracteis lanceolatis vel ovato-lanceolatis, 6–7 $\times$ 3–4 mm., stellato-puberulis, ad apicem 3–4-fido; pedicellis gracilibus 2–4.5 cm. longis, stellato-pubescentibus vel stellato-tomentellis. *Bracteoli* 3, elliptici vel oblongo-elliptici, 8–9 $\times$ 2.5–3.2 mm. *Sepala* anguste lanceolata, 16–17 $\times$ 4–4.5 mm., extus stellato-tomentella intus glabra. *Stamina* 15 in alabastro æquilonga basi cum staminodiis in tubum 3.5–4 mm. altum (in alabastro 1.5–1.8 mm.) connata, filamentorum partibus liberis in alabastro 5–6 mm. longis. *Ovarium* depresso subglobosum, 5-loculare, extus dense stellato-tomentosum intus stellato-pilosum, loculis 5–7-ovulatis, stylo 8 mm. longo (in floribus juvenilibus 6 mm. longo) in parte inferiore tomentoso.

Hab. TANGANYIKA TERRITORY. Rungwe: Mbeya distr., Mporoto Mts., 15 miles out on Great North Road, at 7000 ft., 9. ix. 1936, *B. D. Burt* 6154 (type in Herb. Mus. Brit.; Herb. Kew.).

"Handsome pink-flowered shrub, 4–7 ft. high; ravines and margins of Bamboo—*Hagenia*—forest and mountain grassland."

This species belongs to Subgen. *Eudombeya* K. Schum. and seems to be near *D. platypoda* K. Schum., but the flowers are larger, the indumentum on the peduncles is much shorter, and that on the outside of the sepals is much finer and closer. The flowers are larger than in *D. tanganyikensis* Bak., which also belongs to this affinity.

There are fifteen stamens in the usual groups of three separated by the five staminodes. In bud the anthers of the fertile stamens form an outer ring, while the staminodes are bent inwards and form an inner ring surrounding the style. The flowers appear to be protandrous and to shed their pollen, while the staminodes still enclose the style. Later the staminodes bend away from the style and the stigmas then curve back and presumably become ready for pollination. These observations are made entirely from dried material, but suggest that the staminodes play some part in a cross-pollination mechanism which it would be interesting to confirm from a study of living material.

Dombeya nyasica Exell, sp. nov. *Frutex*, ramulis applanatis primo stellato-pilosis mox glabrescentibus. *Folia* longipetiolata, petiolo 4.5–12 cm. longo primo dense stellato-tomentoso demum sparse stellato-piloso, stipulata, stipulis lanceolatis vel ovato-lanceolatis acuminatis ad 10×6–7 mm., sparse pilosis, lamina ambitu ovata vel rotundato-ovata leviter tri- vel subquingelobata, 10–17×8–16 cm., apice acuta vel obtusa nonnunquam paulo acuminata margine crenato-dentata basi profunde cordata, 7-nervia supra stellato-pubescenti subtus dense molliterque stellato-velutina subtus pallidiore, costis et reticulatione subtus prominulis. *Flores* magni rosei in pseudo-umbellas plurifloras vel multifloras axillares congesti; pedunculo 6–9.5 cm. longo primo dense demum sparsius stellato-villosulo paulo supra medium unibracteato (vel nonnunquam bibracteato?), bractea ovato-lanceolata, 6–7×3 mm., pilosa, ad apicem bracteolato bracteolis caducis; pedicellis 1.5–3.5 cm. longis stellato-villosulis, bracteolis caducis delapsis. *Sepala* anguste lanceolata, 15–18×3.5–4 mm., extus stellato-tomentosa intus glabra. *Petala* oblique obovata, 18–21×15–18 mm., glabra. *Stamina* 15, basi cum staminodiis in tubum 2–2.5 mm. altum connata, mediis triadum brevioribus, filamentorum partibus liberis 3 mm. longis, antheris 3.5 mm. longis, staminodiis 5, partibus liberis 11 mm. longis. *Ovarium* subglobosum, 5-loculare, extus dense stellato-tomentosum, loculis 6-ovulatis intus stellato-pilosis, stylo 6.5 mm. longo basin versus stellato-pilosulo, stigmatibus recurvatis.

Hab. NYASALAND. Between Dowa and Kota Kota, at 5000 ft., 21. vi. 1936, *B. D. Burt* 6085 (type in Herb. Mus. Brit.; Herb. Kew.).

"Shrub of high hilly grassland, pink-flowered."

This species is very near *D. tanganyikensis* Bak., but the flowers are larger and the peduncles and pedicels more densely

hairy. The staminodes are arranged in the bud as in the preceding species.

Grewia gilviflora Exell, sp. nov. *Frutex* 2.5–4 m. altus, ramulis primo ferrugineo-stellato-tomentellis mox glabrescentibus. *Folia* petiolata, petiolo 4–10 mm. longo primo stellato-puberulo glabrescenti, stipulis caducis, lamina lanceolata elliptica vel obovato-elliptica vel oblanceolata apice acuminata margine serrulata vel irregulariter denticulata basi rotundata vel subcordata nonnunquam leviter obliqua, 4.5–11×2–4.5 cm., supra sparse stellato-puberula vel fere glabra subtus densissime albo-velutina. *Flores* in paniculas terminales et axillares dispositi, pedicellati, pedicellis 1–3 mm. longis. *Bractea* ambitu obovata apice bifida vel subtrifida, 7–9×6–7 mm., dense tomentellae. *Sepala* oblonga margine incurva, 9–11×2 mm., velutina. *Petala* oblonga, 3.5×1 mm., basi glandulifera glandula margine pilosa ceteroque glabra. *Ovarium* subglobosum puberulum, stylo 6 mm. longo glabro. *Fructus* obovoideus vel obovoideo-ellipsoideus monopyrenus, 13–15×7–10 mm., primo stellato-puberulus mox glabrescens.

Hab. TANGANYIKA TERRITORY. Mkwemi, near Kahama, 4000 ft., in thickets in hills covered by *Brachystegia utilis* and *B. microphylla*, shrub 12 ft., with pale cream-yellow flowers and yellow anthers, fl. 22. ii. 1937, *B. D. Burt* 5482 (type in Herb. Brit. Mus.; Herb. Kew.); Western Uzinza, at Gieta Gold Mine, 4500 ft., shrub 8 ft., in riverine forest, *B. D. Burt* 6516 (Herb. Brit. Mus.; Herb. Kew.). NORTHERN RHODESIA. Abercorn District: Lake Tanganyika coast between Kalambo mouth and Mpulungu, 2700 ft., shrub 10 ft., yellow edible fruits, on shingle beaches clothed with thickets, fr. 18. v. 1936, *B. D. Burt* 6035 (Herb. Mus. Brit.; Herb. Kew.).

This species belongs to Sect. *Microcos* (L.) Wight & Arn. and is near to *S. malacocarpa* Mast., from which it can be at once distinguished by its much larger flowers.

Combretum abercornense Exell, sp. nov. *Arbor* parva, ramulis tomentellis. *Folia* opposita vel subopposita petiolata, petiolo tomentello, 1–2.3 cm. longo, lamina chartacea elliptica vel anguste elliptica vel oblongo-elliptica, 5–12.5×2.3–5.5 cm., apice leviter acuminata basi acuta vel nonnunquam subrotundata, supra minute verruculosa, costa media basin versus puberula excepta fere glabra, subtus pubescenti et albo-lepidota, lepidibus densis sed marginibus vix contiguis, costa media subtus prominenti, costis lateralibus 8–12-paribus supra conspicuis sed vix prominentibus subtus prominulis. *Inflorescentiae* supra-axillares rachide 3.5–6 cm. longa primo tomentella demum glabra. *Flores* desunt. *Fructus* 4-alatus ambitu orbicularis, 3–3.5×3–3.5 cm., metallico-purpureus, in corpore dense in alis sparsius albo- et aureo-brunneo-lepidotus, dense minutissime pubescens, alis sub-

rigidis c. 10 mm. latis, stipite 7-12 mm. longo albo- et aureo-brunneo-lepidoto.

Hab. NORTHERN RHODESIA. Abercorn, Kalambo Falls, 4500 ft., fr. May, *B. D. Burt* 5963 (type in Herb. Mus. Brit.; Herb. Kew.).

"Valley fringed by *Brachystegia filiformis*; small tree, gregarious."

Although no flowers are available, this species can be placed fairly confidently in Sect. *Glabripetalae* Engl. & Diels. It seems to be related to *C. gazense* Swynnerton & Bak. f., with which it agrees in having leaves which dry a brownish green on the upper surface with characteristic yellowish veins. The type of *C. gazense* has no fruits and there is the usual difficulty met with in the genus of linking with certainty flowering and fruiting material. If I am right in supposing that *Burt-Davy* 17913, from Katanga, represents fruiting material of *C. gazense*, then the species here described differs very distinctly as regards the fruit. The fruit of *Burt-Davy* 17913 is about 4.5 × 4 cm. and is brownish (not purple) with brownish red scales. *C. album* De Wild., from Katanga, which I take at present to be synonymous with *C. gazense*, is described, also, as having fruits 4-4.5 × 4 cm. The matter cannot be satisfactorily cleared up until fruiting material is collected from the type-locality of *C. gazense* (Gazaland).

Combretum mwanzenze Exell, sp. nov. *Frutex* 2-2.5 m. altus, ramulis puberulis. *Folia* 3-4-nata petiolata, petiolo 7-9 mm. longo primo pubescenti demum fere glabro, lamina chartacea elliptica vel oblongo-elliptica, 5-12 × 3.5-5.5 cm., apice leviter acuminata basi acuta vel subrotundata supra nitidula glabra subtus pubescenti et indistincte albo-lepidota, costa media supra applanata subtus prominente in sicco rubra, costis lateralibus 5-7-paribus prominulis in sicco rubris. *Inflorescentiae* axillares vel supra-axillares, rachide 4-8 cm. longa demum sparse pubescenti. *Flores* desunt. *Fructus* 4-alatus ambitu suborbicularis, 2.5-3 × 2-2.5 cm., metallico-purpureus in corpore dense in alis sparse brunneo-lepidotus dense minutissime pubescens, alis subrigidis 7-10 mm. latis, stipite 3-7 mm. longo.

Hab. TANGANYIKA TERRITORY. Uzinza area, west of Mwanza, Minziwera Camp, 4000 ft., fr. March, *B. D. Burt* 6455 (type in Herb. Mus. Brit.; Herb. Kew.); Mwanza, big boulder-kopjes, *H. Lynes* 1339 (Herb. Brit. Mus.).

"In the valley below the *Brachystegia*-hills on seasonally wet hard-pan soil; shrub 6-8 ft. high, growing with *Combretum ternifolium* and *Hymenocardia* sp.; locally common" (*B. D. Burt*).

This species also probably belongs to Sect. *Glabripetalae* Engl. & Diels and is related to *C. abercornense* Exell, described above, having the same type of yellowish veins on the upper

surface of the leaves and metallic-purplish fruits. The species can be distinguished, however, by the rather prominent, often reddish, veins on the under sides of the leaves and by the smaller fruits. Another species which appears to be nearly related is *C. karaguense* Engl. & Diels, but it has glabrescent leaves which are minutely verruculose on the upper surface and have a quite different venation.

Combretum singidense Exell, sp. nov. *Arbor*?, ramulis primo tomentosis mox glabrescentibus. *Folia* opposita petiolata, petiolo ad 10 mm. longo juventute tomentoso tandem glabrescenti, lamina elliptica vel anguste elliptica vel oblongo-elliptica vel late oblongo-elliptica apice plerumque leviter acuminata basi rotundata, 5.5-15 × 2.5-7 cm., supra primo pilosa demum glabrescenti subtus dense cinereo-tomentosa lepidibus vix manifestis, costa media subtus prominente pubescenti, costis lateralibus 10-12-paribus. *Flores* tetrameri sessiles in spicas paniculatas axillares (vel in axillis foliorum delapsorum) dispositi, inflorescentiis omnino tomentosis. *Calycis lobis* late deltoidei. *Receptaculum* superius infundibuliforme, 5-5.5 × 3.5 mm., extus tomentosum intus glabrum; inferius cylindrico-ellipsoideum, 3-3.5 × 1-1.5 mm., tomentosum et sparse rufo-lepidotum. *Discus* infundibuliformis, 4 × 2.5-3 mm., margine libero 2 mm. longo densissime piloso instructus, ceteroque glaber. *Petala* reniformia breviter unguiculata, 1.5 × 2 mm., glabra. *Stamina* 8, filamentis 7-8 mm. longis, antheris 1.5-0.8 mm. *Stylus* exsertus, 13-14 mm. longus glaber. *Fructus* ignotus.

Hab. TANGANYIKA TERRITORY. Singida, 5000 ft., *B. D. Burt* 5071 (Herb. Brit. Mus.; Herb. Kew.); between Singida and Kandaajega, near Wembari Steppe, c. 3500 ft., *B. D. Burt* 5251 (type in Herb. Mus. Brit.; Herb. Kew.).

This species belongs to Sect. *Glabripetalae* Engl. & Diels, and is of the same general affinity as the two species described above. It is probably nearest to *C. gazense* Swynnerton & Bak. f., from which it can be distinguished by its distinctly larger flowers. The species of this affinity are as yet very insufficiently known. They may have to be united eventually into one or more widespread species, but for the time being it seems best to give names to the more distinct-looking forms rather than lump them together in a way which may be misleading.

Combretum Burtii Exell, sp. nov. *Arbor* parva, 2-2.5 m. alta, ramulis juvenilis mox glabrescentibus. *Folia* petiolata, petiolo 8-13 mm. longo juventute sparse lepidoto mox glabrescenti, lamina elliptica vel anguste elliptica vel lanceolata vel ovato-lanceolata apice plerumque leviter acuminata basi rotundata vel subcuneata nonnunquam inaequilaterali, 5.5-13.5 × 2.2-6 cm., supra sparse lepidota subtus dense albo-lepidota lepidibus margine contiguis, costis lateralibus 9-10-paribus.

Flores tetrameri sessiles in spicas simplices plerumque supra-axillares 5.5-7 cm. longas dispositi, pedunculo glabro. *Calycis lobi* triangulares apice acuti, $2 \times 1.6-1.8$ mm. *Receptaculum* superius apicem versus campanulatum basin versus infundibuliforme extus pubescens et dense albo-lepidotum; inferius quadrangulare vel subcylindricum, $1.8-2 \times 1$ mm., dense rufo-lepidotum ceteroque glabrum. *Discus* infundibuliformis, 2.5×2 mm., margine libero $1-1.2$ mm. alto densissime piloso instructus ceteroque glaber. *Petala* cordato-reniformia breviter unguiculata, 1.5×2 mm., glabra. *Stamina* 8, filamentis 5-6 mm. longis, antheris 1×0.8 mm. *Stylus* exsertus 6 mm. longus glaber. *Fructus* ignotus.

Hab. NORTHERN RHODESIA. Twenty-five miles from Kassama on road to Issaka, near Malole Mission, 5000 ft., *B. D. Burt* 5951 (type in Herb. Mus. Brit.; Herb. Kew.).

"On a great flat rock-outcrop several square miles in area and clothed with *Vellozia* and *Aloe*. Small bushy tree, 6-8 ft. high."

This species belongs to Sect. *Glabripetalae* Engl. & Diels and is near to *C. suluense* Engl. & Diels and *C. cognatum* Diels. It differs from both of these by the glabrous rhachides of the inflorescences and by the lower receptacles densely covered with red scales, otherwise almost glabrous.

Combretum Eylesii Exell, sp. nov. *Arbor* 5-6 m. alta, ramulis dense (in sicco) fulvo-tomentosis. *Folia* petiolata, petiolo 6-8 mm. longo fulvo-tomentoso, lamina elliptica vel lanceolato-elliptica, $6-11 \times 1.8-5$ cm., apice leviter acuminata acuta basi rotundata vel paullo cordata, supra primo tomentosa demum glabrescenti subtus primo tomentosa demum tomentella vel pubescenti et dense albo-lepidota sed lepidibus nonnunquam vix conspicuis costa media supra conspicua subtus prominente, costis lateralibus 8-10-paribus. *Flores* tetrameri sessiles in spicas simplices vel paniculatas in axillis foliorum delapsorum dispositi. *Calycis lobi* latissime ovato-acuminati, 1.5×2.2 mm. *Receptaculum* superius supra late campanulatum infra infundibuliforme, 4×4 mm., extus dense pubescens et sparse lepidotum intus glabrum; inferius ovoideo-cylindricum, 1.8×0.7 mm., dense tomentosum. *Discus* infundibuliformis, 3×2 mm., margine libero 1 mm. lato piloso instructus. *Petala* obverse elliptica vel irregulariter suborbicularia unguiculata, $2-2.5 \times 1.5-2$ mm. glabra. *Stamina* 8, filamentis 5 mm. longis glabris, antheris 1 mm. longis. *Stylus* exsertus 7 mm. longus glaber.

Hab. SOUTHERN RHODESIA. Salisbury, 4800 ft., a 15 ft. tree with yellow fugacious flowers, fl. Oct., *F. Eyles* 849 (type in Herb. Mus. Brit.); Salisbury, medium tree about 20 ft., several stems, fl. Oct., *F. Eyles* 4497 (Herb. Kew.).

This species belongs to Sect. *Glabripetalae* Engl. & Diels and is near to *C. suluense* Engl. & Diels, but has much more hairy

leaves, which are rounded or slightly cordate at the base. It also closely resembles *C. pachycarpum* Engl. & Gilg from southern Angola. The latter species, described from a fruiting specimen, has fruits 2.5 cm. long, while *Rand* 105 from Miami, S. Rhodesia, which is probably a fruiting specimen of *C. Eylesii*, has fruits about 4 cm. long.

Combretum Stevensonii Exell, sp. nov. *Arbor*, ramulis juvenilibus applanatis rufis albo-lepidotis ceteroque glabris. *Folia* chartacea opposita subopposita vel 3-nata petiolata, petiolo 1-6 mm. longo albo-lepidoto glabro basi indurato, lamina anguste elliptica vel oblongo-elliptica vel nonnunquam lanceolato-elliptica, $7-16 \times 2.5-6.5$ cm., apice plerumque leviter acuminata mucronata basi plerumque leviter sed distincte cordata, supra albo-lepidota, lepidibus conspicuis densis marginibus fere contiguis vel nonnunquam fere inconspicuis sparsis, subtus plerumque dense lepidota lepidibus marginibus fere contiguis vel nonnunquam contiguis, ceteroque omnino glabra, costa media supra insculpta subtus prominenti plerumque albo-lepidota, costis lateralibus 11-14-paribus. *Flores* tetrameri in spicas confertas in foliorum axillis (vel foliorum delapsorum) dispositi. *Calycis lobi* latissime deltoidei. *Receptaculum* superius infundibuliforme $3-3.5 \times 2.5-3.5$ mm., extus dense lepidotum intus sparse pubescens; inferius cylindricum apicem versus parum constrictum, $2 \times 0.8-1$ mm., dense lepidotum. *Discus* infundibuliformis, 1.5×1.5 mm., margine haud liber, glaber. *Petala* obovato-spathulata lutea, $2 \times 0.8-0.9$ mm., glabra. *Stamina* 8, filamentis 5-6 mm. longis biseriatim insertis, antheris ambitu orbicularibus 0.8 mm. in diam. *Stylus* exsertus 5 mm. longus glaber. *Fructus* 4-alatus ambitu ovalis, 4×3.5 cm., alis c. 10 mm. latis rigidiusculis sed vix coriaceis, corpore dense ferrugineo-lepidoto, alis sparse albo-lepidotis, stipite c. 1 cm. longo.

Hab. NORTHERN RHODESIA. Siburu Forest, 70 miles west of Livingstone, *J. Burt Davy* 581/29 (Herb. Mus. Brit.; Herb. Imp. For. Inst.), 582/29 (Herb. Mus. Brit.; Herb. Imp. For. Inst.), 583 (Herb. Imp. For. Inst.); Mazabuka Golf-course, *J. Burt Davy* 740/29 (Herb. Imp. For. Inst.); Bombwe, *J. D. Martin* 690 (Herb. Mus. Brit.; Herb. Imp. For. Inst.); Mazabuka, *R. G. Miller* A 80/34 (Herb. Imp. For. Inst.); Mazabuka, *D. Stevenson* 99 (type in Herb. Mus. Brit.; Herb. Imp. For. Inst.). BECHUANALAND. Foot of Gogha Hills, about 15 miles north of Tsotsaroga Pan, *J. Erens* 354 (Herb. Mus. Brit.).

This species belongs to Sect. *Chionanthoideae* Engl. & Diels and is very near to *C. chionanthoides* Engl. & Diels from Tanganyika Territory. It differs in having glabrous petals, a shorter upper receptacle, and lateral nerves arranged in a less regular manner. The fruits are fairly broad-winged and not of the narrow stiff-winged or merely ridged type usually found in the species of this section. So far as I know, in *C. chionan-*

thoides itself the fruits are as yet unknown. In spite of the considerable amount of material cited, *C. Stevensonii* has only once been collected with mature flowers (*Stevenson* 99, the type) and even in this specimen the inflorescences are very immature and only a few flowers were available for dissection. The indications are that the fully developed inflorescence would be an axillary panicle of dense spikes, as in *C. capituliflorum* Fenzl and various other species of the section. Some of the sterile material cited is from coppiced trees and may be somewhat abnormal, the leaves being almost sessile.

The following native names are recorded for this species:—
"Chikalanga" (Tonga), "Mukwanku," "Manjubaro."

Combretum tetrandrum Exell, sp. nov. *Frutex* vel *arbor* parva, ramulis glabris vel sparse puberulis demum cortice griseo obtectis. *Folia* opposita, petiolata, petiolo 4-5 mm. longo, primo pubescenti mox glabrescenti, lamina obovata obovato-elliptica vel elliptica apice acuminate acuta basi cuneata, 3-6 × 1.5-3 cm., supra costa media puberula excepta glabra, subtus in nervorum axillis pilosula et vix conspicue lepidota, lepidibus sparsis rufis minutis, ceteroque glabra. *Flores* minuti tetrameri sessiles in paniculas terminales c. 5 cm. longas et spicas axillares dispositi, bracteolis filiformibus 1-5 mm. longis pubescentibus, rachide pubescenti. *Receptaculum* superius cupuliforme, 0.8 × 1.2 mm., pubescens, apicem versus leviter constrictum, calycis dentibus deltoideis minutis 0.4 mm. longis reflexis; inferius 2.5 mm. longum, pubescens, apicem versus attenuatum incurvum, basin versus ferrugineo-lepidotum. *Discus* 0.8 mm. in diam., glaber, margine libero brevissimo. *Petala* 4, ovato-elliptica, 0.8 × 0.6 mm., glabra. *Stamina* 4, petalis opposita, filamentis 0.3 mm. longis, glabris, antheris 0.2 × 0.4 mm. *Stylus* 0.7 mm. longus, glaber. *Fructus* parvus glaber ambitu ovalis vel suborbicularis, 1-1.5 × 0.9-1.1 cm., 4-alatus, alis 4 mm. latis.

Hab. N. RHODESIA. Hills near Mweru, Wantipa, fl. Nov., W. Allen 3 (type in Herb. Mus. Brit.; Herb. Imp. For. Inst.); Abercorn, Luju valley escarpment, 3500 ft., fr. March, C. G. Trapnell 1726 (Herb. Kew.); Abercorn, lower Luju valley, 2500-3000 ft., fr. March, C. G. Trapnell 1742 (Herb. Kew.); Mporokoso district, Mweru, Wantipa, fl. Sept., C. G. Trapnell 1782 (Herb. Kew.).

"Spreading shrub or small tree of thickest" (*Trapnell*).

This differs from all other species of *Combretum* known to me by having only four stamens, opposite to the petals, the outer whorl of stamens being completely absent. It is also distinguished by its numerous tiny flowers with cup-shaped upper receptacles slightly closed at the apex.

When I first received Allen's material, about eight years ago, I was uncertain whether to describe it as a new genus or not

and decided to wait for the fruit to be collected. Trapnell has fortunately now supplied this and it turns out to be a typical *Combretum*-fruit, so that I consider the species to be a reduced type of *Combretum* for which a new section is required:—

COMBRETUM sect. **Haplostemon** Exell, sect. nov. *Flores* tetrameri parvi. *Receptaculum* superius cupuliforme. *Stamina* 4, petalis opposita. *Fructus* 4-alatus. *Folia* subtus vix conspicue lepidota.

Type-species: *Combretum tetrandrum* Exell.

ANNOTATIONES SYSTEMATICÆ.

By A. J. WILMOTT.

III. LEONTODON LEYSSERI (WALLR.), COMB. NOV.

It has been demonstrated by Lacaita (*Journ. Bot.* lvi. 97-105, 1918) that *Leontodon hirtus* L. is not the plant long known to British botanists as *Thrincia hirta* Roth, but is *Leontodon Villarsii* Lois., and also that the epithet "*nudicaulis* (L.)" is not available to replace it for the British species, since *Crepis nudicaulis* L. is also either *Leontodon Villarsii* or is a *nomen confusum*. Lacaita used the name *Thrincia taraxacoides* (Vill.) Lacaita, but pointed out in a footnote (p. 104) that in *Leontodon* another new combination would be required owing to the fact that *Leontodon taraxacoides* Mérat "is a nullity." He [Mérat] quotes "*Leontodon taraxacoides* Willd.," a name that does not exist, and only gives a diagnosis insufficient for the recognition of his plants. Under the present International Rules, the existence of this confused name of Mérat's must count as an earlier homonym, which prevents the correct transference of Villars's epithet to *Leontodon*, and another name must, therefore, be found for the British plant known as *Thrincia hirta*.

When revising the nomenclature for the tenth edition of Babington's Manual, I investigated *L. hirtus* L. with Mr. Lacaita's assistance, but was doubtful concerning the availability of the epithet "*taraxacoides*," and preferred to use the name *T. Leysseri* Wallr. (*Sched. Crit.* 441, 1822). Wallroth created his new name because he found that Roth was in error in attributing *Leontodon hirtus* L. to the plant which he called *Thrincia hirta* instead of to the Mediterranean plant *L. Villarsii*. Wallroth's epithet is therefore available for transference to *Leontodon* by those who place the plant in that genus, and as this is being done in the forthcoming Flora of Devon, I now make this combination for use in that work.

TWO NEW *ASPERGILLUS* MUTANTS.

BY EDWARD YUILL.

(PLATE 618.)

In their Monograph on the *Aspergilli* Thom and Church (1) express the view that mutations probably account for the existence of many of the known species of this genus, particularly of those which differ from each other mainly in colour. Support for this view is to be found in the fact that spontaneous production of mutants under laboratory conditions of culture is gradually enlarging the content of the genus. Since Schieman (2) published her account of mutations from *A. niger* in 1912, several instances from other species in the genus have been reported. The present note records and describes two further examples. These appeared early in 1937 and so far as can be ascertained have not hitherto been described.

1. *Buff Mutant from A. fumigatus*.—This was found as a single light buff head among the dark blue-green heads of a colony of *A. fumigatus*. This colony was one of a number which developed on plates of Kardo-Ssyssojewa solution * agar exposed to the air of a dusty warehouse. The buff head was removed to a plate of Malt agar and one further subculture secured the isolation of the variant. The light buff colour of the heads has remained constant in a series of transfers extending over two years.

Apart from the colour difference, there is nothing to distinguish this mutant from the strain of *A. fumigatus* from which it was derived. On Czapek solution agar the colony colour is pale pinkish buff (Ridgeway XXIX 17'f). The reverse of the mould and the medium itself become coloured a flesh tint (Ridgeway XIV 7'd) or flesh ochre (Ridgeway XIV 9'b). On Prune agar and Malt agar the colony colour is light buff (Ridgeway XV 17'f).

It is proposed to designate this form: *Aspergillus fumigatus* Fres. mut. *helvola*.

2. *White Mutant from A. nidulans*.—This occurred as a group of white heads in a single colony of *A. nidulans* on a plate of Wort agar. The plate had been exposed to the air in a garden shed and a varied assortment of colonies of *Penicillia*, *Aspergilli*, and other moulds developed. The colony of *A. nidulans*, which

* This medium contains:—

NH ₄ NO ₃	0.3 per cent.	ZnSO ₄	0.02 per cent.
KH ₂ PO ₄	0.1 per cent.	FeSO ₄	0.02 per cent.
MgSO ₄	0.1 per cent.	Agar	1.5 per cent.

FIG. 1.

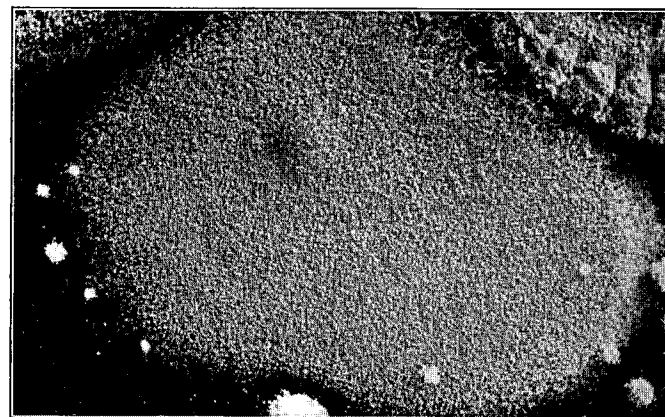


FIG. 2.

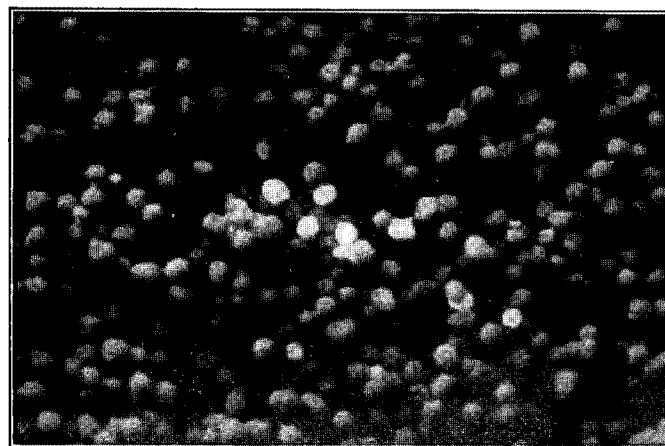
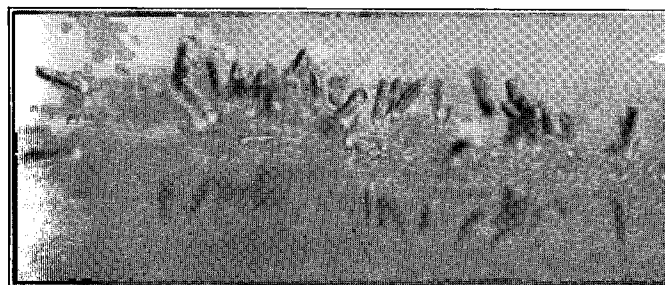


FIG. 3.

*Aspergillus nidulans* and white mutant.

was quite devoid of Hülle cells and perithecia, is illustrated in Pl. 618, fig. 1. In fig. 2 a portion of the same colony is magnified to show the group of white heads. One of these heads was removed—not without touching the surrounding green heads—and transferred to a plate of Wort agar. The resulting growth, a mixture of the two forms as was to be expected, contained areas of white heads large enough to allow of subculture without further contamination. The green portions were also subcultured. After a few days' incubation at 28° C., indications of perithecial formation were seen in both the green and white subcultures. The presence of perithecia was confirmed in due course; each perithecium was surrounded by Hülle cells. In size and colour no certain difference could be detected between the perithecia, asci, or ascospores of the mutant and those of the *A. nidulans* strain from which it arose.

Several isolations of single ascospores were then made from mature perithecia of the mutant, and each ascospore, after incubation on Malt agar, produced a pure white conidial colony. Mass transfers from these colonies gave cultures bearing perithecia and white conidial heads.

Since the original isolations, subcultures have been made over a period of two years both of *A. nidulans* and the mutant, and these have both remained stable and have produced conidia and perithecia regularly.

The name proposed for this variety is *Aspergillus nidulans* (Eidam) Winter mut. *alba*.

Cordial acknowledgment is made to Dr. Charles Thom of the U.S. Department of Agriculture for examining the cultures of the mutants and for confirming that they should be described as such. Thanks are also due to Mr. J. Ramsbottom for suggestions as to nomenclature, and to the Directors of Messrs. John & E. Sturge (Citric), Ltd., for permission to publish this account of work done in their laboratories.

REFERENCES.

- (1) THOM, C., & CHURCH, M. B. (1926.) 'The *Aspergilli*,' pp. 25–31.
- (2) SCHIEMANN, E. (1912.) "Mutationen bei *Aspergillus niger* van Tieghem." Z. indukt. Abstamm. -u. Vererblehre, viii. 1.

EXPLANATION OF PLATE 618.

Fig. 1. Colony of *A. nidulans*. × 3.

Fig. 2. Portion of same colony further magnified to show group of white heads. × 55.

Fig. 3. Typical heads of *A. nidulans*. × 44.

INTERNATIONAL BRYOLOGICAL NOMENCLATURE.

By H. N. DIXON, M.A., F.L.S.

THE following is the substance of a letter sent to the members of the International Special Committee for Nomenclature (Musci). Replies were received from all of the seven members.

I.

With regard to the selection of Standard Species (Lectotypes) for the Nomina Generica Conservanda of Mosses adopted by the Cambridge and Amsterdam Conferences. A list was given of the proposed species, nearly all of which were agreed to unanimously. One member would have preferred *Ditrichum pusillum* (Hedw.) as the standard species, in the place of *D. homomallum* (Hedw.).

It was at first suggested that *Myurium rufescens* Fleisch. would be a more satisfactory type of the genus, being based on a perfect, fruiting plant, while *M. hebridarum* was described from a sterile plant; but this is rendered impracticable by the Rules, as *M. hebridarum* was the only species described under the genus at the time of publication.

II.

It is further suggested that *Gymnostomum aestivum* Hedw. be placed on the list of Nomina Dubia, as there is some doubt whether it is identical with *Anoectangium compactum* Schwaegr. (for one thing, *G. aestivum* was based upon a *paludal* moss). If this is agreed to, the name for the type-species will be *Anoectangium compactum* Schwaegr. (Suppl. I. pt. i. p. 36, t. 11, 1811).

III.

The widespread and familiar plant (*a*) known variously as *Hypnum myosuroides* L., *Isothecium myosuroides* Brid., *Eurhynchium myosuroides* Schimp., has been shifted from one genus to another, but has always retained the specific epithet *myosuroides*.

Unfortunately, Hedwig (who omits this species) has in the Sp. Musc. applied the epithet to another, but allied species (*b*), the plant usually known as *Isothecium myurum* Brid. (*Hypnum myosuroides* var. β L. Sp. pl.), but it has been used scarcely, if at all, by any author, for that species, since 1801; while the epithet *myosuroides* has been applied to the first-named species (*a*) by every author, without exception, since at least 1801.

This appears to justify the application of Art. 62 of the International Rules, viz., "A name of a taxonomic group must be rejected if, owing to its use with different meanings, it becomes a permanent source of confusion or error." The transference of the epithet *myosuroides* from species (*a*), for which it has been universally employed, to species (*b*), for which it has been

practically never used, would lead to endless confusion, besides necessitating a new specific epithet for the former. It is proposed, therefore, to place the name *Hypnum myosuroides* Hedw. Sp. Musc. on the list of Nomina Ambigua. The species (*b*) then, to which Hedwig applied the name, will continue to be known as *Isothecium myurum* Brid., Bry. univ. ii. 367 (1827) (*Hypnum myurum* Brid., Musc. rec. II. pt. ii. 166 (1801); while species (*a*) will be known as *Isothecium myosuroides* Brid. *op. cit.* (1827), p. 369 (*Hypnum myosuroides* Brid. *op. cit.* (1801), p. 168). This assumes that both species are retained in *Isothecium*, which seems to be the generally accepted modern arrangement; but the specific epithets will remain the same in any arrangement. Grout in the 'North American Moss Flora' has cut the Gordian knot by creating for species (*a*) the new genus *Pseudisothecium*; but even if this course is generally adopted, which is doubtful, Hedwig's epithet *myosuroides* would still have to be applied to species (*b*) instead of its almost universally known name of *I. myurum*. In any case, therefore, it appears to me desirable to place Hedwig's name in the list of Nomina Ambigua.

This was agreed to unanimously.

The following proposals will therefore be made at the Stockholm Conference:—

I.

That the name *Gymnostomum aestivum* Hedw. Sp. Musc. p. 32, be placed on the list of Nomina Dubia.

II.

That the name *Hypnum myosuroides* Hedw. Sp. Musc. p. 266, be placed on the list of Nomina Ambigua.

III.

That the following be the Lectotypes (Standard Species) for the Nomina Generica Conservanda adopted at the Cambridge and Amsterdam Conferences:—

ACIDODONTIUM Schwaegr.	<i>A. megalocarpum</i> (Hook.) Ren. & Card. Syn. <i>A. Kunthii</i> Schwaegr.
ALOINA Kindb.	<i>A. aloides</i> Kindb., Laubm. Schwed. u. Norw. p. 136 (1883).
AMPHIDIUM Schimp.	<i>A. lapponicum</i> Schimp. Bry. eur., Coroll. 39 (1856).
ANACOLIA Schimp.	<i>A. Webbii</i> Schimp. Syn. ed. ii. p. 513 (1876).
ANOECTANGIUM Schwaegr.	<i>A. compactum</i> Schwaegr. Suppl. i. pt. i. p. 36, t. 11 (1811). Syn. <i>A. aestivum</i> (Hedw.) Bry. eur. fasc. 29-30, t. 37 (1846) ?
ATRACTYLOCARPUS Mitt.	<i>A. mexicanus</i> Mitt. in Journ. Linn. Soc., Bot. xii. 71 (1869).

- ATRICHUM P. Beauv. *A. undulatum* (Hedw.) P. Beauv. Prodr. 42 (1805).
- AULACOMNIUM Schwaegr. *A. androgynum* (Hedw.) Schwaegr. Suppl. iii. part 1, Mon. p. 2, n. 1 (1827).
- BARTRAMIDULA Bry. eur. *B. Wilsoni* Bry. eur. fasc. 29-30, t. 327 (1846).
- CROSSIDIUM Jur. *C. squamigerum* (Viv.) Jur. Laubm. v. Oesterr.-Ung. p. 127 (1882).
- CYNODONTIUM Schimp. *C. polycarpum* (Hedw.) Schimp., Bry. eur., Coroll. p. 12 (1855).
- DISTICHUM Bry. eur. *D. capillaceum* (Hedw.) Bry. eur. fasc. 29-30, t. 193 (1846).
- DITRICHUM Hampe *D. homomallum* (Hedw.) Hampe in Flora, l. 182 (1867).
- DRUMMONDIA Hook. *D. prorepens* (Hedw.) Jennings, Mosses of W. Penns. p. 116 (1913). Syn. *D. clavellata* Hook.
- EPHEMERELLA C. M. *E. recurvifolia* (Dicks.) Schimp. Syn. 1, p. 7 (1860). Syn. *E. pachycarpa* C. M. Syn. i. 34 (1848).
- GYMNOSTOMUM Smith *G. calcareum* Bry. germ. i. 153, t. 10 (1823).
- GYROWEISIA Schimp. *G. tenuis* Schimp. Syn. ed. ii. p. 38 (1876).
- HAPLOHYMENIUM Doz. & Molk. . *H. triste* (Ces.) Kindb. in Rev. Bryol. xxvi. 25 (1899).
- HOOKEERIA Sm. *H. lucens* Sm. in Trans. Linn. Soc. ix. 275 (1808).
- HYGROAMBLYSTEGIUM Loeske . *H. tenax* (Hedw.) Jennings, Mosses of W. Penns. p. 227 (1913). Syn. *H. irriguum* (Wils.) Loeske, Moosfl. d. Harz. p. 299 (1903).
- HYPNUM Hedw. *H. cupressiforme* Hedw. Sp. M. p. 291 (1801).
- LEPIDOPILUM Brid. *L. polytrichoides* (Hedw.) Brid. Bryol. univ. 11, 269 (1827).
- LEPTOSTOMUM R. Br. *L. macrocarpum* (Hedw.) R. Br. in Trans. Linn. Soc. x. 322 (1811).
- LEPTODON Mohr. *L. Smithii* Mohr. Observ. p. 27 (1803).
- LEUCOLOMA Brid. *L. bifidum* Brid. Bryol. Univ. 11, 218 (1827).
- MITTENOTHAMNIUM Hennings . *M. reptans* (Hedw.) Card. in Rev. Bryol. xl. 21 (1913).
- NECKERA Hedw. *N. pennata* Hedw. Sp. M. p. 200 (1801).
- PAPILLARIA C. M. *P. nigrescens* (Hedw.) Jaeg. Adumbr. p. 169 (1874-5).
- PLATYGYRIUM Bry. eur. *P. repens* (Brid.) Bry. eur., fasc. 46-67, t. 458 (1851).
- PTERYGONEURUM Jur. *P. ovatum* (Hedw.) Dix. in Rev. Bryol. n.s. vi. 96 (1933). Syn. *P. cavifolium* (Ehrh.) Jur., Laubmfl. Oesterr.-Ung. p. 95 (1882).
- PTYCHOMITRIUM Fürnr. *P. polyphyllum* (Sw.) Fürnr. in Flora, xii. Erg. 2, 19 (1829).
- TORTELLA Limpr. *T. humilis* (Hedw.) Jennings, Mosses of W. Penns. p. 95 (1913). Syn. *T. caespitosa* (Schwaegr.) Limpr.
- TRICHOSTOMUM Hedw. emend. Bruch. *T. brachydontium* Bruch in Flora, xii. 393 (1829), fig. iii.

NOTES ON BRITISH CARICES.—III.

By E. NELMES AND T. A. SPRAGUE.

CAREX DIVERSICOLOR.

The name *Carex diversicolor* Crantz was adopted by Druce (Fl. Bucks, 369 (1926); Fl. Oxfordsh. ed. 2, 461 (1927); Brit. Plant List, ed. 2, 121 (1928); Fl. Northants, 256 (1930) * in place of *Carex flacca* Schreb., which is the correct name for the species concerned. Incidentally it may be pointed out that *C. flacca* Schreb. (1771) antedates *C. glauca* Scop. (1772). Kükenthal (Engl. Pflanzenreich, iv. 20, Cyperaceae-Caricoideae, 416: 1909), following Nyman (Consp. Fl. Eur. 774, n. 66, 1881) and Richter (Pl. Europ. i. 160, n. 95, 1890), attributed the binary name *Carex glauca* erroneously to Murray, Prodr. Stirp. Gotting. 76 (1770), where this name does not occur, although the species is mentioned on that page under the phrase-name *Carex spicis maribus una, plurimis femineis pendulis, capsulis ovato-triquetris, confertis* Hall. Hist. 200, n. 1408 (1768).

A detailed study of Crantz's Institutiones Rei Herbariae (1766) shows that it is an abridgement of Linnaeus, Species Plantarum, ed. 2 (1762-3), rearranged under fifteen more or less natural Classes. His account of the genus *Phlox* (Inst. ii. 343) may be taken as typical of his treatment. The same ten species occur under the same names in the same numerical order and with the same diagnoses as in Sp. Pl. ed. 2, i. 216. Two of them are accompanied only by the diagnostic phrase, seven others have in addition a reference to a single illustration, and only one species, *Phlox paniculata*, has references to two illustrations.

Turning to *Carex* (Inst. i. 401-405), we find the same thirty-seven species as in Linnaeus (Sp. Pl. ed. 2, ii. 1379-1389). Thirty-six of them bear the same names, and no. 35, *Carex acuta* L., is re-named *Carex diversicolor* Crantz, although it is accompanied by exactly the same diagnostic phrase: "spicis masculis pluribus, femineis subsessilibus, capsulis obtusiusculis." It

* It may be useful to supply various incidental references to *C. diversicolor* by Druce from 1917 to 1932 in Rep. Bot. Exch. Club Brit. Isles:—

- Carex diversicolor* Crantz; Druce, l. c. vi. 253 (1921); vi. 533 (1922); viii. 487 (1928); viii. Suppl. 92 (1929); ix. 675 (1932).
C. versicolor [sic] var. *stictocarpa* (Sm.) Druce, l. c. iv. 507 (1917).
C. diversicolor var. *aggregata* (Reichb.) Druce, l. c. v. 843 (1920).
C. diversicolor var. *composita* Druce, l. c. vii. 219 (1924).
C. diversicolor var. *bulbosa* (Drejer) Druce, l. c. ix. 142 (1930).

The name *C. diversicolor* Crantz has been adopted also by Salmon, Fl. Surrey, 631 (1931); Horwood and Noel, Fl. Leics. 596 (1933); Wolley-Dod, Fl. Sussex, 485 (1937); A. Wilson, Fl. Westmorel. 248 (1938); and Praeger in Stewart & Corry, Fl. N.E. Ireland, ed. 2, 244 (1938).

should accordingly be clear that *C. diversicolor*, being a superfluous name for *C. acuta*, is illegitimate (Internat. Rules, Art. 60).

Other examples of Linnaean specific epithets changed by Crantz are :—*Schoenus coloratus* L. (Sp. Pl. ed. 2, i. 64) replaced by *S. capitatus* Crantz (Institut. i. 408); *Cyperus Papyrus* L. (l. c. 70) by *C. papyraceus* Crantz (l. c. 411); *Moehringia muscosa* L. (l. c. 515) by *Alsine moehringia* [sic] Crantz (l. c. ii. 405); and *Euphorbia Cyparissias* L. (l. c. 661) by *E. cyparissus* [sic] Crantz (l. c. ii. 462). The generic name *Ajuga* L. was rejected by Crantz in favour of "*Bugula omnium*."

A single illustration is cited by Crantz under *Carex diversicolor*, namely, Mich. Gen. 62, t. 32, f. 12. This was cited by Linnaeus under *C. acuta* var. β and Crantz accordingly adds the words "*Varietatis β* " (belonging to variety β) in order to indicate this. Druce, seeing only a figure of *Carex acuta* var. β cited under *Carex diversicolor* Crantz, apparently assumed that *C. diversicolor* was a new name for *Carex acuta* var. β which he identified with *C. flacca* Schreb. This assumption is erroneous, as is evident from the following examples :—

Under *Festuca elatior*, Crantz (l. c. i. 392) cites two illustrations, one (Morison's) placed by Linnaeus (l. c. 111) under var. α (without the symbol), the other (Buxbaum's) placed under var. β . He adds the words "*Varietatis β* ," which apply only to the second illustration cited. Under *Alsine moehringia* Crantz (l. c. ii. 405) also cites two illustrations, one (Scheuchzer's) placed by Linnaeus (l. c. 515) under var. α (without the symbol), the other (Morison's) placed under var. β . These citations of illustrations are followed by the words "*varietatis β* " which in this case also apply only to the second one.

Under *Trifolium hybridum* L., Crantz (l. c. ii. 41-2) is more precise : he cites figures of Micheli and Vaillant and adds "*Figura Vaillantii est varietatis β* ." Under *Lotus corniculatus* L., Crantz (l. c. 67) mentions that the figure of this species in Dod. Pempt. 573 [ed. 1616] is good. He recognizes var. γ *tenuifolius* L. and adds the words "*Varietas β* " : these apparently mean : "there is (also) a variety β ." The alternative meaning, "it is variety β " seems improbable, since, if Crantz had united the Linnaean varieties β and γ under the name var. *tenuifolius*, he would presumably have adopted the symbol β for that variety. Under *Corylus avellana* [sic] Crantz (l. c. i. 159) includes no varieties, but adds "*Varietates Bauh. habet*" (Bauhin recognizes varieties). Under *Lactuca scariola* [sic] Crantz (l. c. 277) cites three illustrations as follows :—

"*Lactuca sylvestris* etc. Moris. iii. S. 7. T. 2. F. 17. Herm. Parad. T. 191. Varietas β .

γ *Lactuca sylvestris annua*, costa spinosa etc. Moris. iii. p. 58."

This is apparently an abridgement of the following :—

"*Lactuca sylvestris laciniata* Moris. Hist. iii. S. 7. T. 2. F. 17.

β *Lactuca sylvestris italica*, costa spinosa, sanguineis maculis adspersa Herm. Parad. T. 191.

γ *Lactuca sylvestris annua*, costa spinosa, folio integro colore caesio Moris. Hist. iii. p. 58."

In order to save two lines, Crantz abbreviates the first two synonyms to "*Lactuca sylvestris* etc." which might give the erroneous impression that the two diagnostic phrases were the same. He adds "*Varietas β* ," which evidently applies only to the citation from Hermann. He does not seem to have realized that extreme compression of this kind might lead to ambiguity.

Crantz's remark under *Serratula alpina* (l. c. i. 259), "*sunt icones. Varietatum. β . γ . δ* ," might be taken to mean that all the illustrations cited were of varieties β , γ , and δ , whereas the first Gmelin figure (t. 26) was cited by Linnaeus (l. c. 1145) under var. α , and was presumably assigned to that variety by Crantz. Apparently what Crantz meant was that his second and following references belonged to varieties β (Gmel. l. c. t. 32), γ (Hall. Helv. t. 22; Moris. Hist. iii. sect. 7, t. 29, f. 1; Clus. Hist. ii. 151) and δ (Gmel. l. c. t. 33).

On the other hand, Crantz's references to the two figures cited under *Centaurea cineraria* [sic] (l. c. i. 253) are quite unambiguous : "*Iacea montana candidissima* etc. Moris. iii. S. 7. T. 26. F. 20. et β Barr. Ic. 347 et 348."

In view of the foregoing analysis of Crantz's work, the idea that *Carex diversicolor* Crantz was a new name for *C. acuta* var. β L. (Sp. Pl. ed. 2, 515) as typified by Mich. Gen. 62, t. 32, f. 12 is clearly erroneous. It was a new name for *C. acuta* L. sensu lato, and should not be used in place of *C. flacca* Schreb.

PTERIDIUM AQUILINUM (L.) KUHN IN LONDON.

By J. EDWARD LOUSLEY.

THE occurrence of Bracken in the heart of London has previously been recorded by Shenstone from Farringdon Street, Upper Thames Street, and St. John's Street, Clerkenwell (Journ. Bot. i. 117 seq., 1912). As he recorded it from three out of the five "building-sites" examined it would appear that this fern occurs more frequently in the centre of London than one would have expected. Shenstone explained its presence as introduced in the "rough forage given to horses in their nose-bags" or in

"packing material", but neither of these explanations seems entirely satisfactory. Even the roughest forage given to horses would not normally contain bracken, and, indeed, at Shenstone's Bloomsbury site, where forage plants were most numerous, this fern was absent. It is true that *Pteridium aquilinum* may be occasionally brought into London as packing or litter, but this is probably not a very common practice, and it could not possibly explain the following occurrence.

On the north side of Houndsditch, E.C. 3, a large block of buildings was partially demolished a few years ago. For some reason the basements covered in by the ground floors were left standing, together with a few feet of the outer walls. On the remains of the walls several strong clumps of the Bracken now flourish.

In such a position the plants must have grown from spores, and supposing that it would have been impossible for viable spores to be present in the mortar of those old buildings, they must almost certainly have been brought there by air. There can be no doubt that the Bracken reproduces from spores far more frequently than is generally supposed. I have already given some records of the sporelings (Journ. Bot. lxxiv. 201, 1936), and have since seen them at Limpsfield and Wisley, Surrey, and elsewhere.

That such sporelings may originate from spores brought by air-currents is proved by a colony which can be seen growing on the face of a wall at a height of about eight feet above the road near the junction of Kew Road and Lower Mortlake Road, Richmond, Surrey. In such a position they could scarcely be brought by birds, which would drop them on the top rather than the side of a wall.

Bracken has now been eliminated by trampling and cultivation from the Commons and Parks near to the heart of London, and it is almost certain that the nearest* spore-producing colony to Houndsditch would be at least five miles away; that to the wall at Richmond is a much shorter distance. In view of the extreme lightness of the spores there is no apparent difficulty in accepting the proposition that they could be carried for five miles or more.

At some of Shenstone's stations there was the possibility that the spores had remained dormant in the soil from earlier days, but in view of the Houndsditch and Richmond occurrences here recorded, it is suggested that it is highly probable that most plants of Bracken found in the centre of London owe their origin to recent introduction of spores from the surrounding country by means of air-currents.

* There is a colony in the shrubbery of Russell Square Gardens, but this probably does not produce spores, and neither do the occasional plants which occur on the railway tracks near the centre of London.

REPOSITORIES FOR BOTANICAL TYPE-SPECIMENS.

BY WILLIAM W. DIEHL.

(Bureau of Plant Industry, U.S. Department of Agriculture,
Washington, D.C., U.S.A.)

A FEW months ago there appeared in this Journal (F. R. Fosberg, "A Central Repository for Type-specimens," lxxvi. 327-330 (1938)), a serious plea that a single repository for all type-specimens of plants be established somewhere out of the zone of threatened international conflicts, implying that in such an asylum types would escape annihilation so likely in the event of war. If any one sanctuary on this planet could be found where valuable herbaria, as well as other materials precious to human culture, might be preserved against destruction surely no voice would be raised in opposition. But this well-intentioned proposal involves as a first practical difficulty the finding of a place, whether in the fastnesses of the Rocky Mountains or in the interior of the Sahara, remote enough to be inaccessible to airplanes—to say nothing of earthquakes and other dangers. Had such a single repository existed at a seemingly safe place up to 1914 at one of various points in Belgium or northern France, or prior to 1938 at Chillan, Chile, or in eastern China, it is doubtful if its precious contents would exist to-day. The destructive effect of a single high-explosive bomb or of an earthquake accompanied by fire is too generally appreciated to require elaboration in discussion. The proposal if acted upon would seem actually to make certain the annihilation of all type-specimens at one stroke. In the past certain comparably irreplaceable incunabula have been destroyed simply because they happened to be aggregated at one place at a time of some local disturbance—war, fire, or earthquake. The proposal to bring all type-specimens into one collection would seem to invite disaster; unquestionably, it flouts the time-proven admonition against "putting all the eggs into one basket."

After all, is it not preferable to have many repositories, providing that each is well cared for and is accessible for use? The advantages secured through distributing specimens by means of "plantae exsiccatae" and of duplicating types by various means in addition to published illustrations have received considerable attention in various quarters at one time or another and are, of course, generally recognized. The more types that are duplicated and distributed over the world the more certain is their ultimate preservation. The practical value of duplicates in separate collections is well attested by the evidence offered by herbaria of fungi where minute fragments of types, microscopic preparations, and other duplicates as well as standard "fungi exsiccati" are given special consideration. In herbaria of

material less readily duplicated the problem is less simple. But moderate duplication in institutions scattered over the world is reasonably practicable and enables qualified workers to study them without excessive hardships of travel and expense.

To the taxonomist to-day one of the greatest needs is ready information as to where certain types or duplicates and standard "exsiccatae" are to be found. All too often merely to find such specimens is excessively burdensome. Since the publication of the inadequate list of herbaria noted in De Candolle's 'Phytographie' in 1880, there has appeared no suitable guide, although several abortive efforts have been initiated. Such a guide to desiderata would naturally be superfluous once all significant specimens were housed in one place!

OBITUARY.

MARY FLORENCE RICH (1865-1939).—We regret to record the death of Miss Rich, who for many years contributed to the pages of this Journal. After studying at Somerville College, Oxford, she taught at Roedean and then established a girls' school at Leicester. Though not trained as a botanist she became interested in freshwater algæ more than thirty years ago, and published a series of papers in collaboration with Professor F. E. Fritsch. After her retirement in 1923 she came to London, and for the last few years was honorary research assistant in the Department of Botany at Queen Mary (East London) College. She was a well-known and popular figure at the meetings of the Linnean Society.

REVIEW.

Cotton: History, Species, Varieties, Morphology, Breeding, Culture, Diseases, Marketing and Uses. By HARRY BATES BROWN, A.M., Ph.D. Second Edition. 8vo, pp. xiii+592. McGraw-Hill Publishing Co., Ltd: London, 1938. Price 30s

By general revision and the inclusion of the results of investigations carried out during the last twelve years the author, with the assistance of collaborators, has brought up to date a scientific practical handbook on cotton as a crop plant which was first published in 1926. While not omitting reference to cotton production in other countries, the book is mainly concerned with the upland cotton-growing industry of the United States cotton belt—still the pre-eminent cotton-producing area of the world—and covers in varying detail the range of the industry from the taxonomy of the cotton plant to the weaving of cotton fabric. In addition to the history of cotton and its botanical aspects, chapters are devoted to the chemistry of the cotton plant, soils and fertilisers, cultural methods, pests and diseases, harvesting and ginning, grading and marketing,

while others discuss the economics and statistical aspects of cotton productions, cotton exchanges, the uses and spinning qualities of the fibre, cotton-seed products and, in brief outline, the making of cotton cloth. The book is the best general account of the subject available, and calls to mind its classic prototype 'The Cotton Plant,' long since out of print, issued as Agricultural Bulletin No. 33 (1896) by the United States Department of Agriculture, to which frequent reference is made in the useful bibliographies quoted.

To readers of this Journal probably the most interesting section of the book would be that dealing with the taxonomy of the commercially cultivated cotton plants. Not only would that interest be concerned with the classification itself, but with the modern cytological criteria on which it is based, since the primary grouping of the species is:—"A: New World species with 26 haploid chromosomes," and "AA: Old World species with 13 haploid chromosomes." The former group contains *Gossypium hirsutum* L. (American Upland, Dharwar cotton, the most important cultivated cotton), *G. brasiliense* Macfayden (kidney cotton, with the seeds united), *G. barbadense* L. (the long-stapled Sea Island and Egyptian cottons), *G. peruvianum* Cav. (Peruvian cotton) and *G. purpurascens* Poir. (Bourbon or Porto Rico cotton): the second group comprises *G. arboreum* L. (tree cotton), *G. nanking* Merjen (Chinese or Siam cotton) and *G. herbaceum* L. (Levant or Arabian cotton). The "26 haploid" group is by far the more important commercially, and the outstanding species are *G. hirsutum*, from which so many cultivated cottons have been derived, and *G. barbadense*, the Sea Island types of which are again attracting much industrial attention in this country. As will be recalled, the species of *Gossypium* were exhaustively studied by Sir George Watt in his monograph on 'Wild and Cultivated Cotton Plants of the World.'

The work is an example of the best type of modern book on economic botany: it reveals to the practical man how much the improvement and development of his crop plant depends upon purely scientific work; and demonstrates that there is nothing incompatible between investigation designed for strictly utilitarian ends and the enjoyment to be derived from what otherwise might well seem to be purely academic research.

S. E. CHANDLER.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the general meeting on April 27th Miss Dora Stafford gave an account of the flora of Southern Peru, based on three botanical expeditions during the past twelve years; the lecture was illustrated by lantern-slides, many of which were coloured. Professor C. Skottsberg followed with 'Remarks on the Hawaiian islands,' in which he

analysed the flora and traced its connexion with other regions; the lecture was illustrated by coloured lantern-slides.

At the general meeting on May 11th Dr. Lloyd Praeger gave the Hooker Lecture on "The relations of the flora and fauna of Ireland to those of other countries," a subject on which he is the recognised authority. The lecture will provide a useful summary of the present opinion regarding numerous and interesting controversies, with many illuminating comments.

At the Anniversary Meeting on May 24th Mr. J. Ramsbottom took as the subject of his Presidential Address "The expanding knowledge of mycology since Linnaeus." The peculiar characteristics of fungi gave rise to many discussions, first whether they were organisms, then whether they possessed seeds, then whether they were stages in the life-cycles of animals, or animals, or neither animals nor plants. The manner in which the spores are borne, the nature of parasitic fungi, pleomorphy, heterocicism—all provided much for discussion, until certain clear ideas emerged, though many problems, such as those of sex, are still matters of debate.

FOREIGN MEMBERS OF THE LINNEAN SOCIETY.—Professor Alfred Ernst of Zurich, Dr. William Marius Docters van Leuwen, formerly of Buitenzorg, Dr. Alfred Rehder of the Arnold Arboretum, and Professor William Albert Setchell of California have been elected Foreign Members of the Linnean Society.

JOHN ARDAGH.—The many who have benefited from Mr. Ardagh's extensive knowledge of botanical literature and his ready help in the library of the Department of Botany will wish to congratulate him on his election as an Associate of the Linnean Society.

THE first part of volume xlv. of the 'Nuovo Giornale Botanico Italiano' is devoted to an account of the celebrations of the fiftieth Anniversary of the Società Botanica Italiana, and the commemoration of the bicentenary of the death of Pier Antonio Micheli. The volume consists of 248 pages and has a photograph of a bust of Micheli as a frontispiece. The papers presented cover a wide field, but those of interest particular to the occasion are the discourses by the President, N. Passerini, on the origin of the Society and on Micheli as the founder of the Società Botanica Fiorentina (the first-formed botanical society of the world) and the precursor of the Società Botanica Italiana; a commemorative oration by G. Negri on Micheli, and a paper on Bruno Tozzi (1656-1743); and an account of the first fifty years of the Society by A. Chiarugi.

THE latest number of the "Mededeelingen van het Botanisch Museum en Herbarium van de Rijks Universiteit te Utrecht" was published on May 18th, and was issued as part of the

celebrations of the silver jubilee of Professor A. A. Pulle. During his twenty-five years as head at Utrecht, Professor Pulle has had a very great influence on Dutch botanical teaching, and it is largely due to his enthusiasm that botanical taxonomy stands so high in Holland. The sixteen papers included in the number are all by former and present students. A pleasing portrait of Professor Pulle forms a frontispiece.

A NEW International Address Book of Plant Taxonomists, Geographers, and Ecologists is being prepared by the Editors of 'Chronica Botanica,' and will be issued in the near future in the "New Series of Plant Science Books". The Address Book will give not only the names and addresses of the scientists included, but also their scientific interests, together with a conspectus of current and planned research. As it is no longer practicable, or possible, to compile an address book for the whole of plant science, it is hoped that similar address books will be prepared for the other branches of the plant sciences, *e. g.*, general botany (morphology, physiology, genetics), plant pathology, agronomy, horticulture, and forestry.

The new Address Book will not only provide a conspectus of research workers and projects in pure taxonomy, ecology, geography, palaeobotany, etc., but will list also scientists engaged in the systematic, geographic, or ecological aspects of agronomy, forestry, horticulture, and pharmacognosy. Its scope will be restricted to professional and amateur scientists actively engaged in research, organizing work, etc. Completed questionnaire cards should reach the Editor, 'Chronica Botanica,' P.O. Box 8, Leiden, Holland, by the end of September.

THE 'Journal of the Royal Horticultural Society,' lxiv. 164-174 (1939) contains an article by W. Roberts on "R. Bradley, Pioneer Garden Journalist". Most know of Richard Bradley as Professor of Botany at Cambridge, a post of few and indefinite duties and no emoluments. It will be news to some, however, that Bradley can be counted as a journalist, his 'A General Treatise of Husbandry and Gardening' being published monthly, its object being "to establish a general Correspondence among all the curious men in Britain in order to raise these Arts [Husbandry and Gardening] to a much higher Pitch than ever they were before". The title-pages, dedications, etc., of the fifteen numbers (three volumes) are given. The number of March 1722 was dedicated to Sir Hans Sloane; there are several letters from Bradley to Sloane and to Petiver in the Sloane correspondence.

THE Hanbury Memorial Medal, a gold medal given periodically for "high excellence in the prosecution or promotion of original research in the Natural History and Chemistry of Drugs" is to be awarded to Mr. Thomas Edward Wallis.

THE 'London Naturalist' for 1938, the journal of the London Natural History Society, records the finding by L. G. Payne of the Crested Buckler Fern (*Lastrea cristata* Presl) in west Surrey. In the account of the fern, illustrated by two plates, it is stated that this is the first record of it south of the Thames. It is now extinct from most of the old localities, continuing only in two or three stations in East Anglia. There is other botanical matter in the volume including reports on the flora and ecology of Limpsfield Common, which members of the Society are surveying.

IN his Presidential Address to the Gilbert White Fellowship (Pamphlet No. 9) on "Earth and Water Radiations", Reginald A. Smith mentions a use of the divining rod which may prove profitable to those interested in subterranean fungi and in mycophagy. "More trivial achievements are the discovery of truffles in the soil, and distinguishing mushrooms from toadstools".

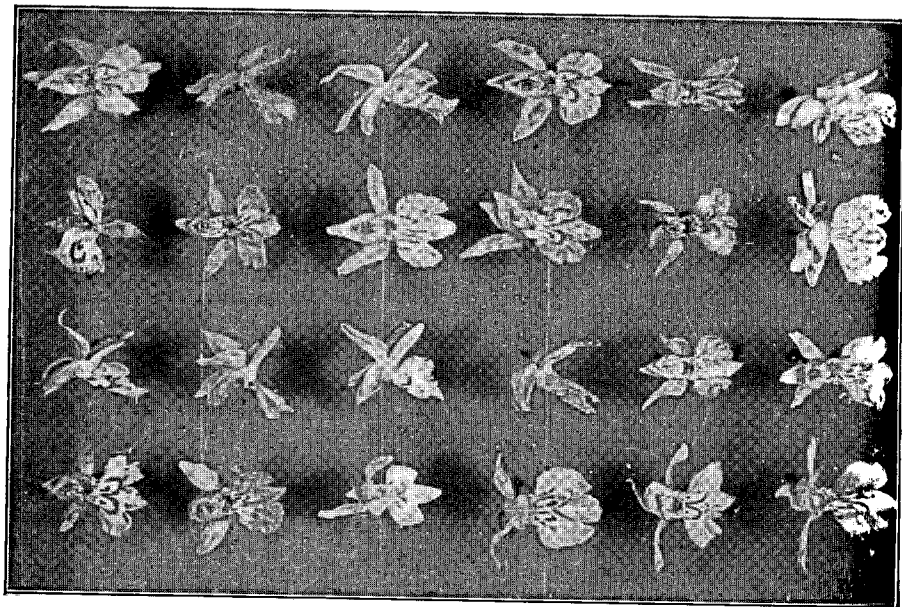
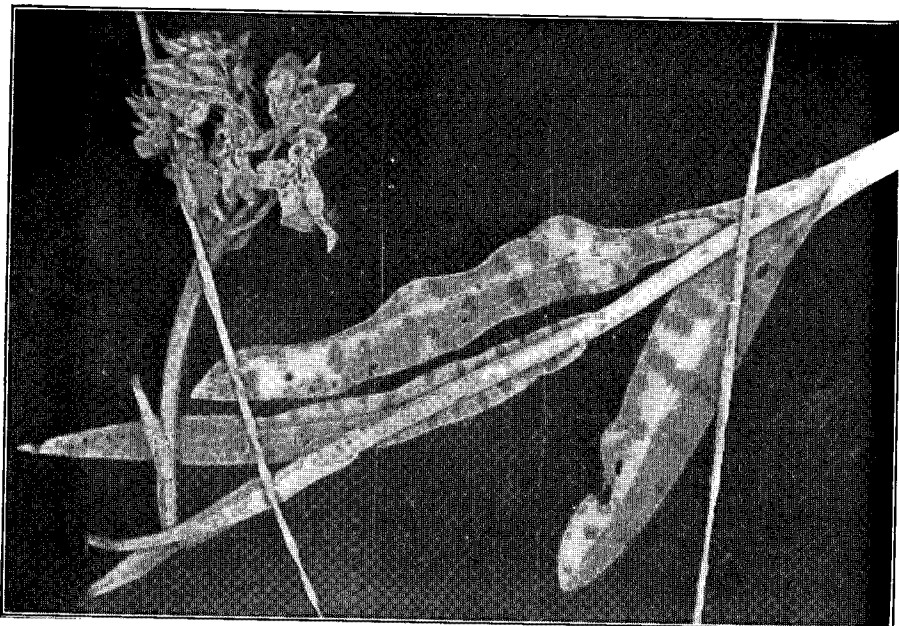
'TRANSACTIONS BRITISH MYCOLOGICAL SOCIETY,' vol. xxiii. part 1, contains Miss K. Sampson's Presidential Address on "Life cycles of smut fungi," which gives a useful summary of our present knowledge of this interesting group; an account of *Ramularia Vallisumbrosae* Cav. by P. H. Gregory, showing that this fungus, which causes the white mould disease of *Narcissus*, is a facultative parasite; a detailed description of an Ascomycete attacking *Riccia himalayensis* St. by K. S. Srinivasan, and a diagnosis of this new species, *Phaeosphaerella Ricciae* by Miss F. L. Stephens; a further study on *Ustilina* by W. H. Wilkins describing conidial germination and infection, and a description of twenty-five species of Indian smuts by B. B. Mundkur, seven being diagnosed as new and five as new combinations. Summaries of five papers read at the November meeting of the Society are headed 'Proceedings.'

THE Royal Microscopical Society celebrates its Centenary on October 25th and 26th next. The meeting will be held at B.M.A. House, Tavistock Square, London, W.C.

MR. W. R. PHILIPSON is to spend six months on a collecting-trip to Jamaica. For two months he will be a member of a Cambridge Biological Expedition to the island, which leaves England towards the end of July.

DR. R. SCOTT RUSSELL, of the Imperial College of Science, is accompanying Mr. E. E. Shipton on an expedition to the Karakoram Ranges in north Kashmir, which is to survey the region surrounding the Hispar Glacier. Dr. Russell will be occupied in making botanical collections and in carrying out experiments in plant physiology. The exploration will take at least twelve months.

LINNEAN SOCIETY'S ROOMS.—The rooms of the Linnean Society will be closed for the month of August. This is a reversion to the former practice, adopted this year for various reasons, but not necessarily a permanent arrangement.



NOTES ON A SHORT VISIT TO BARRA.

BY A. J. WILMOTT.

(PLATE 619.)

LAST summer I was in Barra from July 18th (evening) to 20th. I wished to examine *in situ* some of the plants recorded by the Edinburgh Biological Society (especially "*Orchis Fuchsii*") and also to make a general collection for the Museum. The following notes seem worthy of record:—

Thalictrum. Two forms of *T. minus* L. sensu lato occur on the sand-dunes. One is *T. arenarium* Butcher, with very numerous and coarse glandular hairs, a plant previously misnamed *T. dumense* Dum. by British botanists. The other, with fewer and finer glands and the basal leaf almost eglandular, is what was called by Syme (E. B. ed. iii.) *T. minus* (subsp. *eu-minus*) var. *montanum* (Wallr.) and later by N. E. Brown (E.B. Suppl.) *T. flexuosum* Bernh. Unlike *T. arenarium* it also occurs on cliffs. The nomenclature of this group is not yet settled, and herbarium material is difficult to identify without adequate field-notes. Field-notes should state whether the plant is running or caespitose, whether the flowers nod or not in anthesis, and if the stamens are erect or pendulous. Ripe fruit is necessary, which often necessitates a second collection.

Caltha radicans Forster. The only gathering made—in a marsh by Loch Doirlinn—had the characteristic foliage of this species, but no note of the growth was made at the time.

Fumaria. The only species seen was *F. Bastardii* Bor. in Duchartre, which is frequently mistaken for *F. officinalis* L. The specimen of the latter in Arthur Bennett's herbarium (Somerville 1888) is, however, correctly named.

Brassica Rapa var. *Briggsii* Wats. Small young specimens of this occurred as weeds among oats near L. Doirlinn.

**Lepidium campestre* (L.) R. Br. Roadside, Castlebay. A well-grown plant was collected. This constitutes a considerable extension of range. No obvious introductions were near it, and it was some distance from the harbour.

Viola Curtisii Forster. On Traigh Cuier only yellow flowers were seen, and, although these varied in size, none was exceptionally large. The large-flowered form collected by Shoolbred in N. Uist (1898), which has been variously named (cf. Journ. Bot. xxxix. p. 224), seems to be unusual in the Outer Hebrides. It is possibly the "var. *Symeii* Baker," but I have been so far unable to see a copy of the original description of this variety.

Polygala vulgaris L. Seen on the sheltered bank of a sunken rill near Cuier. This species seems to be uncommon in the Outer Isles, where *P. oxyptera* Reichenb. is far more common.

**Sagina procumbens* var. *gracilis* Nolte. This is a very peculiar light green plant found growing quite erect (c. 3 inches) in damp turf by L. Doirlinn. It matches the figure in 'Flora Danica' (tab. 2103) exactly, and is apparently new to our flora. A specimen so named in Herb. Bennett from Nottingham (F. Robinson) is ordinary *S. procumbens* L. The var. *gracilis* may be merely a habitat form, but I have not previously seen anything approaching it. It was collected by the Edinburgh workers, but, not having seen it growing, I did not realise its peculiarity.

Spergularia salina J. & C. Presl. In the narrow strip of saltmarsh at the head of Loch Obe.

Sorbus Aucuparia L. only seen by Loch an Ail. This loch lies in a depression, and in places the banks descend sharply for fifteen or twenty feet above the water. At the top of one of these slopes were three stunted bushes of this species, about three feet in height. They were cut off sharply (with desiccated browned leaves) at the level of the flat ground at the top of the steep slope.

Epilobium obscurum Schreb. Specimens from Barra and elsewhere in the Outer Isles, previously identified as *E. tetragonum* L., have all been determined by G. M. Ash as *E. obscurum* Schreb. Prof. Harrison's records of *E. tetragonum* [see Journ. Bot. lxxvii. p. 2] therefore need to be confirmed.

Heracleum Sphondylium L. Unusually abundant as a weed in some grass meadows near Castlebay.

Lonicera Periclymenum L. The specimens which I collected at Castlebay and Ard Mhor on exposed rock ledges certainly had thick leaves, but they were not unusually broad. Some of the specimens in Herb. Mus. Brit. from various parts of the British Isles have leaves extremely broad, and the thickness of the leaf may vary with the exposure. As material of var. *Clarki* H. Harrison [see Journ. Bot. lxxvii. p. 2] is not available to me, I cannot say whether my specimens correspond with it or not.

Arctium vulgare (Hill) Evans. A large plant of this was seen by the roadside at Castlebay, but I was unable to collect a specimen. (? "*A. Lappa*" of the "Bock of Barra"?)

Sonchus asper Hill. All (six) specimens examined by me at Castlebay were this, and none *S. oleraceus* L.

Crepis capillaris var. *anglica* Druce & Thell. Kentangaval.

Hieracium. Except for two solitary specimens of *H. Pilosella* L. seen on rock-faces, one at Ard Mhor and the other near North Bay plantation, the only specimens found were on a rock-face on Ben Erival. These have been identified by Mr. Pugsley as *H. scoticum* Hanbury, and are identical with specimens from Barra (unlocalised further) collected by Shoolbred and distributed by him under that name (coll. 27. vii. 1894: B. E. C. 1894 Rep. p. 455). The only other *Hieracium* in Herb. Mus. Brit. from Barra is one collected by the Edinburgh Biological Society, which Mr. Pugsley annotates: "Probably *H. nitidum* Backh."

Rhinanthus stenophyllus (Schur) Druce. Occurs throughout the damp meadows between Castlebay and Halaman Bay, and by Loch Doirlinn; by Loch an Ail. This was the only *Rhinanthus* seen.

Stachys arvensis L. A weed among oats on the hillside, Castlebay. Only once recorded previously for the Outer Isles (Mingalay: Ann. Scot. Nat. Hist. 1890, p. 273).

Atriplex hastata L. All the specimens which I have seen so named by the Edinburgh workers are *A. glabriuscula* Edmondst.

Populus tremula L. Stunted bushes of this grew with the *Sorbus Aucuparia* by Loch an Ail.

Myrica Gale L. Plentiful at one end of Loch a Duin, and seen elsewhere.

Pinus silvestris L. The Edinburgh workers considered that the trees so named at Ard Mhor might be remains of the ancient forest. Mr. McLeod, inn-keeper at Castlebay, however, informed me that these trees were to his knowledge planted at the same time as those in the Northbay and "Breivig" plantations. Mr. A. B. Jackson has identified my specimens from Ard Mhor as *P. nigra* Arnold.

Orchis. As already stated, one of the main objects of my visit to Barra was to examine the Orchids recorded by the Edinburgh workers as *O. Fuchsii* Druce, for if the determination were correct this would constitute a first definite record for the Outer Isles, for those of "*O. maculata* L." may refer to *O. ericetorum* (Linton) Marshall. I had seen no specimens of "*Fuchsii*" either in herbaria or during my visit in 1937, nor have I ever seen herbarium specimens from the island. Shortly before starting, I had received fresh from Miss Campbell from Lewis (Ardroil) a series of Orchids which she stated were the only form seen in one particular locality. They were neither *O. ericetorum* (Linton) Marshall nor *O. maculata* L. (*O. Fuchsii* Druce), but a form which united some of the characters of each, and seemed to be identical with the peculiar plants from Lewis (Lionel)

one of which was illustrated in Miss Campbell's paper in B. E. C. 1937 Rep. pl. viii. In Barra I found that everywhere in the island the damp meadows were full of the same plant, several hundreds being seen and not a single specimen of either *O. ericetorum* or *O. maculata*. Before leaving Oban I had collected typical *O. maculata* (in two colour-forms, the one normally bright pink, the other a pale-coloured form), and I had taken them fresh to Barra to compare with what I might find there. Between Castlebay and Kentangaval I saw in the fields plenty of an orchid which at first sight from the road I imagined was *O. purpurella* T. & T. A. Stephenson, so deep was its colour. But I found that all specimens had heavily blotched leaves like those of *O. maculata*, although the inflorescence was denser and the flowers broader, in form more like those of *O. ericetorum*. Later observations in the island revealed a few plants of *O. purpurella* which were mostly past flowering, and a few plants intermediate between the two which were presumably hybrids. Wherever I went in the island the same series of forms was found—large numbers of the peculiar plant, occasionally a few *O. purpurella*, and a few hybrids. It is somewhat extraordinary that, whereas throughout Europe the spotted orchids have till now been divided into the two groups—generally treated as two species, but sometimes as subspecies of *O. maculata* L. *sensu lato*,—in the Outer Isles there occurs a plant (in Barra the only plant of either group which I saw), which I cannot on morphological grounds place with certainty into either group.

Since *O. ericetorum* is known in the Islands, whereas normal *O. maculata* is not, and the foliage with its heavy blotches resembles that of the latter, it is possible that the new plant will prove to be the representative there of *O. maculata*. But the labellum is as broad as in *O. ericetorum* and is often similar in form, so much so that uncoloured photographs of the flowers could be taken to be of that species. But the colour resembles neither; it is only slightly less deep than in *O. purpurella* var. *pulchella* (Druce) Pugsley.

As the Spotted Orchids are still insufficiently well known, I suspend judgment of its rank until further investigation shows whether or not it can be placed under *O. maculata* (*O. Fuchsii*), and therefore describe it as a new species:

***Orchis hebridensis*, sp. nov.** Foliis fere ut in *O. maculata* L. (*O. Fuchsii* Druce), inferioribus ellipticis mediis superioribusque decrescentibus minoribus angustioribusque, omnibus maculis magnis purpureis (vero sordide rubris) pictis; floribus rubropurpureis, labellis magnis latis extus crenatis, maculis nonnumquam striis saturatoribus varie pictis, fere ut in *O. ericetorum* sed lobis mediis majoribus.

Hab. Outer Hebrides; Barra (abundant); Lewis (Ardroil, holotypus leg. M. S. Campbell, in Herb. Mus. Brit. Pl. 619;

also "Lionel," vide B. E. C. 1937 Rep. pl. viii., bottom right-hand flower).

The general height of the plant is 15–20 cm., which is much less than that of *O. maculata* L. in similar surroundings. It is also normally a stouter, less slender plant, although weak plants are thin and slender. One peculiarity noted is that in one or two specimens spots occurred on the *underside* of the leaf at the very base—a very remarkable feature, since markings on the underside of the leaf are almost unknown in the group, although they occur (fine dots) in *O. cruenta* Mull. The young inflorescence is pyramidal as in *O. ericetorum*, but later it may elongate and look more like *O. purpurella*, although less dense; it is denser than that of *O. maculata*. The labellum, as in other spotted orchids, is very variable, but, whereas except for the colour some could have been nearly matched with those occurring in *O. ericetorum*, none was seen which would exactly match those of *O. maculata* L. (*O. Fuchsii* Druce). Mr. Pugsley tells me that on the continent *O. maculata* frequently has this deep colour and broader labellum, but I am satisfied that the Hebridean plant is distinct from the slender plant known in this country as *O. maculata*.

I had hoped to visit all the localities given by the Edinburgh workers for their "*O. Fuchsii*," but one of the two days was very wet and this aim was defeated. Wherever I succeeded in reaching these localities—by Loch Doirinn, by Loch an Ail, etc.—I found the same plant, *O. hebridensis*, and no sign of *O. Fuchsii*. I have since seen the specimens determined by Mr. Handyside as *O. elodes* Griseb. and hybrids with *O. purpurella*; some of them are *O. hebridensis*. Mr. P. M. Hall, who has seen all my specimens and also those of the Edinburgh Biological Society's collection, considers that some of the latter may be *O. ericetorum*, but, in view of my experience in Barra, I do not feel certain that these more slender plants (which have lost their colour in drying) may not be weak plants of *O. hebridensis*. Mr. McAulay of Castlebay, however, told me that he knew a "white" orchis in one place near Castlebay, which may have been *O. ericetorum* (or these may have been albinos), but this point should be settled by further field-study.

The hybrids already mentioned require a name. I have chosen as the type a specimen from Barra, by the roadside above Loch an Ail, concerning which I noted in the field "fine and large; there seemed no possible doubt about this one":—

× *O. hebridella* mihi; *O. hebridensis* × *purpurella*; inter parentes eisque intermedia validiorque: 35 cm. et ultra alta, foliis eis *O. purpurellae* plus minus similibus sed superioribus minoribus, maculis plus minus aspersis, inflorescentiis magnis densis, floribus colore labelloque intermediis.

Holotypus in Herb. Mus. Brit., A. J. Wilmott 380720.K. (roadside near Loch an Ail).

Orchis latifolia L., *O. incarnata* auct. It should be noted that in Herb. Ar. Bennett the specimen determined thus and annotated as a Vice-comital record, from Barra (July 1888, Somerville), is *O. purpurella* T. & T. A. Stephenson. *O. latifolia*, however, was collected in Barra in 1936 by the Edinburgh Biological Society.

Potamogeton (det. J. E. Dandy and G. Taylor). Three casts from the N.W. end of Loch Doirlinn in failing twilight brought out sterile material of *Potamogeton*, although this genus is not listed for this Loch by Edinburgh workers. It included:—

P. Friesii Rupr. (new to Barra).

Phragmites communis Trin. A largish Phragmitetum at the shore end of L. Doirlinn was not mentioned by the Edinburgh workers.

Pteridium aquilinum (L.) Newman. Only observed in small quantity on the west side of Loch an Ail. It is evidently very rare in the island.

I add some notes concerning the Barra group of Islands made during a visit to the garden of Mr. McAulay, of Castlebay, a boatman who conveys the stores to Barra Head lighthouse, and whose interest in plants has led him to bring several of them into his garden. It was interesting to see *Orchis purpurella* and *O. hebridensis* (with some fine hybrids) growing well in garden borders! The following notes are based on his observations, the identifications being from specimens in the garden:—

Melandrium album (Mill.) Garcke. "All over Vatersay village, and also one plant once seen by the creek at Castlebay."

Lychnis Flos-cuculi L. "This disappeared from some meadows at Castlebay for two or three years and then came back again." (It was abundant this year; possibly for some reason it did not flower those years.)

Sedum roseum (L.) Scop. "The rocks along the shores of Muldoanach are full of it."

Hedera Helix L. "Brought into the garden from a small gorge on the sea-shore on the west side of Ben Tangaval (Barra), and also seen on Mingalay."

Humulus Lupulus L. "Brought into the garden from the Glen Village (the only place on the island) where it still occurs on a fence which was by an old garden; it rarely flowers."

Scilla non-scripta (L.) Hoffmanns. & Link. "Not only in the Northbay plantation [where it was recorded by the Edinburgh

workers; 1936, p. 252] but also in the Garagal and Bruanich (the flat area running out from North Bay)."

Osmunda regalis L. Sandray.

Scolopendrium vulgare Symons. "Brought from Sandray; the only place I ever saw it in the Barra Isles."

Finally, Mr. McLeod took me out to Traigh Cuier to see what he called "Prince Charlie's Thistle," which proved to be *Eryngium maritimum* L. There were three shoots close together, which might have been a single plant. He had known the plant (or plants) there for forty-five years, but it had never spread, nor had he seen it elsewhere. This may be what was recorded by Shoolbred (Journ. Bot. xxxiii. 242 (1895)).

I must, in conclusion, thank Miss Campbell for the use of her MSS. in checking records.

EXPLANATION OF PLATE 619.

Orchis hebridensis Wilmott (Lewis: Ardrol; M. S. Campbell 1938). Flowers taken from different plants—numbers 1 1 1 (abnormal dimerous flower) 2; 3 3 4 4; 5 5 6 6; 7 7 8 13; 9 10 11 12; 14 15 16 16—[reading from left to right and rows separated by semicolons]. Holotype (no. 9). Just over natural size [the horizontal wires were 2 cm. apart].

NOTES ON THE FLORA OF THE ISLES OF SCILLY.—I.

BY J. EDWARD LOUSLEY.

THE only published general account of the Flora of the Isles of Scilly is that of Townsend (Journ. Bot. ii. 102 *seq.* (1864)). During the seventy-seven years which have elapsed since Townsend's visit many changes have taken place in the islands, the most important of which is the establishment of the Spring Flower Industry, to which most of the land suitable for cultivation is now devoted. Much of the land utilized for this purpose remains fallow from late spring to early autumn—a condition very favourable to the rapid establishment of introduced species. Increased commerce with the mainland and other countries has resulted in many such aliens being introduced.

In contrast to this state of affairs on the five inhabited islands, there are numerous small islands which have remained uninhabited for a long period, a study of which is likely to throw some light on the status of certain species in Britain. Samson, the largest of these, has unfortunately been uninhabited only since about 1855, but there are a number of smaller islands which have probably never been cultivated at all. Some of these bear tumuli (*e. g.*, Great Ganilly, Tean, Northwethel, Great Arthur),

but it is probable that prehistoric man only repaired to them for the purpose of burying the dead. Others are used for occasional summer pasturage (e. g., St. Helen's, Tean) and are known to have been inhabited for short periods in the past. Despite these imperfections the flora of the uninhabited islands of Scilly is almost certainly the least contaminated by human influence of any to be found in the south of England.

Townsend noted 348 species during his visit in June 1862, but some of these were undoubtedly errors, and his statements as to the frequency of others were incorrect. Several brief papers and a number of scattered records have since appeared, and a collation of these, with the addition of my own records, shows that approximately 578 species of flowering plants and ferns are now known to have occurred in a wild state within the six and a half square miles of land in the Isles of Scilly.

It is therefore clear that there is ample justification for the publication of a new account of the flora of these islands. I have been collecting material with this object in view for the past three years, and it is now evident that, owing to the limited time which it is possible to spend annually at field-work in the islands, at least several more years must pass before the investigation can be considered sufficiently complete for publication. The present series of "Notes" has therefore been begun with the object of publishing additions to the flora and other matters of more general interest which it is desirable to make immediately available.

The scheme here adopted is to treat each island as a separate district, arranging the five inhabited islands in the following sequence:—St. Mary's, St. Agnes, Treco, Bryher, St. Martin's. Unfortunately many recorders in the past have been content to localize their plants as "Isles of Scilly" without any further details—a practice which has rendered the work of confirmation unnecessarily difficult while obscuring the contrasts which exist between the different islands.

The records in the present paper are all based on plants collected by me between May 28th and June 6th, 1938, with the exception of those attributed to Mr. and Mrs. J. E. S. Dallas, or to the herbarium in the possession of Major Dorrien-Smith at Treco (Hb. D.-S.), or as otherwise indicated. Mr. and Mrs. Dallas spent nearly the whole of June 1938 in the islands, and assisted me with valuable lists and specimens of species seen on Tean, St. Helen's, Great and Little Ganinick, Great Ganilly, and Great, Middle, and Little Arthur—uninhabited islands on which weather conditions have not yet allowed me to land. The herbarium maintained by Major Dorrien-Smith is also rich in specimens from the less accessible islands. The numbers given in brackets after my own records are those which appear on my labels headed "Flora of the Isles of Scilly."

No attempt has been made to gather specimens in any quantity, but where possible duplicates under these numbers have been or will be lodged at the British Museum (Natural History), the Royal Botanic Gardens, Kew, or, occasionally, at the National Museum of Wales, Cardiff.

An asterisk placed before the name of the plant indicates that it is new to the recorded flora of the Scillies (v.-c. la); a dagger indicates that the plant is not native.

RANUNCULUS LENORMANDI F. Schultz. St. Mary's; extremely small in roadside gutters, Watermills (7), and near Tremelethen.

†*RANUNCULUS MURICATUS* L. St. Mary's; near Hugh Town (13): Bryher; Southward. This Mediterranean species appears to have been first recorded for the Scillies by E. Rees in Gibson's 'Guide to the Isles of Scilly,' ed. 2, 62 (1932). It has now increased to such an extent that it has become a pest in St. Mary's, where it occurs in great abundance from Hugh Town to London. At Prestwich in Lancashire it was recorded as "semi-naturalized" from 1875 to 1893 (B.E.C. 1893 Rep. 398 (1894)). The species is thoroughly naturalized in North America and Australia, and is likely to prove persistent in Scilly.

FUMARIA.—All specimens have been named by Mr. H. W. Pugsley.

FUMARIA OCCIDENTALIS Pugsley. St. Mary's; bulbfield near Old Town (22). This handsome plant has proved to be much more abundant than I previously supposed (B.E.C. 1936 Rep. 238 (1937)) and occurs in quantity in the bulbfields within the area bounded by Old Town, Parting Carn, and Salakee. It has been observed only in cultivated ground.

FUMARIA CAPREOLATA L. var. *BABINGTONII* Pugsley. St. Mary's; roadside wall near Old Town (21—"fruits unusually small"): Great Ganinick (uninhabited); south end, J. E. S. Dallas (18).

FUMARIA BASTARDII Bor. "Type [*i. e.* typical form]—H. W. P." St. Agnes; bulbfield (26): Treco; bulbfield, Old Grimsby (14).—var. **Gussonei* (Boiss.) Pugsley, St. Mary's; bulbfield under London (25 a): Bryher; Under Timmy's Hill (17).—var. *hibernica* Pugsley, St. Agnes; bulbfield (26 a): St. Martin's; bulbfield near Middle Town (27).

FUMARIA BORAEI Jord. St. Mary's; bulbfield near Old Town (24); roadside wall near Old Town (20); near Holy Vale (19): Treco; bulbfield at Old Grimsby (15): St. Martin's; bulbfield, Middle Town (28).

*†*COCHLEARIA ARMORACIA* L. Tresco; near School (Hb. D.-S.).

**RAPHANUS RAPHANISTRUM* L. var. *AUREUS* Wilmott in B. E. C. 1937 Rep. 539 (1938)—flowers yellow with concolorous veins. St. Mary's; near Holy Vale in abundance (39).

VIOLAS named by P. M. Hall.

VIOLA RIVINIANA Reichenb. St. Mary's; Porth Hellick (98): Tresco; Borough (96): Samson; North Hill (97). Apparently the most common Violet of the islands.

VIOLA SEGETALIS Jord. f. **OBTUSIFOLIUS* (Jord.) Drabble. St. Mary's; near Holy Vale (92); bulbfield near Old Town (90 & 91): Tresco; weed in Abbey Grounds (89): St. Martin's; sandy field below Middle Town. Variable, and evidently the most common Pansy of the islands.

STELLARIA MEDIA (L.) Vill. Noticed as common in all five inhabited islands, but also occurs in extremely small quantity on Annet—a "bird island." Here it has almost certainly been introduced recently, and probably from seed adhering to the shoes of a visitor.

STELLARIA NEGLECTA Weihe. St. Mary's; Tremelethen (55): Tresco; Abbey Grounds (52).

POLYCARPON TETRAPHYLLUM L. St. Mary's; common on walls, waste ground, etc. almost throughout the island, e. g., Porthloo, Rocky Hill (69), on Golf Links (67), and Pelistry Bay: Tresco; common, e. g., Abbey Grounds as a weed (65) and New Grimsby (64): Bryher; shore at Southward: St. Martin's; very common from Higher Town (70) to below the School. This is one of the five species listed by Townsend as likely to be discovered in the islands, but the earliest evidence of its occurrence is a specimen collected by Miss Anne Dorrien-Smith in Tresco in April 1928 (Hb. D.-S.). If the plant is native it is certainly strange that it should be passed over by the many capable botanists who have visited the Scillies during the past fifty years. On the other hand, the distribution of the species strongly suggests that it is likely to be indigenous, and it has been generally accepted as a native in its station on the Lizard. This conflicting evidence may be explained by the theory that it has long been a native of the islands in small quantity, but that it was not until the introduction of the bulbfield cultivation that opportunity occurred for it to spread.

HYPERICUM PULCHRUM L. St. Mary's; near Innisidgen Point: Great Ganilly; North Hill (Hb. D.-S.).

ERODIUM MOSCHATUM (L.) L'Hérit. Townsend records this as "occasionally," but it now occurs in the greatest abundance in all five inhabited islands in the bulbfields, to the introduction of which it no doubt owes its increase.

*†*OXALIS VIOLACEA* L. Bryher; well established under bracken by the track from the "Town" to the "Pool" (231).

**ONONIS REPENS* L. St. Martin's; St. Martin's Plains (Hb. D.-S.).

TRIFOLIUM.—The scarcity or absence of the less common clovers in June 1938 was very noticeable, and other observers made similar reports from the Lizard. The cause was probably the long period of drought which occurred in the south-west of England during the spring.

TRIFOLIUM SCABRUM L. Tresco (Hb. D.-S.): Bryher & St. Martins, Dallas sp.

TRIFOLIUM REPENS L. var. *RUBESCENS* Ser. (var. *Townsendii* Bab.). Much more widespread than formerly supposed. St. Mary's; Halangy Point (116): Tresco; near Borough (240), Abbey Gardens, between New and Old Grimsby: Bryher; W. side of Pool, Dallas sp.: Samson; abundant and fine, Ralfs in litt. to Townsend 1876; Tean; E. side, Dallas sp.

ORNITHOPUS PINNATUS (L.) Druce. There is no reason to suppose that this species is any less plentiful than formerly. I saw it in 1938 in quantity in Tresco (two stations), Bryher, and St. Martin's, and Mr. Dallas found it in St. Agnes and on Tean (uninhabited).

**LATHYRUS PRATENSIS* L. St. Mary's; Newford. Also seen by Mr. Dallas near Old Town.

POTENTILLA PROCUMBENS Sibth. St. Mary's; Tremelethen (127): Tresco (Hb. D.-S.).

**EPILOBIUM PARVIFLORUM* Schreb. Tresco; Tresco Gardens (Hb. D.-S.).

CARUM PETROSELINUM Benth. & Hook. St. Mary's; on the Garrison (130).

**SCANDIX PECTEN-VENERIS* L. St. Mary's; between Hugh Town and Old Town (131); Parting Carn (Hb. D.-S.).

**ANTHRISCUS VULGARIS* Bernh. St. Martin's; Middle Town (133).

RUBIA PEREGRINA L. St. Mary's; Innisidgen; the Garrison; St. Agnes; the Gugh: St. Martin's; Brandy Point; St. Martin's

Bay; Lower Town: also seen by Mr. Dallas on the following uninhabited islands:—Teau, Great Ganilly, Great & Little Arthur, St. Helen's, Great Ganinick.

VALERIANELLA OLITORIA Poll. Ralfs (*in litt.* to Townsend, 1876) records this from St. Mary's as not common. It is now common or frequent in all the inhabited islands.

DIOTIS MARITIMA (L.) Hook. The colony of this rare plant appeared to be in a very unhealthy condition in 1936, and in 1938 no trace of it could be found.

*†*SYMPHYTUM PEREGRINUM* Ledeb. St. Mary's; Watermill Cove; near Tremelethen (148); Normandy, etc.

*†*ECHIU* VULGARE L. St. Agnes; near Gugh Farm, evidently introduced.

*†*ANCHUSA SEMPERVIVENS* L. Tresco; Appletree Banks, doubtless introduced.

*†*DATURA STRAMONIUM* L. Tresco; Abbey Gardens, G. Andrews.

SCROPHULARIA SCORODONIA L. This was noticed by me in St. Mary's (three stations), Tresco (two stations), and Samson (abundant), and on the Great Ganilly by Mr. Dallas. Townsend also recorded it from St. Martin's, and gathered it in St. Agnes (Hb. S.L.B.I.).

†*VERONICA PERSICA* Poir. This is recorded only from St. Mary's (Perrycoste in Davey, Fl. Cornw. 330, 1909). It is now a frequent weed in all five inhabited islands.

EUPHRASIA.—All determined by Mr. H. W. Pugsley.

EUPHRASIA OCCIDENTALIS Wettstein. St. Mary's; Watermill Bay (164).—var. **calvescens* Pugsley. St. Mary's; Salakee Downs (162); Golf Links (163).—var. **praecox* Bucknall. Bryher; near Samson Hill (160 & 161).

*†*RUMEX SALICIFOLIUS* Weinm. (aggr.). Tresco; near Bathing House (Hb. D.-S.).

URTICA DIOICA L. The distribution of this species on the uninhabited islands is of interest in view of its nitrophilous habits. I have noticed it about the old ruins on Samson, which are frequented by visitors, and Mr. Dallas has observed it only on St. Helen's and Teau, both of which are occasionally used for grazing.

**QUERCUS ROBUR* L. Great Ganinick, Dallas (171). The discovery of an oak about 2 ft. 6 inches tall amidst a tangle of bracken, bramble, and honeysuckle on this uninhabited islet

was due to the keen observation of Mr. and Mrs. Dallas, who kindly brought a leaf back for me. There is no other record of *Q. Robur* in the Scillies, and I do not remember noticing it even in gardens.

RUSCUS ACULEATUS L. Great Ganinick, Dallas. This also occurs on St. Martin's, where it was discovered by Bree in 1831.

*†*PHORMIUM TENAX* Forst. (aggr.). St. Martin's; several plants on the cliffs in each of two bays east of Turfy Hill (225). These bays are a considerable distance from cultivated fields or houses, and the plants are large and have probably been established for many years. They may have originated from the stock introduced to the islands by Mr. Augustus Smith, who attempted to grow New Zealand flax commercially in the Scillies.

(† ?) *ALLIUM TRIQUETRUM* L. St. Mary's; locally abundant—Hugh Town to Normandy; Holy Vale; Pelistry Bay; Garrison Hill: Tresco; frequent in south of the island: Bryher; abundant in south of the island. This plant occurs in abundance in Cornwall, where it has been termed "Native (apparently)" by Davey (Fl. Cornwall, 438 (1909)). It was first recorded for the Isles of Scilly by Perrycoste (*loc. cit.*) from St. Mary's, the date of the record being probably about the beginning of the present century. It appears likely that the plant is an alien in all its British stations, since in Cornwall it was unknown until 1872, and in Guernsey it was first noticed in 1847, becoming abundant by 1865 (Marquand, Fl. Guernsey, 179–180 (1901)). It has since been discovered in other counties, and in at least one of them, Pembrokeshire, it occurs in very "wild" situations (Carr, Watson, B. E. C. 1932 Rep. 189 (1933)). In spite of the rather early flowering of the species it would appear impossible that such a conspicuous plant could be so long overlooked. From the history of the other stations therefore we are justified in regarding *Allium triquetrum* as introduced to the Scillies probably about fifty years ago, and spreading fairly rapidly since that date. It is just possible, however, that it may have had a longer history in the islands, since Borlase in 1756 records *Allium ursinum* L. ('Observations on the ancient and present state of the Islands of Scilly'—quoted ex Davey, *op. cit.*). This plant has not been noticed by any of the numerous botanists who have visited the Scillies since, and owing to the absence of native trees it is not a very likely plant to have ever occurred there. Unless Borlase was led to confuse *A. triquetrum* with *A. ursinum* owing to the similarity of odour I am at a loss to suggest what species was really found by him.

**ARUM NEGLECTUM* (Town.) Ridley in Journ. Bot. lxxvi. 144 (1938). St. Mary's; very common—Hugh Town (182);

Buzza Hill; Tremelethen; Holy Vale (181); Watermill Cove; etc.: Tresco; frequent—Abbey Gardens; near Borough; etc.: Bryher; under Samson Hill: St. Martin's; near Great Bay. Careful search failed to reveal *Arum maculatum* L., which had been recorded for the Scillies by Millett and Ralfs, and the records for that more woodland-loving species should therefore be considered as errors for *A. neglectum*.

**CAREX DIVULSA* Stokes. Tresco; in the wooded part of the Abbey Gardens (191).

**CAREX SYLVATICA* Huds. Tresco; Abbey Gardens.

*†*DIGITARIA SANGUINALIS* (L.) Scop. Tresco; on the shore near the Farm (Hb. D.-S.).

*†*PHALARIS MINOR* Retz. St. Mary's; Bulbfield near Rocky Hill (221)—confirmed by Hubbard.

*†*CYNOSURUS ECHINATUS* L. Tresco; Farm bank, 1933 (Hb. D.-S.).

BRIZA MINOR L. This species was first recorded by Lawson in 1870 from St. Mary's, from which island it was also known to Ralfs. It is now very common in bulbfields in all five inhabited islands, and doubtless owes its increase to the expansion of cultivation.

†*BRIZA MAXIMA* L. St. Mary's; without definite locality, Downes, 1922 (Thurston & Vigurs, Suppl. Fl. Cornw. 152, 1922); Porthmellin, 1923 (Hb. D.-S.); Normandy, Dallas, 1938: Tresco; Farm Gardens (Hb. D.-S.). This grass is cultivated for decorative purposes, and appears to be becoming increasingly frequent as an "escape."

Scleropoa rigida (L.) Griseb. var. *major* (J. B. Presl), comb. nov. (*Sclerochloa patens* J. B. Presl; *Sclerochloa rigida* (L.) Beauv. var. *major* J. B. Presl; *Festuca rigida* (L.) Kunth subvar. *patens* Cosson & Dur.; *Festuca rigida* (L.) Kunth subvar. *umbrosa* Cosson & Germ.; *Scleropoa rigida* (L.) Griseb. var. *patens* Willk.; *Festuca rigida* (L.) Kunth var. *patens* Lousley in Watson B. E. C. 1933 Rep. 240 (1934)). St. Mary's; cultivated field, 1934, Miss E. S. Todd (B. E. C. 1936 Rep. 290 (1937)): Tresco; very fine as a weed in the Abbey Gardens (194). I am indebted to Mr. C. E. Hubbard for the great trouble he has taken in tracing the synonymy of this plant, and make the above new combination at his suggestion.

FESTUCA MYUROS L. St. Martin's; near the school (Hb. D.-S.).

*†*BROMUS GUSSONII* Parl. St. Mary's; Holy Vale (205): Bryher; near Samson Hill (202): St. Martin's; near Middle

Town (206). This is now a very common weed in the bulbfields of these three islands, and I am indebted to Mr. Hubbard for the identification of the three gatherings given above.

*†*BROMUS MADRITENSIS* L. var. *CILIATUS* Guss. Bryher; Southward Bay.—Det. C. E. Hubbard.

†*BROMUS UNIOLOIDES* H. B. K. St. Mary's; near Hugh Town (204): St. Martin's; near Middle Town (207)—both confirmed by C. E. Hubbard. In both stations it occurred abundantly in fallow bulbfields, where it may possibly have been cultivated in past years as an ornamental grass.

The following plants are among those most commonly planted as "windbreaks" to protect the bulbfields, specimens having been taken as vouchers from the localities given:—

†*VERONICA LEWISII* Armstrong. St. Mary's; near Old Town (232).

†*ESCALLONIA MACRANTHA* Hooker & Arnott in Bot. Misc. iii. 341 (cf. Bot. Mag. t. 4473). St. Agnes; Middle Town (226).

†*PITTOSPORUM CRASSIFOLIUM* Banks & Solander, ex A. Cunn. in Ann. Mag. Nat. Hist. iv. 106 (1840) (illustrated in Bot. Mag. t. 5978 from Tresco material). St. Mary's; near Old Town.

It is premature to draw any phytogeographical conclusions from the data so far accumulated, but attention must be drawn to the increasing resemblance between the floristics of the Scillies and those of the Channel Islands. This resemblance may be traced between the native species of the two groups of islands, but it becomes even more marked when introduced plants are taken into account. It may be attributable in part to the horticultural rather than agricultural employment of the land, but it would not appear that there has been any considerable commerce between the two archipelagos likely to lead to a transference of weeds of cultivation. It is more probable that a similarity of insular climates has made possible the persistence of native species and the establishment of aliens from southern Europe.

Botanists visiting the island will greatly assist me by sending lists of their discoveries. Precise records of even the most common mainland species are likely to be of equal interest to those of sought-after rarities.

Indebtedness must be acknowledged to Messrs. C. E. Hubbard, P. M. Hall, and H. W. Pugsley for determinations of critical plants, to Mr. and Mrs. J. E. S. Dallas and Miss M. Knox for notes and specimens, and to Major Dorrien-Smith for his kindly assistance to me on my last visit.

ANNOTATIONES SYSTEMATICÆ.

By A. J. WILMOTT, F.L.S.

IV. TYPIFICATION OF SOME BRITISH *SORBI*.

SEVERAL years ago I borrowed the material in A. Ley's herbarium in order to ascertain what was intended by the names *Sorbus porrigens* and *Sorbus anglica*. As opportunity offered the forms have been studied in the field, and it has become necessary to typify these two names, because neither series of plants included under them is uniform, and further subdivision will be necessary.

A request to Prof. Hedlund, asking him what he regarded as the type of each name, brought the reply that he did not regard any one as the type. I have, therefore, been forced to make the lectotypes myself, as shown below.

S. anglica Hedlund in Nyt. Mag. f. Naturvidensk. lii., iii. 258 (1914); as "n. sp.—vel subsp. *S. Mougeoti*—in Anglia occurs, quae nondum descripta est, cum *S. subsimili* antheris roseis et aliis notis congruit, sed recedit foliis vulgo breviter acutis, apicem versus argute serratis, serraturis elongatis, subtus densius tomentosis, nervis lateralibus pluribus ut in *S. Mougeoti* et fructibus sicis vulgo paullum caesiopruinosus" [no specimens or localities cited].

Typification can be made with the help of notes and correspondence in Herb. A. Ley, who in November 1908 sent a numbered series of specimens to Hedlund. In his reply, dated 23 Dec. 1908, Hedlund writes (in German):—"11, 14, 15 (a very ? young individual), 16, 17, 18, 20, and 21 constitute an elementary species which is very close to *S. Mougeoti*. A difference exists, although at first it appears very slight. Since this *Sorbus*-form—so far as I know—has no name, it can be called '*anglica*.' It becomes a matter of taste whether this *S. (Mougeoti) anglica* is designated as form, variety, or subspecies. The essential point is that it is a pure-breeding ['Samenbeständige'] species."

The specimens corresponding to these numbers in Herb. Ley (now in Birmingham University Herbarium) are all in covers labelled "*Mougeoti anglica*," except no. 15 which is missing. Their origins are:—

"11"; Hb. Ley sheet 6; Glos. W., Penmoel, Shoolbred 8.7.1898:

"14"; " " 9, 12; Herefordsh. Gt. Doward, Ley 28.5.1900 and 8.8.1896:

"15"; missing; Glos. W., Symond's Yat, Ley 1.6.1895:

"16"; Hb. Ley sheet 7; Glos. W., Penmoel, Ley 16.5.1894:

"17"; " " 22, 23, 24; Brecon, Craig Cille, Ley 4.6 & 22.8.1895:

"18"; Hb. Ley sheet 21, 19; Monmouthsh., Piercefield, Ley 16.5.1894 and Shoolbred 14.9.1894:

"20"; " " 2, 3b; Somerset, Cheddar, Ley 26.5.1902:

"21"; " " 3a; Somerset, Cheddar, Ley 20.6.1905.

These were all written up by Ley as "*S. Mougeoti* subsp. *anglica*," but two sheets bear additional notes. Remarks from Hedlund's letter are added to sheet 9 (no. "14")—"a form very near to *S. Mougeoti* Soy. & Godr., but representing a true species (Elementarart) which might be named *S. anglica* (as subspecies). Prof. Hedlund on plant from this sheet." On sheets 19 and 21 ("no. 18") from Piercefield—" *S. Mougeoti* subsp. *anglica* Prof. Hedlund on this specimen " (although there is still a bare space marked "sent to Hedlund xi. 08"). The choice of lectotype gathering may most reasonably be made from these two, although it is possible (but not probable) that Ley's notes were made against these two numbers quite by chance.

In "Some Notes of Prof. Hedlund on *Sorbus* Forms" (MSS. in Ley herbarium: correspondence, etc. relating to *Sorbus* cover i. no. 17) Ley writes:—" *S. Mougeoti* Soy. & Godr. var. or subsp. nov. This is the form I (and I think most of us) have been in the habit of calling *intermedia* Ehrh. Hedlund pronounces it to be undescribed, and proposes the name '*anglica*' for it in view of its endemic and wide distribution in Britain. I have it named by him from (I think) six English and Welsh counties: also from other counties (apparently) and from Muckcross Kerry, in my herb. He places its relationship to the continental *Mougeoti* as subsp. or var.; but he calls it clearly an "Elementarart" and in his opinion it enters into relation with other species to form hybrids."

In his paper on "The Aria Group of British Pyri" (Science Gossip, ii. 113-115 (1895)) Ley gives no indication that any of the gatherings there placed under "*intermedia*" are specially worthy of selection as the type of *S. anglica*. He says:—"I have seen it growing in Somerset (Nightingale Valley)*, West Gloucester (Symond's Yat, and near Chepstow), Monmouth (Piercefield Park), Hereford (Great Doward), Brecon (Craig Cille), Montgomery (Craig Breidden), and Denbigh (Cefn Fedw)." But in his herbarium, sheet 21 of "*Mougeoti anglica*," from "Old tree in Piercefield Park . . . anthers pink, flowers larger than in *P. Aria*," he notes:—"The tree from which *P. intermedia* was first recognised as British." This "fine old tree near Temple Door" (as Shoolbred calls it in his herbarium) can well be con-

* I have seen no specimen from here, nor is there one in Ley's herbarium.

sidered the type of *S. anglica* as so many specimens taken from it are in existence. Unfortunately in three visits I have failed to find either the original tree (doubtless dead) or any descendents near by, but these, no doubt, will be found in the neighbouring woodland below the cliff. I designate as lectotype the specimen sent to Hedlund from sheet 19 in Herb. Ley, collected by Shoölbred 14. 9. 1894.

The epithet "*porrigens*" was first published in 1914 (Nyt. Mag. for Naturvidenskab. lii., iii. 255) by Hedlund, who states (translated):—"(*Sorbus norvegica*) . . . must be closely compared with *S. porrigens* sp. n. not yet described, which is distributed through middle Europe from Asia Minor into England. *S. porrigens* differs from *S. norvegica* in having leaves smaller, shortly obovate, more distinctly cuspidate, the serratures of the upper third of the leaf usually strongly porrect. We have seen specimens from Asia Minor: Paphlagonia (P. Sintenis. Iter orientale 1892, No. 5128 pr. p., specimens pr. p. belonging to *S. graeca*), Balkan: Akdagh (Manissadjian. Plantae orientales 811), Hungary . . . Moravia . . . Germany . . . Rhine Province, Southern England; N. Somerset, Brecon, Chefferton [i. e., Chepstow], Monmouth, Hereford, Radnor (Aug. Ley)."

Although the name was proposed by Hedlund in a letter dated 1 Jan. 1910, dealing with British material sent to him by Augustine Ley, it is clear that he was there proposing it for a form already known to him. He had at first (1908) named the British material *S. aria* $\times$ *anglica*, but in Nov. 1909 he writes (translated):—"The specimen sent as No. 9 permitted an examination of the pollen to be made, from which the form was clear. The species is widely distributed in middle Europe and in the Orient, and in herbaria goes under the name of *S. graeca*. With that it is closely related but not identical. . . . Since the species appears to be generally distributed in England it is probable that Syme denoted it together with *S. salicifolia* under the name *S. rupicola*. . . . We may provisionally retain the name *S. rupicola* for it." Presumably Ley objected to the use of the name *S. rupicola* for this plant, as in the country of its origin it was used for the plant Hedlund called *S. salicifolia*, and Hedlund writes again (1 Jan. 1910) . . . "I have studied Syme's figure and description of *S. rupicola*, and found that he only intended *S. salicifolia*. . . . The other more continental species must have a new name. I suggest *porrigens*, which refers to the 'drawn-out-towards-the-leaf-apex' nerves, lobes and serrations."

I see nothing here to indicate that the lectotype should be a British plant, but on the contrary think it clear that it was mere change of name for an older concept—*S. rupicola* Hedl. non (Syme) —. The obvious choice from the protologue* would

* A "protologue" is the printed matter (description etc.) accompanying the original publication of a name or epithet.

be the *Sintensis*, 1892, no. 5128, except that it is a mixture of *S. porrigens* and *S. graeca*. But Hedlund goes on to give the distinguishing characters of *S. graeca*, which is really very distinct. In the British Museum Herbarium this number is represented by a single small specimen only, but there is no doubt that it is *S. porrigens* and not *S. graeca*. It seems preferable, therefore, to retain the Sintenis plant as lectotype rather than to select the second and less available gathering. I therefore designate as lectotype of *S. porrigens* one of the specimens of that species distributed by Sintenis as It. or. 1892, no. 5128, which was seen and cited by Hedlund.

Sorbus rupicola (Syme). *Pyrus Aria* subsp. [*P.*] *rupicola* Syme: Eng. Bot. ed. 3, iii. 244 (1864). Syme states:—"I am indebted for fresh specimens of the Derbyshire plant, from which the accompanying plate has been made, to Mr. Joseph Whittaker. . . . I regret that I cannot retain either Reichenbach's or Fries's specific name [i. e., *oblongifolia* or *salicifolia*] in consequence of not separating the genera *Pyrus* and *Sorbus*, there is already a *Pyrus oblongifolia* of Spach and a *Pyrus salicifolia* of Linnæus." This last sentence provides no reason for not taking the Derbyshire plant as type, nor is there anything else in the protologue against this course. I therefore have labelled as lectotype one of the four specimens in the Syme herbarium collected by Whittaker in June 1864 at Matlock Bath.

P. salicifolia Pallas (Reise, iii. 734 (1776), "tab. N. fig. 3, A.B."); also of Linn. fil. Suppl. 255 (1781), is a pear, allied to *P. eleagnifolia* Pall.

Sorbus Aria β *salicifolia* [Myrin "Diar. 1834" ex Fries 1846] Hartman, Handb. Sk. Fl. ed. 3, 116 (1838); Fries, Summ. Veg. Scand. 42 & 176 (1846), is an independent use of the epithet *salicifolia*, and Hedlund's is the first use of it as a specific epithet. Syme's epithet, however, has precedence for the species, as *Pyrus rupicola* (Syme) Babington: Manual, ed. 7, p. 126 (1874). The combination *Sorbus rupicola* is usually attributed to Nyman (Consp. ii. 242 (1879)), but this is an error, for although Nyman actually uses the combination it is an illegitimate use for his 5*, because he states in the introduction to the work "subspecies ideo . . . notantur asterisco (*)." At present I am not certain who should be cited.

NOTES ON THE GENUS *PLATYSACE* BUNGE.

By C. NORMAN, F.L.S.

IN this Journal (lxix. 287 (1931)) I discussed the use of the name *Trachymene* Rudge and de Candolle's misuse of it, pointing out that Bentham had used it correctly in 'Flora Australiensis.' Unfortunately most recent Australian Floras have ignored

Bentham's lead and have followed de Candolle. It is not proposed to discuss this point again, and I will only draw attention once more to the fact that there is no ambiguity about Rudge's type-specimen. The sheet consists of two plants, it is true, but that these are congeneric and conspecific is certain. What now remains to be cleared up is the correct name of *Trachymene* DC. non Rudge. It is much to be regretted that Bentham's use of *Sieberta* Reichenb. cannot be followed, but *Sieberta* Reichenb. is the latest of four homonyms and, therefore, is hopelessly invalid.

Apart from Labillardière's use of *Azorella*, the earliest name is *Fischera* Sprengel (Pl. Umb. Prod. 27 in Neue Schr. Naturf. Ges. Halle (1813)), but in the same year de Candolle described a genus of South American Asclepiads under the name *Fischeria* (Cat. Hort. Monsp. 112 (1813)), both genera being dedicated to Ferdinand Fischer, the actual date of publication in each case being unknown. Now *Fischera* Spreng. was never taken up in botanical literature (except by Smith in Rees, Cycl. Suppl. xxxix. (1819), in what amounts to a revision of the genus as then known), but *Fischeria* DC. has been in active use up to the present time. Moreover, Sprengel himself in Syst. Veg. i. 879 (1825) dropped *Fischera* and adopted the name *Trachymene* DC. for his genus, thereby implying the priority of de Candolle's name. But even if it could be shown that *Fischera* Spreng. antedated *Fischeria* DC. it is extremely unlikely that the latter would now be suppressed. In my former note I suggested that the correct name for the genus was *Platysace* Bunge. I am still of that opinion, but it must be remembered that *Platysace* was described as a genus distinct from the shrubby species of *Trachymene* DC. on account of its very flat fruit, and it is so regarded by Drude in Pflanzenfam. iii. 8, 120 (1898). On the other hand, both Bentham (Flor. Austral. iii. 351 (1866)) and Domin (Bull. Acad. Geograph. Bot. xviii. 481 (1908)), the only other writers who have dealt with the genus as a whole, included it in *Sieberta* and *Trachymene* respectively. If this is done, and I believe it is the better view, then the use of the name *Platysace* becomes inevitable. As for the diversity in the characters of the fruit under this arrangement, I suggest that it is not greater than in *Eupleurum*, one of the few really satisfactory genera in the family. In all other characters the shrubby species hold together remarkably well and merge almost imperceptibly into the herbaceous-suffrutescent species. In other words, taken as a whole the genus seems to represent a real taxonomic unit.

Three species are known to produce underground tubers. Investigation may show that other species do so. The function of these tubers is unknown (Hook. Icon. 2740).

There follows an enumeration of the species (giving the new combinations) under their appropriate sections, based on

Domin's account (*loc. cit.*), but it will be seen that I have added one new section—*Euplatysace*—for the very flat-fruited species, i. e., *Platysace*, sensu stricto. Since this paper makes no pretence at being a revision of the genus, but is merely an attempt to establish its name, I have accepted the species as given by Domin without prejudice as to their validity, except where I had obvious reasons for disagreeing with him:—

PLATYSACE Bunge in Lehm. Pl. Preiss. i. 285 (1845). *Azorella* Labill. Pl. Nor. Holl. 1-73 (1804), non Lam. 1783; *Trachymene* DC. Bot. Mag. 2875 (1828), non Rudge 1811; *Sieberta* Reichenb. Consp. 145 (1828); Benth. Flor. Austral. iii. 351, non J. Gay, Mem. Soc. Hist. Nat. Paris, iii. 343 (1827), nec Hoppe, Flora, ii. 24 (1819), nec (*Sieberta*) Spreng. Anleit. ii. 282 (1817); *Catepha* Leschen. ex Reichenb. Handb. 221 (1837) (fide Ind. Kew), nomen nudum; *Platycarpidium* F. Muell. in Hook. Journ. Bot. ix. 309 (1857).

Calycis dentes minuti sed conspicui. Petala integra aliquando subpersistencia. Fructus a latere compressus didymus, mericarpiis quinque jugis, ad commissuram constrictis, valde compressis vel turgidulis dorso acutis vel obtusis; jugis primariis dorsalibus saepius prominulis, intermediis curvilineis plus minusve prominulis, vel subobscuris in medio faciei lateralis dissitis, lateralibus in commissuram latentibus vel ab ea parum distantibus. Plantae perennes herbaceae aut frutices vel suffrutices, foliis integerrimis vel sectis, rhizomatibus interdum tuberosis. Umbellae compositae rarissime simplices.

Type-species, *Platysace cirrosa* Bunge.

Section **PLATYMENE** (DC.) Norman. *Trachymene* sect. *Platymene* DC. Prod. iv. 72 (1830).

Plantae herbaceae virgatae vel suffruticosae ramis applanatis vel teretibus; saepius paucifoliae vel (saltem post anthesin) nudae; folia basalia secta caulina saepius ad bracteas minutas reducta. Fructus turgidulus nec plane compressus.

Type of section, *Azorella compressa* Labill.

Platysace compressa (Labill.), comb. nov.=*Azorella compressa* Labill. Pl. Nov. Holl. i. 75, t. 101.

P. anceps (DC.), comb. nov.=*Trachymene anceps* DC. Prod. iv. 73.

P. filiformis (Bunge), comb. nov.=*Tr. filiformis* Bunge in Pl. Preiss. i. 289.

P. pendula (Benth.), comb. nov.=*Tr. pendula* Benth. in Enum. Pl. Hugel, 54.

P. juncea (Bunge), comb. nov.=*Tr. juncea* Bunge, in Pl. Preiss. i. 286.

- P. ramosissima** (Benth.), comb. nov.=*Tr. ramosissima* Benth. in Enum. Pl. Hugel, 54.
- P. teres** (Bunge), comb. nov.=*Tr. teres* Bunge in Pl. Preiss. i. 286.
- P. dissecta** (Benth.), comb. nov.=*Sieberta dissecta* Benth. Flor. Austral. iii. 354.
- P. heterophylla** (Benth.), comb. nov.=*S. heterophylla* Benth. Flor. Austral. iii. 354.
- P. tenuissima** (Benth.), comb. nov.=*S. tenuissima* Benth. Flor. Austral. iii. 354.
- P. haplosciadia** (Benth.), comb. nov.=*S. haplosciada* Benth. Flor. Austral. iii. 353.

Section **DENDROMENE** (DC.) Norman. *Trachymene* section *Dendromene* DC. Prod. iv. 73 (1830). *Fischeria* Spreng. emend. Smith (*loc. cit.*), non *Fischeria* DC.

Frutices rarius suffrutices ramis foliatis teretibus, foliis integerrimis vel rarius inferioribus trifidis. Fructus turgidulus a latere compressus vel lateribus mericarpiorum expansis nec compressis.

Type of section *Azorella lanceolata* Labill. Pl. Nov. Holl. i. 74, t. 99.

Platysace linearifolia (Cav.), comb. nov.=*Azorella linearifolia* Cav. Icon. v. 57, t. 485.

P. ericoides (Sieb. ex DC.), comb. nov.=*Trachymene ericoides* Sieb. ex DC. Prod. iv. 73.

P. LANCEOLATA (Labill.) Druce, Rep. Bot. Exch. Club Brit. Is. 1916, 647 (1917)=*Azorella lanceolata* Labill. Pl. Nov. Holl. i. 74, t. 99.

P. Maxwellii (F. Muell.), comb. nov.=*Tr. Maxwellii* F. Muell. in Victoria Naturalist, ix. 56 (1872), and in Bot. Centralbl. li. 396.

P. Stephensonii (Turcz.), comb. nov.=*Tr. Stephensonii* Turcz. in Bull. Soc. Nat. Mosc. xxi. 170.

P. Eatoniae (F. Muell.), comb. nov.=*Tr. Eatoniae* F. Muell. in Bot. Centralbl. li. 397.

P. commutata (Turcz.), comb. nov.=*Tr. commutata* Turcz. in Bull. Soc. Nat. Mosc. xxii. iii. 30.

P. effusa (Turcz.), comb. nov.=*Tr. effusa* Turcz. *loc. cit.* p. 31.

P. deflexa (Turcz.), comb. nov.=*Tr. deflexa* Turcz. *loc. cit.* 3, p. 31.

Section **EUPLATYSACE** Norman. *Platysace* Bunge, *loc. cit.*, sensu stricto. *Platycarpidium* F. Muell. *loc. cit.*

Frutices ramis foliatis teretibus, foliis integerrimis. Fructus major, plane compressus, latus.

Type of section, *Platysace cirrosa* Bunge.

PLATYSACE CIRROSA Bunge (*loc. cit.*).

P. VALIDA F. Muell. Fragm. Phyt. Austr. i. 232 (1858-9)=*Platycarpidium validum* F. Muell. in Hook. Journ. Bot. ix. 310 (1857).

THE WITHERING OF FLOWERS.

By H. M. LIVENS.

WITH the production of seeds it is generally assumed that the function of a flower as such is accomplished. By means of its conspicuous and brightly-coloured petals, its nectar and perfume, it has attracted insects capable of transferring pollen from anther to stigma, and now there remains for it but to collapse and fall. That this assumption is wide of the mark seems clear from the following observations. Indeed, in the life-history of a flowering plant there is ground for contention that the withered petal plays a part no less significant than colour, nectar, and scent.

It is of the highest importance to a plant that its mechanism for reproduction should enjoy all necessary protection while its seeds are in process of development and ripening. The ovary must be guarded from injury by birds and insects and protected from extremes of temperature and humidity. To this end it will be advantageous to the seeds if the flower loses its attractions without delay.

Flowers begin to wither within a very short time after pollination. If pollination is artificially prevented, as it often is in a greenhouse, the flower remains unchanged for a considerable time.

Large and brilliant flowers, such as the poppy, and lilies of striking colour fall to pieces quickly. Many clustered small flowers also are evanescent.

Leaves perform a two-fold function. They are *protective* and *vegetative*. When a perennial plant has completed its reproductive cycle the leaves fall—but there is no waste. The chloroplasts in the cells break down, and their products recede down the twigs into the buds as stores for their nourishment in the following spring.

It is my aim to point out how the petals of a flower, by withering, carry on, in specially developed methods to meet a variety of conditions, the two-fold function of protection and nutrition. Thus, along with the shrivelling and decaying leaf,

the withering flower also contributes to the future welfare of the plant.

After the fertilisation of the ovules the flow of food-material appears to be diverted from the petals to the ovary, where henceforth it will be imperatively needed. That this is so is borne out by the non-withering of double flowers, which will sometimes last for weeks and even months after the corresponding single flowers have dropped.

I venture to suggest therefore that the process of withering is a modification which has proved helpful to the preservation of the species.

In addition to a measure of nutrition, the advantages gained are :—

(i.) The cutting off of attractions from insects, birds, and other creatures which otherwise might continue to visit the flower and injure the ripening seed. Hence the withdrawal of colour, scent, and nectar.

The colours of withering are principally shades of dull buff and light brown—the least conspicuous tints in nature. Such, likewise, are the prevalent tones of the coats of wild animals and birds. It is nature's camouflage—her khaki. There is safety in dulness—in dust colour.

Other tones of withering are in the nature of reductions in the normal colour of the petals. Hence the appropriateness of the term *withering* or *weathering*: that is, the washing-out and bleaching of the pigment as if by the action of the weather.

(ii.) The protection of the ovary from the inclemencies of the atmosphere.

I will endeavour to illustrate these points by observation of some familiar wild flowers :—

(i.) *Tragopogon pratensis*.—After fertilization the involucre, with its long green bracts, closes tightly round the shrivelling florets, pinching them into a solid mass. This condition is retained while the seeds are ripening and the pappus is growing. Then, after a few days, the involucre relaxes its grip and we have the beautiful head of grey pappus displayed to perfection.

Similar manœuvres may be observed in other composite flowers, such as Sow Thistle and Hawkweed, the flower of which screws itself up tightly and so excludes rain and enemies.

(ii.) The Dandelion shuts up after pollination in a like manner, but subsequently plays a trick of its own. The stalk with the flower-head reduced once more, as it were, to a big green bud, bends towards the ground, remaining in a recumbent or nearly recumbent position until the seeds are mature. Then the stalk straightens itself again, and its hoary head is elevated and catches the breeze, when seed after seed sails away on its miniature parachute.

The rapidity with which the stems and filaments of the pappus develop is noteworthy; the growing mass of down eventually pushing off the withered florets in front of them.

Anthemis nobilis behaves very differently. It does not close—for the simple reason that it cannot. Its involucre is too small to enclose the flower-head, which, for its part is too solid to yield to pressure, and it produces no pappus.

Instead of following the tactics of the Dandelion and other composites, the Chamomile drops its ray-florets—one only remaining here and there, discoloured and limp, giving the plant an untidy appearance.

The withered disc-florets, on the other hand, remain in position much longer, thus forming a loose blanket over the young fruits. For the rest, the strong smell and taste of the plant is probably defence enough against insect enemies.

The calyx commonly remains green and doubtless helps to feed the seeds.

In the Greater St. John's Wort (Tutsan), the calyx is relatively large for the flower, although that is very big and handsome. As it withers (1) the petals fold close round and over the ovary, pressing the stamens down upon it. (2) In a few hours the corolla and stamens fall off in a mass. Then (3) the open-mouthed calyx almost envelopes the ovary.

The same thing takes place in *Convolvulus*. Compare the opening with the closing of the flower. The bud is a twisted cone which untwists to open. But after fertilization the beautiful trumpet-shaped corolla cannot be re-twisted. It has expanded too widely at the mouth. So, instead, the outer edge is turned in after the grocer's way of tucking in the ends of a packet of moist sugar.

In Roses, the petals being scented and retaining their colour and scent after dying, they fall away entirely and without delay and so do not offer any further attraction to insects. The dead protective stamens remain, however; some even on the ripe fruit. The acidity of the unripe fruit itself acts as a deterrent to birds until the seeds are ripe.

Prunella vulgaris.—This plant has a box-like calyx which is closed over the bud and opens for the flower to emerge. When the flower falls, exposing the four seeds at the base of the calyx, the lower lip of the latter gradually closes up until it meets the upper lip, precisely in the manner of the lower jaw closing on the upper one. When the small seeds, at first white, have grown much bigger and turned black, the lip or jaw falls again and they drop out.

It will be observed how intimately the mechanism of withering is connected with the mechanism for the distribution of the seeds, in this as in many flowers.

White (or Dutch) Clover.—Every separate floret on the flower-head as it is fertilized closes and turns brown, and then, instead of standing erect and catching the sunshine and the eye of the passing insect as it has done hitherto, hangs down and so throws off the rain. It is very interesting to watch this sequence of posture as flower by flower shuts up and declines.

Red Clover.—Here is a noteworthy difference. The dead flowers shrivel at the lips but remain erect. This variation is accounted for by the length of the corolla of the red as compared with that of the white clover. The tube is narrow and pipe-like, and therefore the flower of red clover needs the long tongue of the Humble Bee to fertilize it. Hence the importation of Humble Bees into New Zealand, and hence, too, Darwin's famous riddle of the Cats and the Clover.

The flower of white clover is short, wide open at the mouth, and the upper and lower parts are separate to the base, so that if they remained open the seeds would be exposed.

Campanula rotundifolia.—When it withers this charming flower loses all its beauty and becomes but a discoloured shred. But note the difference in its portly relative the Canterbury Bell or Giant Bell Flower, which, while it loses its colour does not merely collapse, but gathers itself together and becomes a neat bell-tent.

Digitalis purpurea.—The divided pistil closes at once after fertilization, and then the flower carrying with it the spent stamens falls off, leaving the ovary and pistil exposed.

Daffodil.—In the withering daffodil we see a gradual dying and collapse of the flower. Note the protective service of the dry membranous bract.

Teucrium Scorodonia.—The flower after fertilization soon falls leaving the four seeds exposed at the base of the calyx which remains open; in Self-heal it closes.

The following points are also to be observed:—(i.) The calyx, bracts, and stalk are all of a dull and inconspicuous green. (ii.) The calyx is lined with defensive hairs set at right angles to the inner surface, a defence against small insects. (iii.) While the flower on opening is inclined upwards at an angle of 45° with the stem, the calyx with the fertilised seeds is depressed to a right angle. This is better than hanging downwards as the seeds are thus likely to be more widely scattered.

Erica cinerea.—The bells turn a light brown but retain their shape almost perfectly, only contracting a little at the mouth. Stamens and pistil also remain rigid. Protection is thus afforded against the cold drenching mists and dew of moor and mountain. This persistence of the dead flower is to be seen in various

heaths and other mountain and moorland flowers, *e. g.*, gorse, ling, etc.

Another interesting example is the Carline Thistle. In winter this plant, though dead, retains its living form and colour. It thus remains for many months conspicuous with its yellow head on the short green turf of the downs until beaten and blown to pieces by wind and rain. The long inner scales of the involucre, straw-coloured and glossy, form a fine radiant crown. In sunshine they lie flat; when the atmosphere is moist they rise and form a conical roof over the florets after the style of the peristome of a moss-capsule.

Arum maculatum. Everyone is familiar with the ingenious device for cross-fertilization in this flower.

The points to be noted are (1) the withering of the abortive flowers: (2) the collapse of the sheath so closing up the chamber after fertilization.

A very similar arrangement of organs and process of fertilization and withering may be observed in *Aristolochia Clematis*.

Poppy.—The petals fall off immediately after fertilization, without withering, leaving the ovary entirely exposed. It is roofed in with, as it were, ridges of tiles, and with eaves which project over a row of perfectly fitting ports, which remain tightly closed until the seeds are ripe when they open automatically. No insect, probably, will venture to bite through the opium-charged walls of the capsule.

That withering is not just an unavoidable accident is indicated by the fact that some flowers do not wither. An interesting case is presented by the *Persicarias*.

Polygonum Convolvulus.—Here the ripe seed enclosed in the perianth has exactly the same appearance in shape and colour (though larger) as the bud before opening. The six divisions of the perianth actually go on growing, keeping pace with the rapid growth of the triangular fruit within. The apparent reason of this singular phenomenon is that the flower is *self-fertilizing*, and that it can afford to be very inconspicuous: (small, light green, and white).

Even the empty anthers retain their original colour—pink. Finally, the fruit, soft at first, becomes hard and black, and invested in the perianth.

Another good example of this interesting procedure is seen in the flower of the Elm.

These instances of the varied methods adopted by flowers in the process of withering might no doubt be almost indefinitely extended. They are a few only of those that have come under my own observation, but sufficient, it may be, to show that it is not an accidental or aimless occurrence to organs which have

fulfilled their service. On the other hand, withering appears to be a highly elaborated process playing a very important part in the life-history of the plant. Every species has its own method of withering, to which it adheres strictly. Throughout its various stages withering contributes, as we have seen, to the future welfare of the species. It may do so

(1) By repelling, instead of attracting, insects and other visitors.

(2) By providing protection from the weather for the seeds during the period of their development.

(3) By diverting the current of vital elements from parts which no longer need them to organs which henceforth demand a large and rapid supply of nourishment.

REVIEWS.

Principles of Palaeobotany. By WILLIAM C. DARRAH. 8vo, pp. 239. Chronica Botanica Company, Leiden, 1939. Price 7 Guilders (stiff paper cover).

IN the foreword to this book the Author modestly writes that he does not expect to satisfy the Palaeobotanical specialist or the morphologist and that his only purpose is to prepare a general introductory survey of the field of Palaeobotany. It is not clear then for whom the book is intended.

There are chapters on the history and technique of the subject concisely treated with useful references to literature. The principal groups of vascular plants and special problems of morphology occupy about ten chapters and here the references are the most valuable part. There is a useful chapter on coal. The rest of the book consists of chapters dealing with stratigraphical matters, the distribution of fossil floras, evolution, and phylogeny.

The book seems to have been written in a hurry. In the chapter on the Psilopsida we find a description of *Baragwanathia*, one of the earliest known vascular plants in which the sporangia are found on the axis among the leaves; a few lines further on we find "When we began with our study of Upper Silurian and Lower Devonian Floras we found no such structures as roots, leaves, strobili, or seeds. The plant body is nothing more than a simple green axis bearing terminal sporangia. . . ."

The author has made notable contributions to our knowledge of North American fossil plants, and in the opinion of the reviewer this book does not reach his usual standard of attainment.—J. W.

Wild Flowers of Australia. By THISTLE Y. HARRIS. Illustrated by ADAM FORSTER. 8vo, pp. xviii+195, 65 coloured plates. Sydney and London: Angus and Robertson. Price 8s. 6d.

THIS is an attempt to meet the demand for a popular guide to Australian wild flowers. After a "foreword" there is "an appreciation" of the artist, Adam Forster, who died recently at the age of seventy-eight before the publication of the book. The introduction, placed strangely on the pages with Roman numerals before the list of contents, gives a summary of the main types of Australian plants in a little over five pages.

The main body of the book is in two sections. Part I contains popular descriptions of the 248 species shown on 65 plates. These descriptions are adequate, and the illustrations, though somewhat small and sometimes distorted to fit in the available space, are on the whole quite successful. The second part has a key to the families based on Mueller's "Census of Australian Plants" (*i. e.* Bentham & Hooker), and characters of the families and genera, with a key to the species and a reference to the plate number for each species. Thus, although for convenience of reproduction the botanical sequence is not followed in the popular descriptions, the cross-reference makes this of no consequence.

Derivations of generic and specific names are given; this is very important in popular books, because it leads, through understanding, to the use of scientific names. It would have been a little more inspiring, however, to have dealt more fully with some of the personal names. A. Cunningham is described as "Australian Botanist and Explorer," but R. Brown as "eighteenth century botanist," and the Bauer brothers as "botanical artists." There is a glossary, a list of names of authors with their abbreviations, a list of books of reference, and an index.

The book will doubtless prove useful to those wishing to learn the names of a few Australian plants. The method of presentation is unusual and should give great help in getting down to botanical facts. But, more than with most incomplete works, it is probable that the omissions will cause annoyance so soon as any serious attempt to use it is made.

Plant Growth-substances. By HUGH NICOL. 8vo, pp. 108, 6 figs. London: Leonard Hill, Limited, 1938. Price 3s. 6d (stiff paper cover).

THIS book is based on a series of articles in 'The Manufacturing Chemist,' and gives a reasonably simple account of the chemistry and applications of growth-substances, with special reference to their synthesis. The first chapter is headed

"A Chapter for the Layman" and the second "Also for the Layman." It is extremely probable that without some stimulation the layman will get little beyond these first fourteen pages. The book, however, should provide for students a useful summary of the present state of our knowledge of this important subject.

BOOK-NOTES, NEWS, ETC.

PERSISTENCE OF MILDEW ON EUONYMUS JAPONICA.—When in 1919 we took a house in Richmond, Surrey, I noticed that two shrubs of *Euonymus japonica*, which were in the privet hedge on each side of the gate, had their leaves covered with the mildew *Oidium Euonymi-japonicae*. The hedge has been cut back several times each summer and, because of their position, the shrubs have received drastic treatment, often most of their leaves being removed. In addition, the shrubs have frequently been attacked by caterpillar, and from one cause or another there has been complete defoliation. In spite of this the fungus has recurred every year for twenty years. The fungus was first described in 1900 from Italy. It was recorded for this country in 1903 and was found in 1904 at the Kew end of the road in which our house stands; it still occurs in various places along the road. I have no doubt, however, that the mildew overwinters on the two shrubs, for it is always to be noticed there at least as early as on any plants in the neighbourhood.—J. R.

BRAKE FERN ON BRISTOL WALLS, ETC.—The interesting article by Mr. J. E. Lousley on *Pteridium aquilinum* (L.) Kuhn in London, and the statement that "Bracken reproduces from spores far more than is generally supposed," reminds me that a few years ago I paid particular attention to the occurrence of this fern (and various other plants) on walls in Bristol and Clifton. A semi-popular article by me on the subject was entitled "Bracken on Stone Wall" ('Gardening Illustrated,' 1 Jan. 1938). This was chiefly about a Brake fern, 2 ft. 6 inches high, in the mortar of a Millstone Grit Quartzite wall at about 8 ft. above the path at the corner of two roads close to Richmond Hill, Clifton. It had sent down a rhizome, then two feet long, "with the growing point vainly seeking a more hospitable home." A photograph taken of the plant was not a success.

To-day the rhizome is still there, but dried up and shortened. Some fresh fronds of the *Pteris* now grow in the mortar for four feet along, near the top of the 10 ft. high wall (of the garage) which has a brick coping at this corner. Three plants of small *Filix-mas* now grow below the dried up rhizome. *Linaria Cymbalaria* is the only other plant there, with quantities of a minute moss on the mortar. The *Linaria* is extremely common

about Clifton on walls, and so is *Asplenium Ruta-muraria*. Only once or twice, years ago, have I seen a plant or two of *A. Trichomanes* in Bristol.

During the past few years I have seen Bracken growing in several places in Bristol. In Aug. 1938 very small fronds of Bracken and Male fern were on a wall in Hampton Road, Redland. Two clumps of young Bracken six inches high were last year on sloping stone-work in Queen Square, where to-day there is no sign of it. It still grows 9 ft. up a 22 ft. high stone retaining wall in Park Row (below the University and the Museum). This clump has several short fronds springing from a narrow mass of roots two feet long. There is nothing else on this part of the long and very high stone wall except a few small *Sagina apetala*.

And once at an earlier date Bracken grew on low ground between the Gas Works and Bristol Station. This may be the same site where J. W. White mentioned as having in 1888 seen "a large patch flourishing on one of the rubbish-tips in St. Philip's Marsh, Bristol."

I have also seen Bracken two or three times among condemned and partially demolished roofless houses on the West (Clifton) and North sides of Bristol City.

My belief is that most if not all the plants of Bracken found on Bristol walls, demolished houses, and waste places owe their origin to spores brought by air-currents.

Nearly all the younger fronds and seedling plants noticed are "thinner in texture, and the ultimate pinnules roundish-ovate and crenate," to quote 'English Botany,' vol. xii. 146, as Mr. Lousley did in Journ. Bot. 1936, p. 201. Indeed, they are very different from the mature fronds.—H. S. THOMPSON.

BRACKEN SEEDLINGS IN LONDON.—A still more remarkable appearance of sporelings of *Pteridium* in London than any mentioned by Mr. Lousley in the last number of this Journal (p. 181) is the occurrence of young plants in the lower edges of window-frames in the underground tunnel from South Kensington Station to Exhibition Road. I have watched them growing there for several years. The window-edges are about ten feet from the floor of the tunnel, but doubtless the spores got into the cracks from the main street above. There are also young plants in a wall on the south side of Kew Road, near its junction with Richmond Road. I have pointed out in the 'Dispersal of Plants,' p. 554, that spores are carried about in rough baggage sacks and as formerly at least bracken cut in autumn was largely used as litter in stables it is possible that spores might be carried in the hair of horses used in traffic, but I think that in the majority of cases, certainly in that of the plants in the tunnel, they must be wind-borne—perhaps from a long distance.—H. N. RIDLEY.

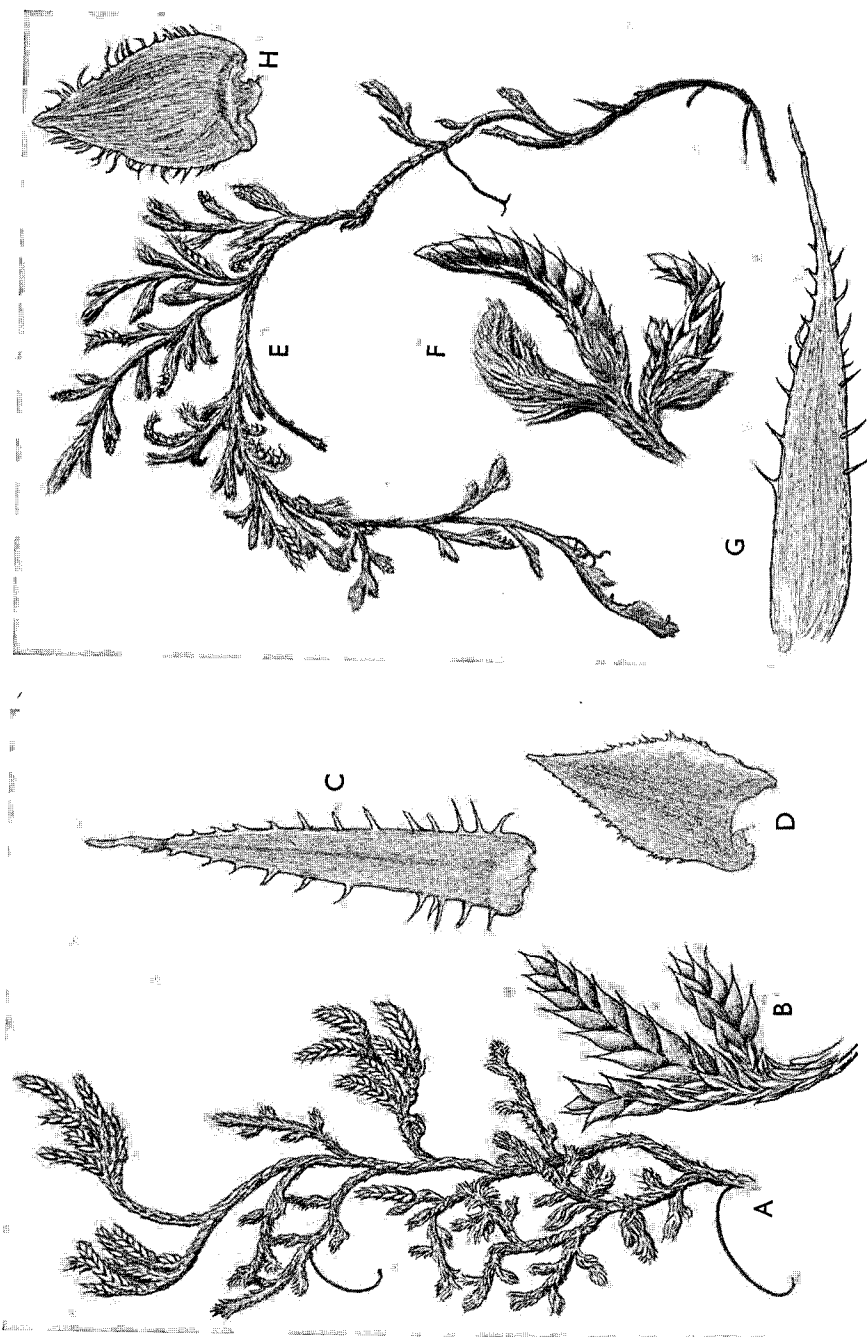
"WILD ASPARAGUS."—The following letter from Capt. A. E. A. Dunston appeared in *The Times* on June 19th last:—"I was travelling from Donhead St. Mary to Devizes about a week ago, and at Trowbridge my attention was attracted by a notice outside a shop which read, 'Wild asparagus 2d. a bunch.' The boy who sold me a quantity of it told me that this shop always got it in large quantities, and that a lot of customers regarded it as better than garden asparagus. On eating it, it proved to resemble to quite an appreciable degree the garden asparagus. Two stalks fortunately had flowers out, and it proved to be on examination *Ornithogalum pyrenaicum*, or the spiked Star of Bethlehem. It would be an interesting thing to know if this plant, which is only found in abundance locally, is elsewhere used as a substitute for asparagus."

VIIITH INTERNATIONAL BOTANICAL CONGRESS.—The preliminary programme of the next International Congress, which is to be held at Stockholm, July 17th–25th, 1940, has been issued. There are to be eleven sections:—Agronomy, Cytology, Experimental Ecology, Genetics, Morphology, and Anatomy, Mycology and Bacteriology, Palæobotany, Phytogeography (including Comparative Ecology), Plant Physiology, and Taxonomy and Nomenclature. The programme includes many subjects of fundamental interest, and also provides for intersectional discussions. A most attractive series of excursions has been arranged, which in effect extend the Congress from June 26th to August 21st.

Professor Rob. E. Fries is President of the Congress. Professor Hugo Osvald, Lantboukshögskolan, Uppsala, is General Secretary, having replaced Dr. Rudolf Florin, who is prevented from continuing in office through pressure of scientific work.

BRITISH PTERIDOLOGICAL SOCIETY.—The Annual Meeting of this Society has been fixed for July 24th at the George Hotel, Chard, Somerset.

THE Swedish Post Office has issued four stamps to commemorate the 200th Anniversary of the foundation of the Swedish Royal Academy of Science, which is to be celebrated in Stockholm in September. Two of the stamps have a portrait of Linnaeus, who was one of the founders of the Academy and its first President; the other two that of the chemist Berzelius. The portrait of Linnaeus is evidently taken, most appropriately, from the famous painting by A. Roslin, which is in the possession of the Swedish Academy, and shows him in 1775, in his sixty-eighth year.

NOTES ON *SELAGINELLA*.

IX. THE SOUTH AFRICAN SPECIES.

BY A. H. G. ALSTON.

(PLATE 620.)

A REVISION of the South African species of *Selaginella* has been urgently needed for some time, as several supposed species were not seen by T. R. Sim, who was obliged to transcribe his descriptions from Baker's 'Fern Allies.' In this paper four of Sim's species are reduced to synonymy, and one, *S. rupestris*, is subdivided into two, the number of South African species being reduced from ten to seven.

Key to the Species.

- Leaves never dimorphous :
 Leaves distant, spreading or reflexed 1. *S. pygmaea*.
 Leaves crowded, spirally arranged, never reflexed :
 Sporophylls dimorphous ; strobili horizontal ;
 lateral branches not dorsiventral ; terminal
 arista of leaves white, opaque 2. *S. Dregei*.
 Sporophylls uniform ; strobili erect ; lateral
 branches strongly dorsiventral ; terminal
 arista of leaves translucent 3. *S. caffrorum*.
 Leaves dimorphous :
 Stems upright :
 Stems tufted ; branches curling up in drought ;
 leaves of the upright stems uniform ; sporo-
 phylls uniform 4. *S. imbricata*.
 Stems not tufted, stoloniferous ; branched ;
 leaves all dimorphous ; sporophylls dimor-
 phous 5. *S. abyssinica*.
 Stems creeping :
 Lateral leaves denticulate ; leaves of main stem
 distant 6. *S. Kraussiana*.
 Lateral leaves ciliolate at base, imbricate 7. *S. Mittenii*.

1. *S. PYGMAEA* (Kaulf.) Alston in Journ. Bot. lxi. 257 (1931).
Lycopodium pygmaeum Kaulf. Enum. Fil. 9 (1824). *L. bryoides*
 Kaulf, l. c. 10. *Selaginella bryoides* (Kaulf.) Hieron. in Engl.
 u. Prantl, Nat. Pfl. 1, pt. 4, 449, no. 4 (1901), non Underw. (1900).
Lycopodium pumilum Schlecht. Umbr. i. p. 6, no. 3, t. 3 (1825-32).
Selaginella pumila (Schlecht.) Spring in Bull. Ac. Brux. x. 136
 (1843) ; Sim, Ferns S. Afr. ed. 2, 332, no. 207, t. 182, ff. 2, 3 (1915).

CAPE PROVINCE, mainly in the Western Districts. Reported
 from Natal :—Port Natal, Gueinzus (BM), but not found there
 recently.

2. *S. DREGEI* (Presl) Hieron. in Hedwigia, xxxix. 315, no. 24
 (1900). *Lycopodium Dregei* Presl, Bot. Bemerk. 153 (1845) ;
 in Abh. Böhm. Ges. Wiss. ser. 5, 583 (1845). *S. Dregei* vars.
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Bachmanniana, *pretoriensis*, *Rehmanniana*, and *Petersiana* Hieron. l. c. 317. *S. rupestris* var. *recurva* f. *Dregeana* A. Br. in Kuhn, Fil. Afr. 214 (1868). *S. rupestris* forma *Dregei* (Presl) Milde, Fil. Eur. 262 (1867). "*S. rupestris* Sprengel"; Sim. op. cit. 332, no. 208 (1915), p. p.

PONDOLAND: *Bachmann* 9 (K).

NATAL: *Gueinzus* (BM); *Stevens* 329 d (BM); Magalisberg, prostrate on bare hill side, 4000 ft., *Pegler* 932 (BM); on rocks on river bank near Omsamcaba above the big waterfall, 1200 ft., *Drège* b (BM).

ORANGE FREE STATE: *Fouriesburg*, *Brierley* (BM).

TRANSSVAAL: *Houtbosh*, *Rehmann* 5576 (BM); hills above Aapiessriver, Pretoria, *Rehmann* 4333 (BM); Wonderboom, Pretoria, *Bottomley* 2871 (BM); Silvertown, Pretoria, *Watson* 3000 (BM), *Bosman* 4651 (BM); between Standistan and Pretoria, *Wilms* 1814 (K); Kensington, Johannesburg, *Goldberg* 19100 (BM); Milner Park, Johannesburg, *Moss* 18988 (BM); Lobombo-borgen, *Wilms* 1814 a (BM); Derde Poort, *Leendertz* 935 (BM).

RHODESIA: *Wankie*, *Mack* (BM); Victoria, *Munro* 1777 (BM), 1021 A (BM), 1883 (BM); Matopo Hills, on kopjes, 4500 ft., *Gibbs* 4 (BM); *Rogers* 5683 (BM); Chinamani Mts., 7000 ft., *Swynnerton* (BM).

PORTUGUESE E. AFRICA: *Namaacha*, *Gomes e Sousa* 85 (BM).

Some of the supposed varieties of *S. Dregei* described by Hieronymus are no doubt distinct species.

S. grisea, nom. nov. *S. Dregei* var. *Hildebrandtiana* Hieron. in Hedwigia, xxxix. 317 (1900).

KENYA: *Egu*, between Duruma and Taita, *Hildebrandt* 2363 (BM).

TANGANYIKA: *Tembo*, N. Kilosa district, c. 2500 ft., on bare rocky outcrops, *Haarer* 1953 (BM); between Zanzibar and Uyni, *W. E. Taylor* (BM); c. 1300 m., Morogoro district, *Schlieben* 3338 (BM); summit of great rock, 2000 ft., Zindeni Hill, Handeni district, *Burt* 4949 (K); Taro plains, 1100 ft., *Kaessner* 531 (BM).

This species is separated from *S. Dregei* by its narrow leaves with short distant cilia and long white terminal awn.

Another distinct species of this group is:—

S. Phillipsiana (Hieron.), comb. nov. *S. Wrightii* var. *Phillipsiana* Hieron. in Hedwigia, xxxix. 320 (1900).

BRITISH SOMALILAND: *Wagga* Mts., *Lort Phillips* (BM); Dimoleh, *Gillet & Aylmer* (BM); El Gaboli, 3500 ft., *Godman* 163 (BM); Darra-as, 5000 ft., *Lort Phillips* (K), *Cole* (K).

KENYA: *W. Sak*, rocky ground on hill-top, 4000 ft., *Napier* 2054 (K).

TANGANYIKA: *Mbalu*, c. 1500 m., *Uhlig* 845 (BM).

It seems advisable to separate this from the Indian plant, which has longer, more yellow awns.

3. *S. CAFFRORUM* (Milde) Hieron. in Hedwigia, xxxix, 313, no. 22 (1900). *S. rupestris* f. *caffrorum* Milde, Fil. Eur. 262 (1867). *S. capensis* (A. Br.) Hieron. op. cit. 314, no. 23. *S. rupestris* var. *incurva* f. *capensis* et *abyssinica* A. Br. ex Kuhn, Fil. Afr. 213 (1868), p. p. *S. rupestris* var. *incurva* f. *angolensis* A. Br. l. c.

E. CAPE: *Tsola*, nr. *Umtata*, *Welsh* 18089 (BM).

KAFFRARIA: *Terra Caffrorum*, *Bunge* (type); *Katberg* and *Witbergen*, 5–6000 ft., *Drège* a (BM); *Witberg*, *Drège* aa (D); *Witteberg*, *Molmonspuit*, *Caledon R.*, *Rehmann* 3924 (D); *Katberg*, *Drège* a (D); *Tina River*, *Tanskei*, *Schlechter* 6397 (BM); *Windwagelsberg*, *Baur* 1110 (D); *Top of Dohne Hill*, *Sim* (D).

ORANGE FREE STATE: *Bethleem*, *Rehmann* 4005 (BM, D).

NATAL: *Friedenau*, *Rudatis* 857 (BM, D); *Zifafa*, *Rudatis* 361 (D); *Byrne*, on flat dry exposed rocks on mountain tops, 5–5500 ft., *Galpin* (BM).

Also in Angola and Tanganyika.

The Abyssinian specimens quoted by A. Braun probably represent an undescribed species.

4. *S. IMBRICATA* (Forsk.) Spring ex Dene. in Arch. Mus. ii. 193, t. 7 (1841–2); Sim, op. cit. 336, no. 211, t. 184, f. 3. *Lycopodium imbricatum* Forsk. Fl. Aeg.-Arab. 187 (1775).

RHODESIA: *Victoria Falls*, *Gibbs* 179 (BM), *Eyles*, 546 (BM).

PORTUGUESE E. AFRICA: *Tete*, *Kirk* (K); *Lupata*, *Kirk* (D, K).

Mozambique, *Peters* (D), also in Kenya, British Somaliland, Abyssinia, Eritrea, and Arabia.

5. *S. ABYSSINICA* Spring in Mem. Ac. Belg. xxiv. 99, no. 44 (1850). *S. Kirkii* Bak. in Journ. Bot. xxiii. 176, no. 257* (1885). *S. Goetzei* Hieron. in Engl. Bot. Jahrb. xxx. 265 (1901); in Engl. u. Prantl, Nat. Pfl. i. 4, 686, no. 160 (1901). *S. Whytei* Hieron. in Engl. u. Prantl, Nat. Pfl. i. 4, 697, no. 299 (1901); in Hedwigia, xliii. 18, no. 32 (1904). *S. Preussii* Hieron. in l. c. 686, no. 161, and 197, no. 18. *S. bueensis* Hieron. in Hedwigia, xliii. 20, no. 33 (1904). *S. molliceps* "Spring"; Sim, op. cit. 339, no. 216, t. 183. ? *S. Goudotana* Spring in Bull. Ac. Brux. x. 140, no. 36 (1843).

RHODESIA: *Caruso Forest*, *Gilliland* 1822 (BM).

PORTUGUESE E. AFRICA: *Namuli Mts.*, *Last* (K).

Also Nyassaland, Tanganyika, Kenya, Uganda, Belgian Congo, Abyssinia, Cameroon Mt., and Fernando Po.

S. Goudotana from Madagascar is probably the same.

6. *S. KRAUSSIANA* (Kze) A. Br. Ind. Sem. Mort. Berol. 1860, App. 22; Sim, op. cit. 335, no. 210, t. 182, f. 1. *Lycopodium Kraussianum* Kze in Linnaea, xviii. 114, no. 2 (1844).

East Cape, Kaffraria, Natal, Transvaal, and Rhodesia; also in Eastern Tropical Africa, and the Cameroon Mountain, and in the Azores.

Originally found by Kraus "in sylvis Zitzikamma districtus Uitenhage."

7. *S. MITTENII* Bak. in Journ. Bot. xxi. 81 (1883). *S. Welwitschii* Bak. l. c. p. 81. *S. Mackenii* Bak. op. cit. xxii. 89 (1884); Sim, op. cit. p. 338, no. 214. *S. Cooperi* Bak. op. cit. 89 (1884); Sim, op. cit. 338, no. 215. *S. tectissima* Bak. op. cit. 89, no. 119 (1884); Sim, op. cit. 337, no. 213. *S. depressa* "A. Br."; Sim, op. cit. 334, no. 209, t. 168, f. c. *S. integerrima* "Spring"; Sim, op. cit. 337, no. 212.

KAFFRARIA: Mt. Fletcher (teste Sim).

NATAL: Inanda, *Rehmann* 8184 (BM); Vildshill (Pinetown), *Rehmann* 8001 (BM); Ennerdale, Dumisa, *Rudatis* 936 (BM); Tugela R., *Gerrard & Macken* 237 (K); Colenso, *Penther* 24 (BM).

ORANGE FREE STATE: *Cooper* 1056 (BM, K).

BASUTOLAND: *Leribe, Dieterlen* 791 (K).

TRANSVAAL: wet rocks, Krantz Kloof, 400 m., *Schlechter* 3211 (BM); Pelindaba, *Bottomley* 3133 (BM); Macalisberg, *Sanderson* (K).

RHODESIA: Makoni, 5000 ft., *Eyles* 828 (BM).

Also in Tanganyika and Angola.

The type-specimen of *Lycopodium depressum* Sw. at Stockholm is *S. ciliaris* (Retz.) Spring, a native of Tropical Asia. Thunberg's locality was no doubt Ceylon as stated by Juel (Plantæ Thunbergianæ).

S. integerrima is confined to Ceylon and is the same as *S. ornithopodioides* (L.) Spring.

X. THE SPECIES OF THE SOLOMON ISLANDS.

It is entirely due to the collection of Mr. R. J. A. W. Lever that I am able to give an account of the Selaginellas of the Solomon Islands, and I wish to thank him for collecting the material for this revision. The affinities of the flora as shown by this group are entirely with New Guinea. The number of species found in the Solomon Islands is still small and there are no doubt many more to be discovered when the tops of the mountains are explored. There appears to be no floristic difference between the islands, the species being widespread throughout the archipelago.

Key to the Species.

Leaves strongly dimorphic through the main stems:

Lateral leaves strongly auricled; stems prostrate, rooting throughout; sporophylls uniform ..

Lateral leaves exauriculate; stems rooting throughout the lower half; sporophylls dimorphic ..

Leaves becoming more or less equal towards base of the main stem; stems suberect, rooting at base only:

Branches pubescent ..

1. *S. sepikensis*.

2. *S. ciliaris*.

3. *S. Leveriana*.

Branches glabrous:

Lateral leaves ciliate:

Lateral leaves long-ciliate 4. *S. firmula*.

Lateral leaves shortly ciliate 5. *S. nana*.

Lateral leaves entire or denticulate:

Main stem less than 1 foot; frond-like part deltoid 6. *S. poperangensis*.

Main stem about 1½ ft.; frond-like part oblong 7. *S. Reehingeri*.

1. *S. SEPIKENSIS* Hieron. in Engl. Bot. Jahrb. lvi. 243, no. 58 (1920).

ISABEL I.: Bogutu, *Lever* (BM); Tiratona, *Brass* 3218 (BM).

TULAGI I.: *Lever* (BM).

GUADALCANAL: Kau Kau Bay, *Norton Stewart* (BM).

MALAITA I.: Maramasike, *Lever* (BM).

GEOGRAPHICAL RANGE: New Guinea.

2. *S. CILIARIS* (Retz.) Spring in Bull. Ac. Brux. x. 231, no. 136 (1843). *Lycopodium ciliare* Retz. Obs. v. 32, no. 92 (1789).

ISABEL I.: Bogutu, *Lever* (BM).

GEOGRAPHICAL RANGE: eastwards to India and Southern China.

3. *S. Leveriana*, sp. nov.

Species heterophylla e turma *S. arbusculae*; caulibus e basi decumbente erectis, usque ad 35 cm. altis, parte inferiore simplicibus, sordide stramineis, subteretis, dorso sulcatis, parte superiore tripinnatum ramosis, ambitu deltoideis; ramis crebre pubescentibus, caulibus glabrescentibus; ramis primi ordinis ambitu ovato-oblongis, pinnatim ramosis; ramis secundi ordinis pinnatis, flexuosis, ambitu oblongo-lanceolatis; ramulis ultimis usque ad 8 mm. longis; foliis in parte simplice caulium homomorphis, elongato-triangularibus, acuminatis, minute serrulatis; foliis aliis valde heteromorphis; foliis lateralibus costatis, usque ad 3 mm. longis, 1-25 mm. latis, leviter inaequilateralibus, semifacie superiore semi-lineari-lanceolata, apice integra, basi minute serrulata; semi-facie inferiore semi-linearis, apice subacuta, basi truncata, integra; foliis axillaribus oblongo-linearibus; foliis intermediis costatus, inaequilateraliter ellipticis, integris, apice breviter aristatis, basi exteriore auriculatis; strobilis tetragonis, in apicibus ramorum ramulorumque singuli dispositis, c. 1 cm. longis, 2 mm. latis; sporophyllis ovato-deltoideis, carinatis, serrulatis, basi ciliolatis, apice acuminatis; megasporis superficie irregulariter reticulatis.

TETIPARI I.: *Lever* (BM).

ISABEL I.: Bogutu, *Lever* (BM).

GUADALCANAL I.: Kaukau River, *Lever* (BM); Bouegi R., *Lever* (BM); Kovagombi, *Lever* (BM).

SAN CRISTOBAL: Balego-nagonago, *Brass* 2702 (BM, type).

I have made Brass's specimen the type because it is the most complete and because this collection is represented in other herbaria.

4. S. FIRMULA A. Br. ex Kuhn in Verh. k.-k. zool.-bot. Ges. Wien, xix. 585, no. 132 (1869).

KOLOMBANGARA I. : Lady Lever, *Lever* (BM).

NEW GEORGIA I. : Pauru, *Lever* (BM).

ISABEL I. : Bogutu, *Lever* (BM).

RUSSELL Is. : Somata, *Lever* (BM).

SAVO I. : *Lever* (BM).

MALAITA : Maramasike, *Lever* (BM).

GEOGRAPHICAL RANGE : New Hebrides and Fiji.

5. S. NANA (Desv.) Spring in Bull. Ac. Brux. x. 232, no. 151 (1843). *Lycopodium nanum* Desv. ex Poir. Suppl. iii. 554, no. 96 (1814).

BOUGAINVILLE I. : Kamago, 900 m., *Kajewski* 2145 (BM).

SHORTLAND I. : *Guppy*, 125, p.p. (BM).

ISABEL I. : Bogutu, *Lever* (BM).

GUADALCANAL I. : Boyd's Creek, *Milne* 580 (K) ; Bouegi R., *Lever* (BM).

NGGELA I. : Halavo, *Lever* (BM).

TULAGI I. : *Lever* (BM).

MALAITA I. : Maramasike, *Lever* (BM) ; Uras Cove, *Norton Stewart* (BM).

SAN CRISTOBAL : Waimasi, *Brass* 2778 (BM) ; Balego-Nagonago, *Brass* 2707 (BM).

GEOGRAPHICAL RANGE : New Guinea.

Very little material has been seen from New Guinea, and it is possible that this is a distinct species.

6. S. POPERANGENSIS Hieron. in Denkschr. Ak. Wien, lxxxix. 483, t. 7, f. 13 c (1914).

POPERANG I. (SHORTLAND Is.) : *Rechinger*, 4082 (V).

SHORTLAND I. : *Guppy* 123 (BM) ; Faisi, *Lever* (BM).

NEW GEORGIA : Pauru, *Lever* (BM) ; Segi, Marovo Lagoon, *Lever* (BM).

TETIPARA I. : *Lever* (BM).

ISABEL I. : Bogutu, *Lever* (BM).

SAVO I. : *Lever* (BM).

MALAITA : Maramasike, *Lever* (BM).

ULAWA I. : *Lever* (BM).

SAN CRISTOBAL : Hinuahaoro, *Brass* 2868 (BM).

GEOGRAPHICAL RANGE : confined to the Solomon Islands.

7. S. RECHINGERI Hieron. *op. cit.* 486, t. 7, f. a & b (1914).

BOUGAINVILLE I. : Popoko, *Rechinger* 4715 (V) ; inland from Kieta, *Rechinger* 4666 (V) ; Kugumaru, Buin, *Kajewski* 1948 (BM).

SHORTLAND I. : *Seale* (BM ; Ho) ; *Guppy* 125, p.p. (BM), 123 (BM), 124 (BM), 126 (BM) ; Faisi, *Lever* (BM).

KOLOMBANGARA I. : Vila, *Lever* (BM) ; Lady Lever, *Lever* (BM).

NEW GEORGIA : Segi, Marovo Lagoon, *Lever* (BM).

TOTIPARI I. : *Lever* (BM).

ISABEL I. : Bogutu, *Lever* (BM) ; Fara, Maringe Lagoon, *Lever* (BM).

RUSSELL Is. : Yandiva, *Lever* (BM) ; Pepesala, *Lever* (BM) ; Lingatu, *Lever* (BM) ; Somata, *Lever* (BM) ; West Bay, *Lever* (BM).

SAVO I. : *Lever* (BM) ; Sulphur Springs, *Lever* (BM).

TULAGI : *Lever* (BM).

GUADALCANAL I. : *Milne* 577 (K) ; Kaukau R., *Lever* (BM) ; Bonegi R., *Lever* (BM) ; Kovagombi, *Lever* (BM).

MALAITA : Maramasike, *Lever* (BM).

SAN CRISTOBAL : Kira kira, *Lever* (BM) ; Waimamura, *Brass* 2568 (BM) ; above Mekara Harbour, *Milne* 538 (K).

SANTA CRUZ Is. : Nupani, *Norton Stewart* (BM ; Ho).

GEOGRAPHICAL RANGE : confined to the Solomon Islands.

EXPLANATION OF PLATE 620.

Selaginella cafferorum (Milde) Hieron. A, habit (natural size) ; B, strobili ; C, leaf ; D, sporophyll.
Selaginella Dregei (Presl) Hieron. E, habit (natural size) ; F, strobili ; G, leaf ; H, sporophyll.

AN ENUMERATION OF THE TROPICAL AFRICAN SPECIES OF *CENTAUREA* L.

By W. R. PHILIPSON, B.A.

THE *Centaureas* of Tropical Africa were last revised by Oliver and Hiern in the 'Flora of Tropical Africa' (iii. 436 (1877)), at which time eight species were recognised. Since then six additional valid species have been described and five previously described species have been found within the area (two of them as weeds of cultivated land). In the present paper two new species are described, and *C. Perrottetii*, usually considered as synonymous with *C. Calcitrapa*, is reinstated as a distinct species, bringing the total up to twenty-two. It was thought desirable to prepare a key to include all these species.

The study of the Tropical African species of *Centaurea* is particularly difficult, because several of the species flower before, or just as, the leaves appear. These species are very closely allied and it is extremely difficult to distinguish them on the characters of their capitula and florets. The leafy shoots which appear later in the season are quite distinct in their characters, but have been rarely collected except in the young state.

Tropical African specimens of those species of the section *Calcitraba* in which the pappus is absent have been misinterpreted in the past. Oliver and Hiern thought all the material to be conspecific with *C. Calcitraba* L., reducing *C. Perrottetii* DC. to synonymy. Hutchinson and Dalziel (Fl. W. Trop. Afr. ii. 176 (1931)), while recognising the distinctness from *C. Calcitraba* of the West Tropical African material, identify it with *C. alexandrina* Del., citing *C. pungens* Pomel in synonymy. I find that the Tropical African material falls under three species; there being one gathering of *C. Calcitraba* from the Anglo-Egyptian Sudan; two gatherings of *C. pungens* from the Hoggar Mountains; and a species frequently collected in West Tropical Africa, for which the name *C. Perrottetii* must be revived. The distinguishing characters of these species are set out in the key.

CENTAUREA L. Sp. Pl. ii. 909 (1743) et Gen. Pl. ed. 5, 389 (1754).

Perennial or annual herbs of very diverse habit. Leaves radical or alternate, entire, or more usually dentate, or more or less deeply incised. Capitula small to large, usually peduncled, either solitary or paniculate. Receptacle covered with setae. Corolla deeply 5-cleft, the peripheral lobes often enlarged and spreading. Anthers auriculate at the base, the adjacent auricles usually fused. Style-arms with a hairy swelling below their junction. Achenes oblong or ovoid, compressed or 4-angled, glabrous or hairy, with an oblique or lateral areole. Pappus multiseriate, setaceous or paleaceous; the setae or paleae, which usually become longer inwards, may be entire, serrate, barbellate, or plumose, or they may be shorter and caducous, or more rarely absent.

Distribution.—Europe; Asia; North Africa and more sparingly in Tropical and South Africa; Queensland; sparingly in North America and Temperate South America; adventitive elsewhere.

Key to the Tropical African Species.

- A. Involucral bracts with an appendage.
- B. Appendage spiny or fimbriate.
- C. Appendage with at least one indurated spine.
- D. Appendage with a terminal spine and smaller lateral spines.
- E. Corolla white, pink, or purple; leaves not decurrent except in *C. nigerica* when heads solitary and terminal.
- F. Spines of the involucre equalling or exceeding the corollas (1 *Calcitraba*).
- G. Pappus present 1. *C. senegalensis*.
- GG. Pappus absent.
- H. Achene with a ridge around the apex.

- I. Heads ovoid; spines about 10–15 per head 2. *C. Calcitraba*.
- II. Heads globose; spines about 20–30 per head ... 3. *C. Perrottetii*.
- HH. Achene with a rounded apex 4. *C. pungens*.
- FF. Spines of the involucre much shorter than the corollas (2 *Seridia*).
- J. Leaves decurrent; pappus as long as the achene; heads terminating mature shoots .. 5. *C. nigerica*.
- JJ. Leaves not decurrent; pappus very short; heads usually precocious and later overtopped by the leafy shoots.
- K. Heads in radical branched clusters or terminating stems which bear leafy branches below.
- L. Leaves large (about 6 cm. broad), elliptic 6. *C. Tisserantii*.
- LL. Leaves smaller (under 3 cm. broad).
- M. Leaves oblong, rounded at the base 7. *C. rhizocephala*.
- MM. Leaves oblanceolate or linear, narrowed at the base 8. *C. praecox*.
- KK. Heads terminating simple stems (up to 10 cm. long) which bear narrow bract-like leaves 9. *C. Goetzeana*.
- EE. Corolla yellow; leaves decurrent; heads in a lax inflorescence (3 *Mesocentron*) 10. *C. melitensis*.
- DD. Appendage consisting of a single weak spine with broad basal scarious fimbriate margins (4 *Acrolophus*) 11. *C. Foucauldiana*.
- CC. Appendage without indurated spines, but with fimbriated margins (5 *Cyanus*).
- N. Plants perennial.
- O. Leaves auriculate 12. *C. abyssinica*.
- OO. Leaves not auriculate 13. *C. varians*.
- NN. Plants annual or biennial 14. *C. Cyanus*.
- BB. Appendage rounded (of the innermost bracts acute) with an entire margin (sometimes mechanically split) (6 *Leuzea*).
- AA. Involucral bracts without an appendage (7 *Amberboa*).
- P. Leaves decurrent 16. *C. Lippii*.
- PP. Leaves not decurrent.
- Q. Pappus purple 17. *C. leucantha*.
- QQ. Pappus white or yellow.
- R. Median involucral bracts membranaceous, smooth or scarcely scabrid.
- S. Plants annual 18. *C. crupinoides*.
- SS. Plants perennial 19. *C. somalensis*.
- RR. Median involucral bracts thick, opaque, scabrid.

T. Mature leaves with scattered puberulence and terminal segment over 5 mm. broad.

U. Median involucre bracts abruptly tipped with black.

UU. Median involucre bracts with black tip continued down their margins.

TT. Mature leaves with woolly tomentum and terminal segment under 5 mm. broad.

20. *C. Hochstetteri*.

21. *C. Saltii*.

22. *C. Aylmeri*.

Sect. 1. *CALCITRAPA* (Adans.) Lam. & DC. Fl. Fr. iv. 100 (1805).

1. *C. SENEGALENSIS* DC. Prod. vi. 598 (1837).

FRENCH WEST AFRICA: Senegal, *Perrottet* (type, Paris); *Roger*; *Leprieur* (Kew). Upper Senegal and Niger, *Hagerup* (Kew).

NORTHERN NIGERIA: Bornu, *Vogel*; *Golding* (Kew).

ANGLO-EGYPTIAN SUDAN: Darfur, *Dandy* 30; *Lynes* 358 (BM); *Macintosh* 23 (Kew). Kordofan, *Muriel*; *Pfund* 99; 393; *Kotschy*; *Andrews* 233 (Kew).

2. *C. CALCITRAPA* L. Sp. Pl. ii. 917 (1753).

ANGLO-EGYPTIAN SUDAN: Kordofan, *Kotschy* (Kew). Also found in Europe, North Africa, and Western Asia.

3. *C. PERROTTETII* DC. Prod. vi. 598 (1837).

"*C. CALCITRAPA* L." Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 437 (1877), pro parte.

"*C. alexandrina* Del." Hutch. & Dalz. Fl. W. Trop. Afr. ii. 176 (1931), pro parte.

GAMBIA: *Dalziel* 8033 (Kew).

FRENCH WEST AFRICA: Senegal, *Brunner* (BM); *Roger*; *Farmar* 146 (Kew).

NORTHERN NIGERIA: Kano, *Dalziel* 176. Sokoto, *Moiser* 228. Bornu, *Vogel*; *Elliott* 129 (Kew).

NORTH CAMEROONS: *Talbot* 1007 (BM).

FRENCH EQUATORIAL AFRICA: Oubangui-Chari, *Chevalier* 10097 (Kew).

4. *C. PUNGENS* Pomel, Nouv. Mat. Fl. Atl. 29 (1874).

"*C. alexandrina* Del." Hutch. & Dalz. Fl. W. Trop. Afr. ii. 176 (1931), pro parte.

ALGERIA: Southern Territory, Hoggar Mts., *Chipp* 104; *Meinertzhagen* 80 (Kew). Also found in North Africa.

Sect. 2. *SERIDIA* (Juss.) Lam. & DC. Fl. Fr. iv. 98 (1805).

5. *C. NIGERICA* Hutch. in Bull. Misc. Inf. Kew, 1921. 383 (1921).

NORTHERN NIGERIA: Bauchi, *Lely* 252 (type); 359; *Gregor* 426 (Kew).

6. *C. TISSERANTII* Philipson in Journ. Bot. lxxvii. 87 (1939).

FRENCH EQUATORIAL AFRICA: Oubangui-Chari, *Tisserant* 975 (type, Herb. Le Testu).

7. *C. RHIZOCEPHALA* Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 438 (1877).

ANGLO-EGYPTIAN SUDAN: Equatorial Province, *Schweinfurth* 2657 (type, Kew; BM).

8. *C. PRAECOX* Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 438 (1877).

C. rhizocephala var. *australis* S. Moore in Journ. Bot. liv. 284 (1916).

C. atakorensis A. Chev. in Bull. Soc. Bot. Fr. lxi. Mem. 8,261 (1917).

FRENCH WEST AFRICA: Upper Volta, *Chevalier* 24497 (Kew).

GOLD COAST COLONY: Gold Coast, *Anderson* 46 (Kew). Ashanti, *Dalziel* (Kew). Northern Territory, *Krause*; *Williams* 164; *Vigne* 3781 (Kew). Without precise locality, *Kidston* (BM).

DAHOMY: between Djougou and Pobegou, *Chevalier* 2390 (paratype of *C. atakorensis* Chev., Herb. Chev.).

NORTHERN NIGERIA: Sokoto, *Dalziel* 405; *Lely* 116. Bauchi, *Barter* 1223 (type); *Lely* 58; P 54 (Kew). Muri, *Kumm* (BM). Nassarawa, *Hepburn* 15 (Kew).

FRENCH EQUATORIAL AFRICA: Oubangui-Chari, *Le Testu* 3633 & s.n. (Herb. Le Testu).

BELGIAN CONGO: Haut-Luapula, *Sakania*, *Rogers* 26400 (BM; Kew).

KENYA: Nyanza Province, *Brodhurst-Hill* 282; *Powell* 92; *Lugard* (Kew).

UGANDA: Eastern Province, Elgon district, *James* (Kew).

TANGANYIKA: Arusha, *Piemeisel & Kephart* 517; *Grant* (BM). Iringa, *Horsburgh-Porter* (BM). Nyika Plateau, *McClounie* 66 (Kew).

NORTHERN RHODESIA: Luangwa, *Young* 71 (BM); Sangola, *Kassner* 2107 (BM; Kew); Broken Hill, *Allan* 307; Mwini-lunga, *Milne-Redhead* 874; 2574 (Kew).

SOUTHERN RHODESIA: Salisbury, *Gilliland* 112 & 662; Rand 482 (BM); *Craster* 12 (Kew). Mazoe, *Eyles* 397 (BM). Without precise locality, *Walters* 2304 (Kew).

9. *C. GOETZEANA* O. Hoffm. in Engl. Jahrb. xxx. 441 (1902).

TANGANYIKA: Unyika, *Goetze* 1459 (type collection, BM).

The specimen has the appearance of a precocious inflorescence. If leafy shoots are produced later in the season, they are unknown.

Sect. 3. *MESOCENTRON* (Cass.) DC. Prod. vi. 592 (1837).

10. *C. MELITENSIS* L. Sp. Pl. ii. 917 (1753).

KENYA: Nakura, *McDonald* 1290. Njono, *Napier* 218. Without precise locality, *Harvey* (Kew).

An alien weed; native of the Mediterranean region.

Sect. 4. ACROLOPHUS (Cass.) DC. Prod. vi. 581 (1837).

11. *C. FOUCAULDIANA* Maire in Bull. Soc. Hist. Nat. Afr. Nord, xx. 186 (1929).

ALGERIA: Southern Territory, Hoggar Mts., *Maire* 734; 740; 742 (Herb. Alger.).

Sect. 5. CYANUS (Adans.) Lam. & DC. Fl. Fr. iv. 91 (1805).

12. *C. ABYSSINICA* (Boiss.) Sch. Bip. ex [Boiss. Diagn. ser. 2, iii. 62 (1856) in synonym.] Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 436 (1877).

Plectocephalus abyssinicus Boiss. l.c. 61 (1856).

C. varians var. *macrocephala* Vatke in Linnaea, xxxix. 512 (1875).

ABYSSINIA: Tigré, *Schimper* 1473 (type collection); 1476 (BM; Kew). Ankober, *Rohr* 376; 378 (Kew). Arussi, *Drake-Brockman* 240 (Kew). Without precise locality, *Schimper* 897; *Steudner* 233 (Kew).

13. *C. VARIANS* A. Rich. Tent. Fl. Abyss. i. 453 (1847).

Plectocephalus cyanoides Boiss. Diagn. ser. 2, iii. 62 (1856).

ABYSSINIA: Tigré, *Schimper* 333. Addis Abbaba, *Dobinson*; *Sandford* (BM); *Omer Cooper* 654 (Kew). Gondar, *Massey* 11. Ouodgerate, *Petit* (Kew). Without precise locality, *Salt* (BM); *Plowden*; *Schimper* 519 (Kew).

14. *C. CYANUS* L. Sp. Pl. ii. 911 (1753).

TANGANYIKA: Iringa Province, *McGregor* 52 (Herb. Amani). An alien weed; native of Europe and South-western Asia.

Sect. 6. LEUZEIA (DC.) O. Hoffm. in Engl. & Prantl, Pflanzenfam. iv. 5, 327 (1894).

15. *C. imatongensis* sp. nov. *Herba* perennis caulibus simplicibus, usque ad circa 2.5 m. altis, cinereo-tomentosis. *Folia* alterna petiolata; petiolus circa 1 cm. longus; lamina ovata denticulata, circa 12×8 cm., juventute utrinque tomentosa demum superne glabra, costa nervisque subtus prominentibus. *Capitula* magna terminalia solitaria, 6×6 cm., involucri squamæ eburneae appendice rotundata plurifissa; receptaculum dense setosum. *Flosculi* hermaphroditi; corollæ tubus usque ad 25 mm. longus, limbus 12 mm. longus; antheræ 11 mm. longæ. *Achenia* 10 mm. longa angulata; pappi setæ numerosæ barbellatæ, extimæ breviores, intimæ usque ad 27 mm. longæ.

ANGLO-EGYPTIAN SUDAN: Equatorial Province, Imatong Mountains, Issore to Laboni, in dry grassland and scrub at 3800 ft., *A. S. Thomas* 1737 (type, BM; Kew).

The heads of this beautiful species are very similar to those of *C. conifera* L., which occurs in Morocco and Algeria, but they

lack the purple tint present in that species. The habit is quite different from that of *C. conifera* and the pappus-setæ are barbellate and not plumose and silky as in that species.

Sect. 7. AMBERBOA Pers. Syn. Plant. ii. 481 (1807), emend.

16. *C. LIPPII* L. Sp. Pl. ii. 910 (1753).

ABYSSINIA: Boran, *Lord Delamere* (BM.).

KENYA: Aberdare Mountains, *Dowson* (Kew). Nanyuki, *Napier* 2094 (Kew; Herb. Amani). Also found in Spain, North Africa, and south-western Asia.

17. *C. leucantha* (Coss.), comb. nov.

Volutarella leucantha Coss. ex Ball in Journ. Linn. Soc. Lond., Bot. xvi. 526 (1873), nomen nudum.

Amberboa Perraldiana Coss. in Bull. Soc. Brot. Fr. xxii. 62 (1875), nomen nudum.

Amberboa leucantha Coss. ex [Battand. in Battand. & Trab. Fl. Alg. 506 (1890), nomen nudum] Battand. & Trab. Fl. Alg. et Tunis. 410 (1902).

Volutarella leucantha (Coss.) Maire in Jahandiez & Maire, Cat. Pl. Maroc. iii. 817 (1934).

ALGERIA: Southern Territory, *Maire* 724, 728 (Herb. Alger.); *Meinertzhagen* 64, 75 (Kew). Also found in northern Algeria and Morocco.

18. *C. CRUPINOIDES* Desf. Fl. Atlant. ii. 293 (1798).

Amberboa sinaica DC. Prod. vi. 559 (1837); Oliv. & Hiern in Oliv. Fl. Trop. Afr. ii. 439 (1877).

ANGLO-EGYPTIAN SUDAN: Kassala, Red Sea Hills, *Schweinfurth* 441 (BM).

Also found in Egypt, Arabia, and Palestine.

19. *C. SOMALENSIS* Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 438 (1877).

BRITISH SOMALILAND: *Hildebrandt* 1448 (type, BM).

20. *C. HOCHSTETTERI* Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 438 (1877).

Amberboa abyssinica A. Rich. Tent. Fl. Abyss. i. 435 (1847), non *Centaurea abyssinica* (Boiss.) Sch. Bip. ex Oliv. & Hiern (1877).

Amberboa Hochstetteri Buchinger ex Oliv. & Hiern, l.c. in synonym.

ABYSSINIA: Agow, *Schimper* 197, 2183 (BM; Kew).

Also recorded from the Yemen district of Arabia.

21. *C. Saltii*, sp. nov. *Herba* ut videtur perennis, caulibus striatis lanatis. *Folia* 8×4.5 cm., utrinque tomentosa, profunde pennilobata; lobi utrinsecus circa 3, remoti, lineari-oblongi

obtus irregulariter dentati. *Capitula* sine flosculis 17×10 mm.; involucri squamæ deltoideæ, lanatæ et scabræ, medio fulvæ apice marginibusque nigræ, mucronatæ, margine breviter pectinato-ciliolatæ. *Flosculi* hermaphroditi; corollæ tubus usque ad 11 mm. longus, limbus 15 mm. longus; antheræ 4 mm. longæ. *Achenia* ignota.

ABYSSINIA: without precise locality, *Salt* (type, BM).

This species is known only from a single old gathering, which unfortunately is incomplete. It differs, however, from its nearest ally, *C. Hochstetteri* Oliv. & Hiern, in the narrower and more obtuse lobes of the leaves, and in the coloration of the involucre bracts. The median involucre bracts are minutely pectinate-ciliate.

22. *C. AYLMERI* Baker in Bull. Misc. Inf. Kew. 1895, 218 (1895).

BRITISH SOMALILAND: *Aylmer* (type, Kew); *Godman*; *Donaldson Smith* (BM); *Lort Phillips* (BM; Kew); *Drake Brockman* (Kew).

SOME SOUTH AFRICAN RHODOPHYCEAE.—

I. *HELMINTHOCLODIA PAPENFUSSII* KYLIN.

BY MARGARET T. MARTIN, PH.D.
(Westfield College, University of London).

OUR knowledge of the structure and reproduction in the genus *Helminthocladia* has up till now been based mainly upon observations made on the northern species *H. purpurea* (Harv.) J. Ag. Accounts of this species have been given by Schmitz and Hauptfleisch (in Engler & Prantl, 1897) and by Rosenvinge (1909); in 1915 it was renamed *H. calvadosii* (Lamour.) Setchell [Collins, Holden & Setchell, 1915], and more recent workers, e. g., Hamel (1930) and Kylin (1930), have used this name. More recently, however, Kylin (1933) has given a brief description of a new species *H. Papenfussii*, from material collected by Professor T. A. Stephenson at Strandfontein near Cape Town. This species is of interest, firstly, because it is an exclusively southern form, and, secondly, because, although the anatomical construction is that characteristic of the genus, it differs in several other particulars from the species so far described. Kylin points out that in the plane of the first wall formed after fertilisation and also in the presence of a sterile wall covering the gonimoblast, this plant resembles *Helminthora divaricata* rather than *Helminthocladia calvadosii*, but on consideration of its anatomical structure he places it as a new species of the genus *Helminthocladia*.

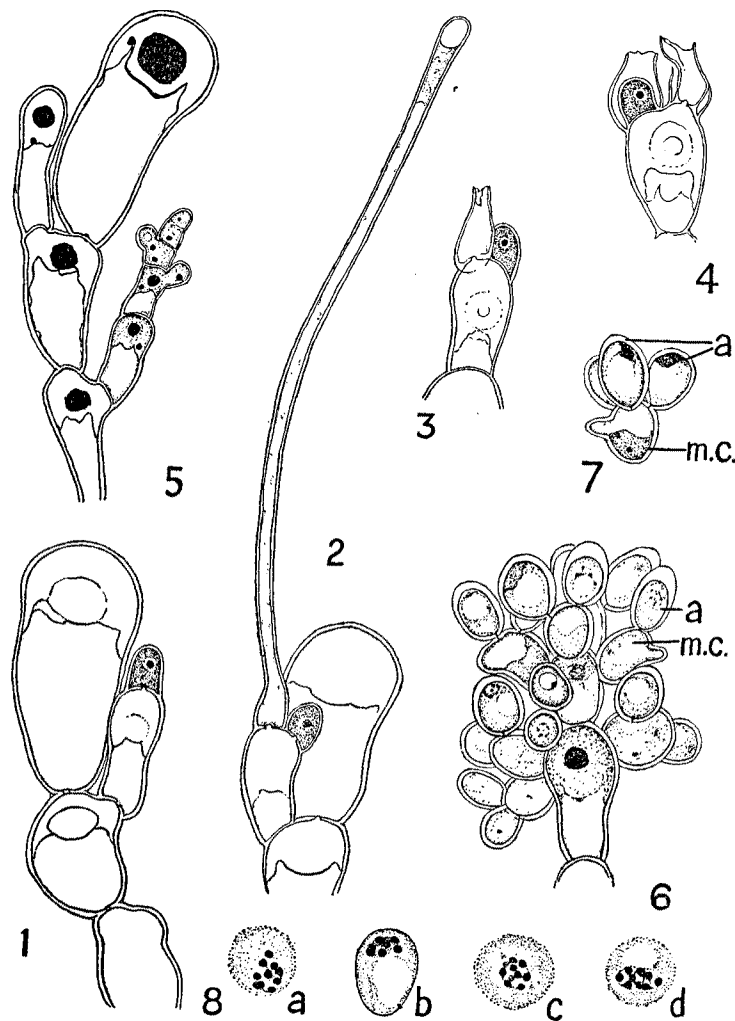
During a visit to South Africa in the last half of 1938, it was possible to collect and fix material of this species, and the structure and development can now be illustrated in greater detail. At that time Strandfontein, in False Bay, was the only locality in the vicinity of Cape Town where *Helminthocladia Papenfussii* had been found, but Dr. G. F. Papenfuss has since sent me a record of it at Maclear Beach, near Cape Point. It is generally a warm-water form, and has been recorded by Dr. Papenfuss from two localities further east—Struis Bay, four miles east of Cape Agulhas, where a single specimen was cast up, and Port Alfred, where the plant was found attached. It is probable too that specimens of *Helminthocladia* collected from time to time along the south coast of the Cape Province are to be referred to this species; I have been able to examine some of these in the herbarium at Cape Town, and those from Cape Morgan named "*H. australis*" certainly seem to be identical with *Helminthocladia Papenfussii*.

The plants at Strandfontein are attached to rocks in the lower part of the intertidal zone; they are easily accessible at low water of spring tides, but are scarcely uncovered at all during neaps. The rocks in that locality are of limestone, worn out into round pools; the *Helminthocladia* plants are generally found trailing in the smaller pools, and only rarely exposed. The plant is a spring and summer annual, growing rapidly and reaching maturity in a very short time. Thus on visiting the shore on September 10th there were only a few plants present, most of them less than eight inches long, and apparently all male. Six weeks later (October 24th) plants were abundant in the same locality, and could be found up to four feet in length. They are strictly dioecious, but both male and female plants were present, the female fruiting freely. Subsequent visits were not possible, but Dr. Papenfuss tells me that later in the season there is no sign of the plants, and it seems probable that they are washed away by heavy seas.

Habit and Vegetative Construction.

The mature plant is attached by a very small basal disc, from which several main axes spring; these taper below and above, but in their mid-region are cylindrical and from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in diameter. Slender lateral branches are borne irregularly, and these may branch again, finally tapering to a point. The whole plant is strongly gelatinous, and when fresh is a brownish red, the male plants being rather paler than the female.

As found by Kylin, the construction of the axis is that characteristic of the genus, and is very similar to that described by Rosenvinge for *H. purpurea* (1909). There is a central strand of closely interwoven filaments, similar to that in *Nemalion*, and a surrounding "cortex" of branched assimilating filaments. Here, however, as generally in the genus, the terminal cells of the



Figs. 1-4.—Vegetative filaments showing stages in development of hairs.

Figs. 5-8.—Origin of antheridia and spermatia.

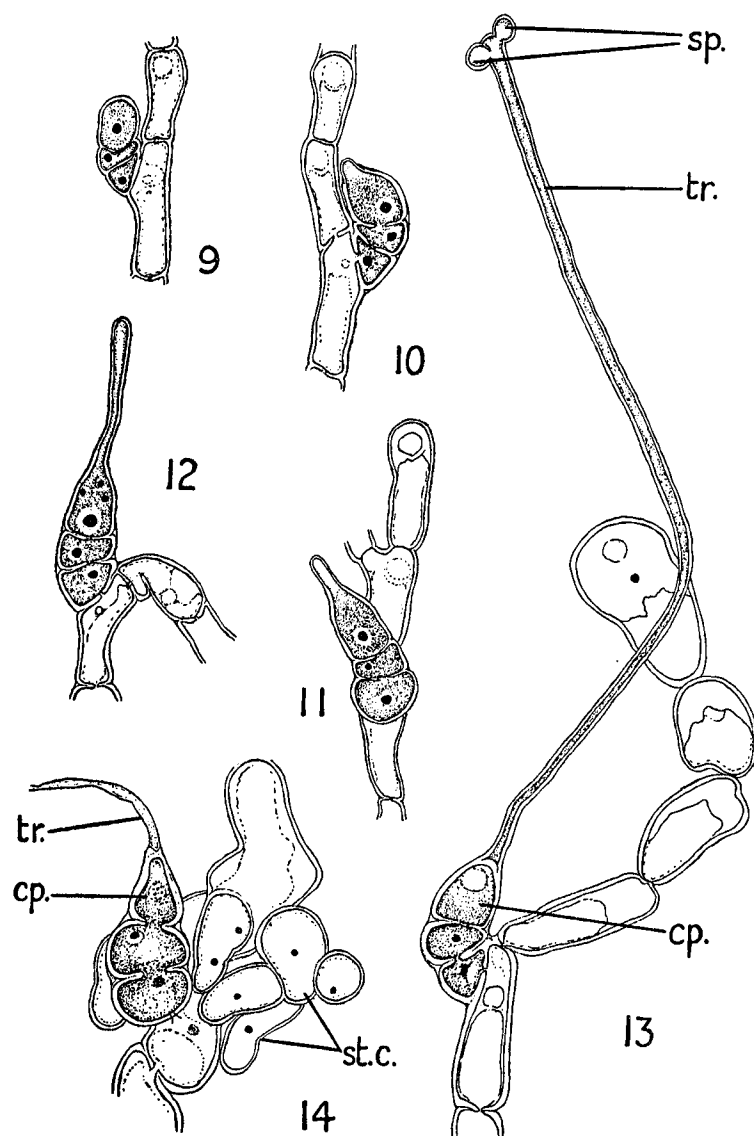
1 ($\times 800$), very young hair initial; 2 ($\times 800$), elongated hair, with second initial arising beside it; 3 ($\times 800$), broken base of old hair, and young initial; 4 ($\times 800$), regeneration of "secondary" hairs through empty bases of "primary" ones; 5 ($\times 800$), assimilating filament, showing position of young male branch; 6 ($\times 1700$), tip of male branch bearing antheridial mother-cells and antheridia; 7 ($\times 1700$), antheridial mother-cell bearing four antheridia (one a young protuberance); 8 a-d ($\times 2800$), spermatia at time of liberation, b still enclosed in antheridial wall. a=antheridium; m.c.=antheridial mother-cell.

assimilating filaments are much larger and club-shaped, and each has a single apical chromatophore with a large embedded pyrenoid (cp. Kurssanow, 1909). Hairs are present in the younger parts, and are borne not on the enlarged terminal cells of the assimilating filaments, but on smaller cells which terminate short lateral branches (figs. 1-4). Each hair arises as a small cell which is cut off from the tip of one of these terminal cells, and has at first dense cytoplasm and a conspicuous nucleus (fig. 1). It elongates rapidly into a colourless long hair, which projects beyond the assimilating cells and is almost devoid of contents except just behind the tip (fig. 2). These hairs are very delicate, and are easily broken off, and only their broken bases remain in the older parts (figs. 3 & 4). Very often, however, a second hair arises beside the first one (figs. 2-4). Rosenvinge has figured hairs similar to these in *H. purpurea*, but does not consider that the second cell in that species represents a hair. In *H. Papenfussii*, however, it is undoubtedly similar to the first one, and in older parts the broken bases of both can be seen side by side. Here, too, regeneration seems to take place through the empty bases of old hairs and fig. 4 shows the basal sheaths of two hairs one inside the other. Rosenvinge (1909) figures a similar regeneration of hairs in *Nemalion multifidum*.

Male Organs.

The antheridia form dense terminal clusters amongst the assimilating filaments. Like the hairs, they are borne not on the large assimilating cells themselves, but at the tips of short lateral branches, the cells of which remain small and narrow (figs. 5 & 6). The uppermost one or two cells of the male branch bear the antheridial mother-cells, from three to five arising from each cell. Each cell of the male branch contains an apical chromatophore, a small part of which passes into the antheridial mother-cell, but is not, so far as can be seen, passed on to the antheridium.

As many as four antheridia may arise from a mother-cell, being developed in regular succession (fig. 7). The process is very similar to that described by Grubb (1926) for many of the Florideae. A small protuberance is put out near the tip of the mother-cell and gradually enlarges, a small daughter-nucleus passing in. As the antheridium enlarges, its base is pulled out into a narrow neck, and finally the mature antheridium is attached to the mother-cell only by a well-marked cytoplasmic thread (fig. 7). It contains a large vacuole, clear cytoplasm, and a dense apical nucleus. At the time of liberation of the contents as a spermatium, the nucleus is in prophase, as has been shown for many other Florideae. Here there are eight to ten rounded granules or "körnchen" clearly present; if, as seems probable, these represent chromosomes, there are probably ten (fig. 8 a-d).



Figs. 9-14 ($\times 800$).—Stages in development of carpogonial branch. 9-12, young stages; 13, mature branch with elongated trichogyne and two spermatia attached at its tip; 14, a post-fertilisation stage showing shrivelled trichogyne, widened pit-connections in carpogonial branch, and outgrowth of sterile cells from supporting filament. *sp.* = spermatium; *cp.* = carpogonium; *st.c.* = sterile cells.

In fig. 8 *b* the spermatium has not yet been liberated and is still surrounded by the antheridium wall; on liberation, however, the spermatium slips out of the wall, and appears at first to be naked. The empty walls are left behind in the antheridial cluster, but although older material has been examined no signs of regeneration have been seen through these empty sheaths.

Carpogonial Branch.

The carpogonial branch arises in a lateral position on the assimilating filament, about four or five cells back from the terminal cell. It is sessile, replaces a lateral branch, and consists of three (occasionally four) cells. Figs. 9-13 show stages in its development. When first recognisable it consists of three cells with dense granular contents and conspicuous nuclei, the terminal cell being larger than the others (fig. 9). All the cells enlarge, the pit-connections between them and the bearing cell become very evident, and the tip of the terminal cell elongates to form a trichogyne (figs. 10-12). The mature trichogyne may reach a considerable length, and projects above the level of the assimilating cells (fig. 13). It is quite common to find two or three spermatia attached around the tip; by this time each has acquired a wall, and a canal can clearly be seen between the spermatium and the trichogyne.

It has not yet been possible to determine the nuclear behaviour at this stage. No trichogyne nucleus has been seen, nor has the fate of the spermatium nucleus been ascertained, so that it is not possible to say whether it completes the division as recorded for other Nemalionales. A nucleus has, however, been seen in the trichogyne, and there seems every reason to think that fertilisation occurs in a normal way.

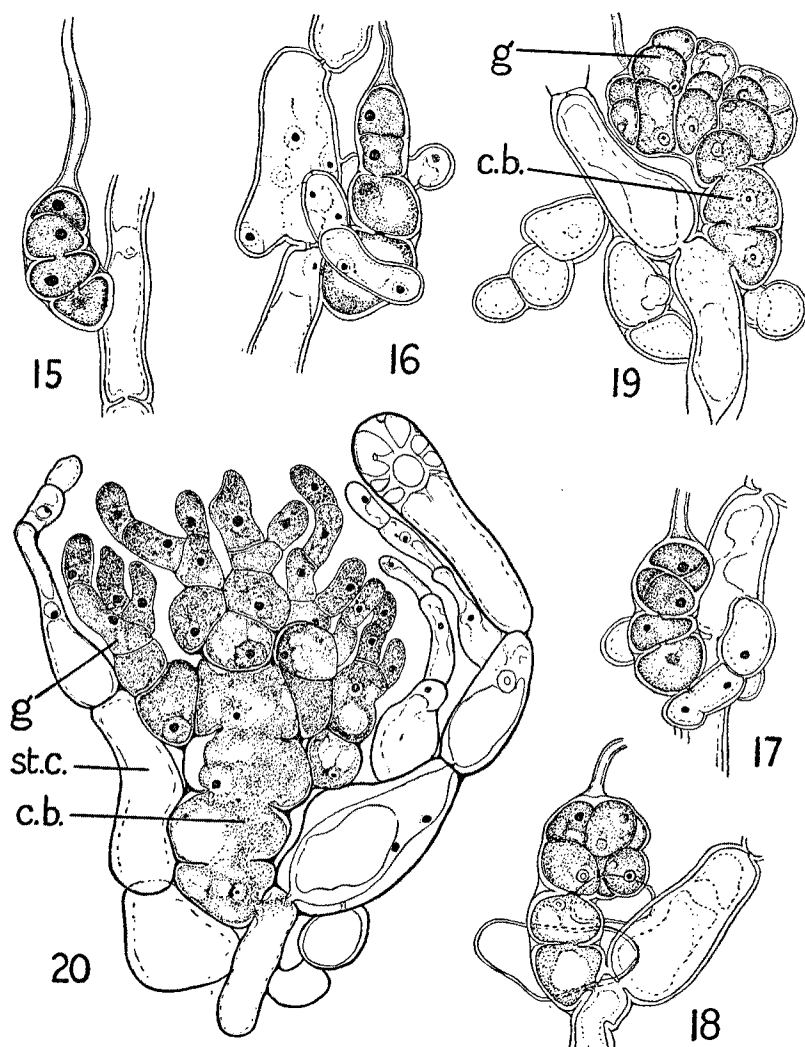
Development of the Cystocarp.

In the stage shown in fig. 13 fertilisation has presumably taken place and a wall has cut off the carpogonium from the base of the trichogyne. Immediately after fertilisation several changes occur:—

(1) The pit-connections between the carpogonium, the two lower cells of the carpogonial branch, and the bearing cell become considerably widened (fig. 14).

(2) Outgrowths arise from the cell of the vegetative filament next above the bearing cell. There are generally three of these (seen well in fig. 14) and at this stage they form short filaments of two or three cells, surrounding the developing carpogonial branch. Their cells have granular contents and are often multinucleate.

Both these changes have been initiated in the stage shown in fig. 14, although the carpogonium has not yet started to divide.



Figs. 15-20 ($\times 800$).—Stages in development of gonimoblast and cystocarp.

15, 16, formation of first wall in carpogonium; 17, second division in carpogonium; 18, 19, formation of cushion of gonimoblast cells; 20, vertical section through young cystocarp showing gonimoblast filaments and sterile investment. *g*=gonimoblast; *c.b.*=carpogonial branch; *st.c.*=sterile cells.

(3) The carpogonium divides by an obliquely horizontal wall (fig. 15); this wall is inclined towards the side of the carpogonial branch nearest the bearing cell, so that if viewed from the other side (fig. 16) it appears to divide the carpogonium horizontally. In each of the two cells thus formed, a vertical wall soon appears (fig. 17), and this is followed by others, so that a small cluster of cells is produced (fig. 18). As Kylin points out, this process differs from that in *H. calvadosii*, where the first segmentation of the carpogonium is by several longitudinal walls.

A dense cushion of about twenty cells is then formed (fig. 19). After this stage it is necessary to follow the development by

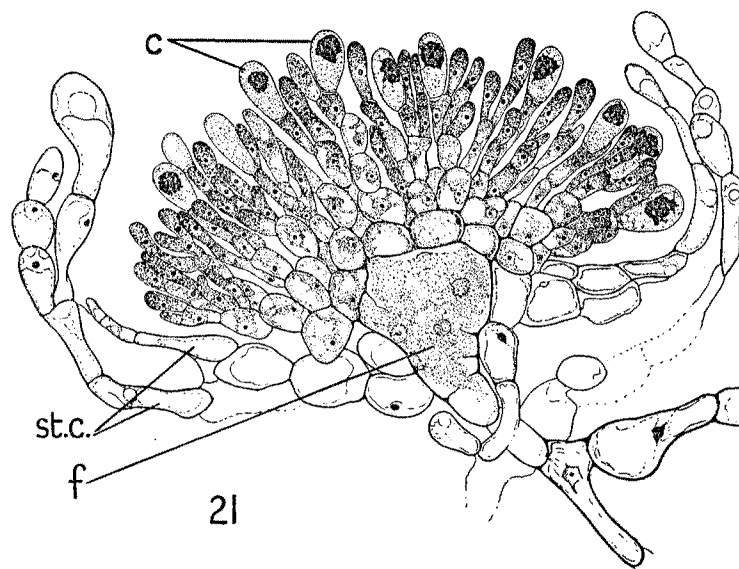


Fig. 21 ($\times 600$).—Vertical section through mature cystocarp. *f*=fusion cell formed from cells of carpogonial branch; *c*=carposporangia; *st.c.*=sterile cells of investment.

means of sections. From the cushion of cells short branching filaments are put out, the cells of which have very thin walls, dense contents, and conspicuous nuclei. At this stage (fig. 20) the cells of the carpogonial branch are in open communication with each other, the walls between them having almost disappeared, and there is every reason to suppose that nutritive material is passed by this channel from the bearing cell to the developing gonimoblast. The sterile filaments put out from the cell above the bearing cell have also grown considerably, and now form a loose one- or two-layered investment around the developing cystocarp.

As the cystocarp matures, several further changes take place. The component cells of the carpogonial branch fuse entirely to form a large polygonal "fusion cell," in which only the relics of the separating cell-walls can be made out (fig. 21). The gonimoblast filaments increase in number and in length; the cells nearest the fusion cell are rounded and have dense contents, and form a compact "placental tissue," generally two cells deep. They are succeeded by two or three narrow elongated cells and each filament terminates in a large oval carposporangium. Only the terminal cell produces a carpospore; its contents show a densely staining plastid and small nucleus, and finally slip out of the carposporangium wall.

When mature, the gonimoblast is a large radiating structure, and is still surrounded by sterile filaments. Around the base (*i. e.*, in the region of the fusion cell) these form a coherent tissue, their cells being easily distinguished from the cells of the gonimoblast by their scanty contents; distally, the filaments separate from their neighbours, so that the peripheral investment is quite loose. Any function which these sterile filaments perform must be a purely protective one, as their cells have scanty contents, and there is no sign of fusion between them and the cells of the carpogonial branch or gonimoblast.

Discussion.

It is quite clear that *Helminthocladia Papenfussii* agrees very closely in anatomical characters with previous descriptions and figures of other species of the genus. The general construction is that given by Schmitz and Hauptfleisch (in Engler & Prantl, 1897) for *Helminthocladia*, and the figures of assimilating cells and their plastids given here are almost identical with those of Rosenvinge for *H. purpurea* (1909).

Kylin separates this species on characters of the developing cystocarp. As shown above, the first wall formed after fertilisation is an oblique one, cutting the carpogonium into two equal segments, in each of which a wall is subsequently formed at right angles to the original one. From this four-celled complex a spherical mass of cells arises. In *H. calvadosii*, the same result is attained, but by a slightly different process. The first wall is an obliquely longitudinal one dividing the carpogonium into two unequal parts; and subsequent walls are longitudinal ones formed in the larger segment. However, in both species the result is the production of a mass of cells, representing the whole contents of the fertilised carpogonium. Kylin considers that the obliquely horizontal wall first formed in *H. Papenfussii* is more reminiscent of *Helminthora divaricata*, where the first wall is a completely transverse one; in that species, however, only the upper half of the carpogonium gives rise to the gonimoblast, the lower cell remaining sterile. This seems to me to be

a much more fundamental point of difference than the degree of obliquity of the wall; the slight difference in segmentation in the two species of *Helminthocladia* is a relatively minor one in view of the fact that in both it is the whole contents of the carpogonium which goes to form the gonimoblast.

The other point in which *H. Papenfussii* differs from Kylin's account of *H. calvadosii* is in the presence of sterile filaments forming an investment round the developing gonimoblast. These are entirely lacking in *H. calvadosii* according to Kylin (1930), and this author considers that in this respect, too, *H. Papenfussii* bears more resemblance to *Helminthora divaricata* than to the genus *Helminthocladia*. But it must not be overlooked that a sterile investment has been found in *Helminthocladia* by older workers. Schmitz and Hauptfleisch (1897) describe a wall to the cystocarp composed of filaments arising as outgrowths of the "Fruchtstiel," while Rosenvinge (1909) considers that in *H. purpurea* the "involucre" arises both from the sterile lower cells of the carpogonial branch and from the ones nearest in the supporting filament. Kylin (1930) discounts these versions, and says that "Die Angabe in Engler und Prantl . . . ist demnach nicht richtig." Judging by *H. Papenfussii*, however, the sterile investment is so unmistakable and easy to see that it is difficult to understand how several authors could be entirely mistaken as to its presence. It seems much more likely that the material of *H. calvadosii* which Kylin examined was not identical with the *H. purpurea* of earlier workers. At any rate, there is evidence within the genus *Helminthocladia* for the presence of a sterile investment to the cystocarp; in this respect, *H. Papenfussii* agrees with other species of the genus, and it is not necessary to look to *Helminthora* for a parallel.

It seems, therefore, that the resemblances which *H. Papenfussii* was supposed to bear to *Helminthora* are merely superficial ones, and I would agree with Kylin in retaining this species within the genus *Helminthocladia*. In fact, there are only two features in which it differs from other species of that genus—the slight difference in early post-fertilisation segmentation already dealt with, and a feature which so far as I know is a new one for the genus, *i. e.*, the fusion between adjoining cells of the carpogonial branch, and bearing cell. As shown above, the pit-connections between the carpogonium, the lower cells of the carpogonial branch, and the bearing cell become widened at an early stage after fertilisation, and the dividing walls between these cells soon break down, so that they are in open communication with one another. Finally, in the mature cystocarp all these cells have fused to give a large central "fusion cell." So far as I know, no such process has been recorded in either *Helminthocladia* or *Helminthora*; a widening of pit-connections between adjacent cells of the carpogonial branch has, however,

been figured for *Nemalion multifidum* (Kylin, 1916) and for *Liagora viscida* (Kylin, 1930). This must result in an increased rate of nutritive supply to the developing gonimoblast.

I am much indebted to Dr. G. F. Papenfuss for help in collecting material and for the records of distribution quoted above. I should also like to thank Prof. R. S. Adamson for granting facilities for laboratory work in the Botanical Department of the University of Cape Town. The collecting expenses were met out of a grant from the Central Research Fund of the University of London.

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AMBIGUOUS ELM NAMES.—

1. *ULMUS SATIVA* MILL.

By R. MELVILLE, PH.D., F.L.S.

THE name *Ulmus sativa* was given by Miller to an elm which he first described in his 'Gardeners' Dictionary' ed. i. (1731) as:—

"3. *Ulmus minor folio angusto scabro*. Ger. Emac. 1480. The small-leaved or English Elm,"

without further amplification beyond the statement that "The first four sorts are very common in divers parts of England."

No alteration was made in the description until the seventh edition (1759) when it was changed to the following:—

"3. *Ulmus foliis ovatis acuminatis duplicato serratis basi inæqualibus*. (. . translation . .) This is the *Ulmus minor folio*

angusto scabro. Ger. Emac. 1480. The small-leaved or English Elm."

The following additional information was added:—

"The third sort is commonly known in the nursery gardens by the title of English Elm, which is far from being a right appellation, for it is not a native of England and is only found growing near London or in plantations where young trees were procured from the neighbourhood of London. Where this tree grows naturally is not easy to determine; some persons have supposed it was brought from Germany. As this tree is well known it requires no description. The flowers of this are of a purplish red colour and generally appear the beginning of March, but I could never observe any seeds on this sort."

In the eighth edition of the Dictionary (1768) the only change made was the addition of "(*Sativus*) *" after "3. *Ulmus*."

On the evidence of the Dictionaries, it appears that Miller at first merely copied Goodyer's description from Johnson's edition of Gerard's Herbal without having any clear idea what Goodyer's Elm was. By the time the seventh edition was published (1759) he had formed a definite opinion of its identity, as indicated by the change in the description and addition of explanatory matter. Little doubt can now remain that Miller was mistaken in his identification of *U. sativa* with Goodyer's Elm, which still grows between Lymington and Christchurch, where Goodyer said it grew: it was recently described as *U. stricta* var. *Goodyeri* (Melville, Journ. Bot. lxxvi. 115 (1938)), and the reasons for its identification as a variety of *U. stricta* were given in full. Goodyer's Elm has a restricted distribution, it is not in cultivation, and there is no reason to believe that it has ever been propagated by nurserymen, and far less that it was ever common in cultivation near London. The reference to Goodyer's Elm is therefore a false identification introducing a confusing element which must be disregarded in any endeavour to discover what Miller meant by *U. sativa*.

Later botanists interpreted *U. sativa* in various ways. Hunter in Evelyn's 'Silva' (1786) repeated Miller's diagnosis and observations, but added, "It is by some called the Cornish Elm." This is evidently an identification of Goodyer's Elm rather than of *U. sativa*. Aiton ('Hortus Kewensis,' 1789) also identified the Cornish Elm with both Goodyer's Elm and *U. sativa* Mill. under the name *U. campestris* β *stricta*. In 1808, under t. 1886, "*U. campestris*," Smith (Sowerby and Smith, 'English Botany'), said, "perhaps *U. suberosa* of Ehrhart and Willdenow is the cultivated Dutch Elm . . . which seems distinct . . . yet I suspect it may be the *U. minor folio angusto scabro* of Goodyer and Ray."

* Corrected to *Sativa* on last page of volume.

Two years later, following information supplied by Borrer, Smith described and figured (t. 2161) "*U. suberosa*," by which he intended the tree now known as *U. procera* Salisb., and gave "*U. minor*... Ger. Emac." as a synonym. A few years later he realised that Miller had led him astray, for in his 'English Flora' (1824) he said of "*U. suberosa*": "It seems to be Miller's *U. sativa*, N. 3, whose error in quoting *U. minor*... of Goodyer in Gerard, led to the same misapplication of that writer's synonyms in Fl. Br. 281 and Engl. Bot. 1886 and 2161." At the same time Smith transferred the reference to Goodyer's Elm to the synonymy of his "*U. campestris*," which represents a tree recently described as a new species, *U. diversifolia* (Melville, Journ. Bot. lxxv. 138 (1939)). Smith, therefore, recognised two elements in *U. sativa* Miller, one of which he identified as "*U. suberosa*" (= *U. procera* Salisb.) and the other as "*U. campestris*" (= *U. diversifolia* Melville).

After Smith had expressed his opinion that *U. sativa* consisted of two elements, British botanists ignored the name for about eighty years, and it was not until the early part of the present century that it again came into use. Druce in the Report of the Botanical Exchange Club 1907 (1908) published the name *U. sativa* var. *Lockii* for the elm he later described as *U. Plotii*, and in his 'List of British Plants' (1908) he used *U. sativa* Mill. for the common English Elm (*U. procera* Salisb.). Druce continued to use *U. sativa* in this sense in 'Hayward's Botanists' Pocketbook,' ed. 15, 1919, and in the second edition of the "List" (1928). Later, in Rep. Bot. Exch. Club, 1930 (1931), p. 294, he suggested a new name, *U. anglica*, should be used for this species (*U. procera*) as in the meantime Moss had confused the name *U. sativa* by using it for *U. Plotii*.

Davey in his 'Flora of Cornwall' (1909) gave *U. sativa* as a synonym of *U. campestris* L., by which he intended *U. procera* Salisb., but it was ignored by Ley in his treatment of the elms (Journ. Bot. xlviii. 70 (1910)). Moss adopted the name (Gard. Chron. ser. 3, li. 216, 236 (1912); Cambridge Brit. Fl. ii. 93 (1914)) for the "Small-leaved Elm." The principal element in this was *U. Plotii* Druce, though by the synonymy and distribution he gave it is evident that Moss's interpretation of *U. sativa* included *U. stricta* var. *Goodyeri*, *U. diversifolia*, and probably various small-leaved hybrids as well as certain continental forms. Henry (Elwes and Henry, 'Trees and Shrubs of Gt. Britain and Ireland,' 1913) had adopted *U. minor* Mill. for the British elms placed by Moss under *U. sativa* and gave *U. sativa* as a synonym of *U. campestris* L., by which he meant *U. procera* Salisb. The same group of small-leaved British elms was called *U. sativa* Mill. sec. Moss by Wilmott in Babington's 'Manual of British Botany,' ed. x. (1922) with *U. minor* Mill. sec. Henry as synonym, while *U. minor* Mill. sec. Henry with *U. sativa* Mill. as a synonym

was used by Gilber Carter ('Catkin-bearing Plants,' 1930) and Gilmour and Stearn (Journ. Bot. Suppl. 20, 1932). The only recent dissentient from the view that *U. minor* and *U. sativa* are synonymous is Bancroft (Journ. Bot. lxxv. 342 (1937)), who thought that *U. sativa* was probably *U. procera* Salisb.

It will be evident from the foregoing that recent usage of the name *U. sativa* has served only to confuse it. After so great a lapse of time it now appears impossible to decide with any degree of certainty which tree Miller intended. Such information as he gave is very meagre. Some significance may be attached to date of flowering, "the beginning of March," which coincides with that given for his first elm, *U. campestris* (= *U. procera* Salisb.). This species is the first of the British elms to flower and come into leaf. Unfortunately the flowering times of the other elms in the 'Dictionary' were not given, though it was stated that *U. minor* is later in coming into leaf than *U. sativa*. This fact, based on Miller's personal observation, goes strongly against the suggestion that *U. minor* and *U. sativa* are synonymous. In Miller's time the elms must have been late in flowering, judged by recent seasons, when *U. procera* has flowered not later than mid-February. However, flowering dates are dependent on the weather and there is evidence that the winters were severe in the latter half of the 18th century (Baxendell, Meteorological Mag. lxxiii. 59 (1938)). It is possible therefore, that Miller's *U. sativa* was a small-leaved variety of *U. procera*, while his *U. campestris* was the large-leaved form. A small-leaved variety of *U. procera*, at present undescribed, grows commonly in parts of south Essex near London, and is fairly frequent in the Midlands. This tree would have been in easy reach of the London nurserymen and probably grew in parts of London now built over. *U. procera* has been in cultivation in Gt. Britain for a long period and several horticultural forms derived from different varieties exist. If this view is correct, then Miller's *U. sativa* is exactly what he said it was—a small-leaved English Elm. Henry (*loc. cit.* p. 1903) arrived at a similar conclusion, basing his opinion on contemporary literature. Smith identified it with his *U. suberosa*, evidently meaning one of the forms of *U. procera* with corky bark on the epicormic shoots. Such corky outgrowths are much more common on the small-leaved variety than on the large-leaved forms. Among later authors, Druce and Bancroft held similar views. There is one other possibility, namely, that Miller was correct when he suggested a continental origin for the tree. Most likely, if this were so, the name would have covered imported seedlings, many of which would have been indeterminate hybrids, to judge by recent importations. In the absence of any herbarium specimen, the question of the identity of *U. sativa* must remain open. Unfortunately it is not represented in Miller's Herbarium in Herb. Mus. Brit. and the name is therefore *nomen dubium*.

As conclusive evidence of the identity of *U. sativa* is lacking, and in consideration of the fact that the name has been used in five different senses (1. *U. stricta* var. *Goodyeri* Melville, 2. *U. procera* Salisb., 3. *U. diversifolia* Melville, 4. *U. minor* Mill., 5. *U. Plotii* Druce) it is hereby proposed that the name be rejected as a permanent source of confusion and error under Art. 62 of the International Rules of Botanical Nomenclature, and listed as *nomen ambiguum*.

OROBANCHE HEDERAE IN AND ABOUT BRISTOL.

By H. S. THOMPSON, A.L.S.

IN this Journal for 1932, pp. 100-103, was a paper by me entitled "Vegetation at Brislington Railway Station." At least 120 species of phanerogams were noted on Aug. 25 that year in the small area dealt with. These included *Orobanche Hederae* "at the foot of the boundary wall within 40 yards of the booking office." It was also "in profusion on the ivy-topped wall of the lane just outside of the station-approach, and also on the main tramway road to Bristol."

It has long been known in abundance on a bank of the main road towards Stapleton, Bristol, N.; and a few years ago I saw it abundantly on various plants in a garden at Stapleton. Last year two spikes were growing at the foot of one of the older Clifton College buildings, adjoining the public footpath in College Road. I saw it also in shrubberies etc. in Clifton.

On June 29 this year I counted at least sixty spikes on a patch of Ivy, four yards long, at the edge of the public path (and precipice) close to the Clifton Observatory and the Suspension Bridge. Several more had been gathered and left there. As mentioned by J. W. White in his 'Flora of Bristol,' it is found "On St. Vincent's Rocks in many places, especially along the upper edge of the cliffs." He also mentioned that Swete recorded it in 1854 on a "Wall opposite Cornwallis Crescent, Clifton."

On the same day I saw, and left *in situ*, a single spike on ivy growing on the ground of a sort of plantation which separates the lower end of West Mall, Clifton (where I live), from the opposite road called Caledonia Place. This is practically one road, but with two names, separated by garden ground and the said small plantation.

It would appear from White's Flora and my own observations that this Broomrape is much more frequent on and about ivy-covered walls etc. in Bristol and several small towns in N. Somerset than in wilder districts of Somerset, even where ivy is abundant. In R. P. Murray's 'Flora of Somerset,' 1896, it is described as "Rare, and very local," and only five localities

are given, two being small towns. In Marshall's 'Supplement to the Flora of Somerset,' 1914, only two more stations (in N. Somerset) are mentioned, and I believe that it has not yet been recorded from S. Somerset (v.c. 5), which seems remarkable. But it appears to prefer ivy growing on a limestone soil; and incidentally I notice that the ivy it grows on is usually the entire, ovate or lanceolate form (like those of most of the flowering branches) and not that which bears a sagittate leaf.

The distribution of this plant on the Continent of Europe seems to be western and southerly, just as it is in England and Wales.

On July 9 I saw literally hundreds of the *Orobanche* scattered on both sides of the steep tarred path called "The Zigzag," which descends from opposite the Rocks Hotel to the road by the Avon. These extend upwards to within forty yards of that Hotel. Also not far off there are a score of spikes on ivy near the path only fifty yards from the nearest house in Sion Hill.

ANNOTATIONES SYSTEMATICÆ.

By A. J. WILMOTT.

V. NOMENCLATURE OF TWO BRITISH ALCHEMILLAS.

ROTHMALER has recently (Fedde, Repert. xlii. 167 (1937), also Schedae ad W. Rothmaler *Alchemillæ exsiccatae*, p. 6 [no. 8] (1938)) created the new name *Alchemilla anglica* for the plant generally known to British botanists as *A. minor* Huds. The reasons given (1937) are that "*A. minor* (Huds.) Buser 1895" cannot be used for this plant because it is a "later homonym," Buser having in 1891 used the name for another species, *A. hybrida* Mill. Hudson, he says, only used the epithet *minor* as a variety of *A. vulgaris* L., and identified it with Linnæus's var. β *minor*, which is *A. glaberrima* (Schmidt) Buser 1895=*A. minor* (L.) Tausch apud Host 1827.

It is unfortunate that Rothmaler is evidently without access to the necessary literature, for his statements are founded on erroneous citations by Buser in 1891. Hudson in all editions of his 'Flora Anglica' prints *A. minor* as a species, and makes no reference to Linnæus's *A. vulgaris* var. β , nor did Linnæus give any name to this variety. *A. minor* Huds. is therefore a valid name, and the new name *A. anglica* is illegitimate, being created in this way to replace Hudson's name which was erroneously thought to be invalid.

The synonym given by Hudson in his 'Flora Anglica'—"*Alchemilla alpina pubescens minor* Tourn. 508, Pluk. Ph. t. 240" f. 2 ["1" in errore]—is that given by Linnæus in 1753 for his *A. alpina* var. β *hybrida*; it was for this reason that in 1891 Buser used the name *A. minor* Huds. for *A. hybrida* (L.) Mill.

In 1895 Buser transferred the name to the plant for which it has since been used by British botanists, because, said he, *A. hybrida* was not known as a wild plant in Britain. At that time that was true, but since then *A. hybrida* (L.) Mill. (or at least the Pyrenean plant named by Tournefort, for Miller's plant, according to the specimen in his herbarium, was a cultivated large plant which I am not sure is identical with Tournefort's smaller plant) has been found wild over a considerable area of open fell grass-land in Yorkshire extending into Westmorland, as well as in both Scotland and Ireland. Hudson gives as the locality for his *A. minor* precisely such a habitat in Westmorland, and there is therefore no reason to doubt that his plant was correctly identified by him with Tournefort's plant, i. e., was "*A. pubescens* Lam." (which is a *nomen abortivum* owing to Lamarck's citation of "*A. hybrida* Lin." as a synonym). It should also be noted that the word "sericeis," used by Hudson in his definition, fits this plant and does not fit "*A. anglica*." Buser's use of Hudson's name for that species in 1891 was therefore quite correct, and *A. minor* Huds. must be used in this sense, and not for the more common and more lowland English plant.

For those who do not separate specifically *A. filicaulis* Buser from this common English plant (which, in 1893, Buser named *f. vestita*) the name *A. filicaulis* [*f. vestita*] Buser will be correct for this latter, re-named by Rothmaler *A. anglica*, but for those who separate the two as distinct species a peculiar nomenclatural difficulty arises. It would appear that as *A. anglica* is illegitimate, being created to replace "*A. minor* (Huds.)" under the mistaken impression that this name was not legitimate, some other name must be found to replace it. As Rothmaler rightly indicates, no other name is available, and it is necessary to create one at the same time as one destroys *A. anglica*. I therefore propose *A. pseudominor* sp. nov., *A. minor* auct. angl., non Hudson; Wilmott 1922, in Babington Manual ed. 10, p. 578: holotypes in Herb. Mus. Brit. leg. E. S. Marshall "between East Anstey and Brushford, S. Somerset, 30. v. 1905": Herb. E. F. Linton. This specimen was one of those used in drawing up my account of the genus for the Appendix to Babington's 'Manual.'

REVIEW.

The World was my Garden. Travels of a Plant Explorer. By DAVID FAIRCHILD. 8vo, pp. xiv+494. London: Charles Scriber's Sons, Ltd. Price 18s.

THOUGH, as the subtitle suggests, this book is mainly concerned with the travels of the author as a plant explorer, it deals with a number of additional subjects such as the first American attempts at aviation. Probably most academic botanists will find their chief interest in the first eighty pages, however, for the light given on botanical teaching in America and Europe.

The author was born in 1869 at Michigan State College, where his father was Professor of English Literature; W. J. Beal was Professor of Botany there, engaged in experiments on the longevity of seeds, and among the students were L. H. Bailey and B. D. Halstead (Fairchild's uncle). Incidentally it is related that William Jennings Bryan based one of his most popular sermons on immortality on newspaper accounts of "mummy wheat." When Fairchild was ten years old his father was made President of Kansas State College of Agriculture. Fairchild took a course of botany there under W. A. Kellerman and became interested in the subject; he had W. T. Swingle and M. A. Carleton as class-mates. After graduating in 1888 he was invited by Halstead to Iowa State College, where he was Professor of Botany, soon moving to Rutgers where Fairchild accompanied him as a post-graduate student. B. T. Galloway met Fairchild when visiting Rutgers and invited him to join the staff of his new section of Plant Pathology at the Department of Agriculture at Washington. This at the time (1889) consisted of Galloway and five assistants, and was housed in two or three rooms, one of which was an attic! Fairchild resigned from Washington in 1893 to become the first occupant of the Smithsonian "working table" at Naples. On his trip over he met B. Lathrop, who, some months later, called on him and offered him one thousand dollars to visit Java. Fairchild delayed for two years so that he could study in Germany. He had been recommended by Theodore Holm to go to work under Pax at Breslau, and there are notes about Pax, Cohn, Weberbauer, and Fedde. Later he visited Berlin and mentions several botanists, speaking most highly of O. Warburg. As a mycologist Fairchild made the acquaintance of Lindau and Hennings, but found that if he associated with Paul Magnus, a Jew, he would not be acceptable to them. In 1913 I found, similarly, that the fact that I went to see Magnus and said frankly that I had enjoyed the visit was regarded like my smoking a pipe in the street. On Alfred Moeller's advice Fairchild then went to study under Brefeld at Münster; he gives an interesting account of Brefeld's methods. It is always a matter of surprise how Brefeld, who refused to adopt more refined technique as it was developed, could have carried out his studies on the life-histories of fungi in so exact a manner: he is said to have sat through twenty-four hours with his eye to a microscope focused on a single bacterium. R. A. Harper also came to work under Brefeld, but when he and Fairchild realized that their keenness on proving sexuality in fungi, which would have upset Brefeld's ideas, led to their being neglected in his laboratory, they moved to Bonn to study under Strasburger. Here a band of active workers were greeted each morning with the query "*Haben Sie etwas neues*"? It is related how in November 1895 Strasburger

announced to them Röntgen's great discovery and showed them the first X-ray photographs of the key, ring, and purse.

After visiting Melchior Treub at Leiden, Fairchild accompanied him to Buitenzorg. Much is told of this aristocratic man of the world, an accomplished linguist with waxed moustache, eye-glass on a ribbon, fashionably tailored clothes, and spotless linen—"he was different from the scientific men I had known." After a year at Java he was visited by his patron, Lathrop, and then began what is called the "Lathrop-Fairchild Odyssey," the account of which occupies about two hundred pages—South Sea Islands, Siam, Australia, New Zealand, New Guinea, West Indies, South America, Corsica, Egypt, Ceylon, Persian Gulf, Japan, China, Africa. He returned to the Bureau of Plant Industry at Washington in 1903 as an unsalaried employee of the Office of Seed and Plant Introduction. Then is told the story of many plant introductions and productions. But his travelling days were not yet over, for in 1924 began the Allison Armour Expeditions which lasted for six years—the Mediterranean, Norway, Canary Islands, Mexico, South America, West Indian Islands. The account of three of the expeditions has already been published ("Exploring for Plants"), and a mere summary is here given. The author has been assisted by Elizabeth and Alfred Kay and the fact that his story was taken down by a stenographer probably accounts for a certain jerkiness in the narrative. There is a great deal of valuable botanical information scattered throughout the book and a great wealth of excellent photographs. Few have had such opportunities for botanical travel as David Fairchild, and his fascinating story makes inspiring reading.—J. RAMSBOTTOM.

BOOK-NOTES, NEWS, ETC.

In the 'Cactus Journal,' vol. 7, nos. 2 and 3, W. T. Stearn has published "An annotated index to Salm-Dyck's 'Monographia Generum Aloes et Mesembryanthemi'" giving a biographical note on the author, the dates of publication of the parts, and an index to the plates with their dates of publication. There are also four plates.

'RESEARCH AND STATISTICAL METHODOLOGY, Books and Reviews, 1933-1938,' edited by Oscar Krisen Buros, and published by the Rutgers University Press at 1 dollar 25 cents, gives in 100 pages of small type the titles of books and monographs on the subjects together with extracts from published reviews. The fact that it is prepared in the School of Education suggests the public aimed at. Some of the reviews give much useful information, and a comparison of the standpoints of different reviewers of the same work provides interesting reading.

EDITORIAL.

As this number goes to press war has been declared. No good purpose would be served by commenting on the insane stupidity which has led to this second struggle before the sufferings caused by the last war have ceased to be obvious.

It is intended to carry on with the *Journal of Botany*, but conditions may be such that publication will have to be suspended. If it should be that I am not free to continue editorial work for the time being, one or other of my colleagues will take over.

The *Journal of Botany*, since it first appeared in 1863, has been closely connected with the Department of Botany. It is not an official publication of the Museum and perhaps for that reason has played a more effective part in British botanical affairs. Many of its contributors will doubtless find some escape from present anxieties in their studies of Botany, *scientia amabilis*, which seems to be wholly divorced from the horrors of war. By publishing their observations they may help others to turn their minds from unthinkable things—if only for a short time.

STUDIES OF BRITISH POTAMOGETONS.—VII.

BY J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

VII. SOME NEW COUNTY RECORDS.

OUR researches both in the field and in the herbarium during the last three years have shown that the distribution of pondweeds in the British Isles is still far from being fully worked out. This applies more particularly to some of the hybrids and "pusilloid" species which have been so much overlooked or confused in the past that they have appeared rarer than they really are. It seemed clear to us that such a hybrid as $\times P. Cooperi$, for example, whose parent species often grow together, should occur more commonly than the existing records would indicate. Accordingly special search has been made for it this year, with the result that it has been found in three new vice-counties. Similarly, exploration for the elusive *P. trichoides* has led to its discovery in eight new vice-counties during the last twelve months. This year also the rare hybrids $\times P. sparganifolius$ and $\times P. fluitans$ have each been found in two new vice-counties. Below we enumerate these records and many more which appear also to be new* in order that they may be made available to botanists. This should stimulate still further the recent increased interest in the genus, so strongly reflected in the fact that almost half of these new county records are based on specimens collected during the last three years. The remaining records include a number that have lain unnoticed in herbaria owing to erroneous identifications. We are grateful to the many botanists who have assisted our work by submitting material.

In the following list the species and hybrids are, for convenience, in the order of the 'London Catalogue', Ed. 11 (1925), p. 46, with the interpolation of the hybrid $\times P. venustus$ which was omitted from that work. No records of *P. Berchtoldii* or *P. pusillus* are included, as these two species will be dealt with in future notes. All the gatherings cited are represented in the British Museum Herbarium (including the Boswell and Hanbury Herbaria) unless otherwise indicated.

P. COLORATUS Hornem.(51) FLINT. Stream, Prestatyn, 30th Mar. 1888, *A. E. Lomax*.*P. ALPINUS* Balb.(56) NOTTINGHAM. Ditch, Lenton, Nottingham, July 1849, *J. Mitchell* in *Herb. Boswell*.

* We cannot be sure that every one of the records is new, as our survey of the existing literature—a task requiring considerable time—is not yet complete.

(91) KINCARDINE. South side of R. Dee (near Cults), 19th July 1868, *N. E. Brown*. R. Dee, Ardoe, 5th Sept. 1914, *J. W. H. Trail* (Herb. Univ. Aberdeen).

(98) ARGYLL. Lusragan Burn, Connel Ferry, near Oban, 21st July 1885, *C. Bailey*.

(105) WEST ROSS. Loch Achaidh na h-Ithinnich, near Duncraig, 21st Aug. 1937 and 6th Sept. 1938, *A. Stewart Sandeman*. Loch an Arbhair, Strome Ferry, 24th Aug. 1937, *A. Stewart Sandeman*.

× *P. VENUSTUS* Baagöe ex A. Benn. (*P. alpinus* × *crispus*).

This hybrid has already been correctly recorded from (88) MID PERTH and (93) NORTH ABERDEEN.

(78) PEEBLES. R. Tweed, Peebles, 1888, *G. C. Druce*, recorded as *P. rufescens* by A. Bennett in Trans. Bot. Soc. Edin. xvii. 420 (1889); 6th June 1939, *G. Taylor*. R. Tweed ½ mile above Manor Bridge, Manor, 6th June 1939, *G. Taylor*.

(H 39) ANTRIM. Six Mile Water, Antrim, 1938, *N. D. Simpson*, Ref. 381103; floating fragments only were collected.

× *P. SPARGANIFOLIUS* Laestad. ex Fr. (*P. gramineus* × *natans*).

(31) HUNTS. Upwood Common Drain, Ramsey, 20th Aug. 1939, *J. E. Dandy* & *G. Taylor*; growing with both the parent species.

(92) SOUTH ABERDEEN. R. Don, Old Aberdeen, 16th July 1876, *J. W. H. Trail*. Mill lade, Woodside Paperworks, near Aberdeen, 20th July 1914, *J. W. H. Trail* (Herb. Univ. Aberdeen). R. Don, Grandholm, Old Machar, 20th June 1939, *G. Taylor*. Trail's 1914 specimens in Herb. Univ. Aberdeen were named × *P. sparganifolius* by A. Bennett in 1918, but with some doubt. The 1876 specimen in the British Museum Herbarium was, however, named × *P. fluitans* by Bennett in 1924, after an earlier suggestion of "*polygonifolius pseudo-fluitans* ?"; the specimens of the same date in Herb. Univ. Aberdeen were named *P. heterophyllus* var. *maximus*.

(96) EASTERNNESS. Small loch ½ mile east of Nairn, 11th June 1939, *G. Taylor*; growing with both the parent species.

× *P. NITENS* Weber (*P. gramineus* × *perfoliatus*).

(56) NOTTINGHAM. Drain close to Park Drain Station, Misson, 17th Aug. 1905, *J. W. Carr*, recorded as *P. falcatus* by A. Bennett ex Bickham in Bot. Exch. Club Brit. Is. ii. 314 (1908) and in Watson Bot. Exch. Club, ii. 159 (1908), and by Carr himself in Journ. Bot. xlvii. 138 (1909); 13th Aug. 1939, *C. I. & N. Y. Sandwith*.

(63) SOUTH-WEST YORK. North Idle Drain, Roe Carr, Hatfield, 13th Aug. 1939, *C. I. & N. Y. Sandwith*.

(64) MID-WEST YORK. Stream from Malham Tarn, 22nd May 1935, *J. E. Lousley* (Herb. P. M. Hall), named *P. lucens* by Pearsall in 1935.

(74) WIGTOWN. Dernaglar Loch, Old Luce, 22nd July 1939, *G. Taylor*. Cut between White Loch and Black Loch, Castle Kennedy, Inch, 24th July 1939, *G. Taylor*.

(87) WEST PERTH. Strathyre, 23rd June 1906, *W. E. Evans* (Herb. Evans). [× *P. nitens* var. *subintermedius* was recorded from Loch Lubnaig, as new for this vice-county, by Pearsall in Bot. Soc. & Exch. Club Brit. Is. x. 545 (1934), but the plant is *P. gramineus*; it was collected by *G. Taylor* on 21st Aug. 1933.]

(99) DUMBARTON. R. Leven, Loch Lomond, July 1824 (no collector indicated) (Herb. Edinburgh); 28th Aug. 1897, *L. Watt*. The various attempts to identify these gatherings are interesting. Watt's plant in the British Museum Herbarium was named *P. angustifolius* by A. Bennett. The 1824 plant in Herb. Edinburgh was named *P. lucens* originally, this later changed to *P. praelongus*; Syme suggested "possibly *nitens*?" and Bennett "*P. perfoliatus*, L. f.!", while Fryer finally determined it as *P. nitens* f. *praelongifolius*.

× *P. FLUITANS* Roth (*P. lucens* × *natans*).

(9) DORSET. Moors R. below St. Leonard's Bridge, West Parley, 20th Aug. 1839, *P. M. Hall*, Ref. 3686. Stream east of Trickett's Cross near its junction with Moors R., West Parley, 20th Aug. 1939, *P. M. Hall*, Ref. 3683. The hybrid is plentiful in the Moors R. down to Palmer's Ford in South Hants (see below), and both the parent species grow in the same stretch of the river.

(11) SOUTH HANTS. Moors R. by footbridge at Palmer's Ford, St. Leonards & St. Ives, 30th July 1939, *P. M. Hall*, Ref. 3668 and 3669; 20th Aug. 1939, *P. M. Hall*, Ref. 3679, 3680, 3681, and 3682.

× *P. DECIPIENS* Nolte ex Koch (*P. lucens* × *perfoliatus*).

(15) EAST KENT. R. Wantsum near Chambers Wall, St. Nicholas at Wade, 3rd Aug. 1939, *C. Norman*.

(22) BERKS. R. Thames near Reading, 3rd July 1885, *C. A. Wright*; 8th July 1921, *H. W. Monckton* (Herb. Univ. Reading), named *P. lucens*. Kennet & Avon Canal, Burghfield, 4th June 1939, *T. M. Harris*, Ref. 2. Kennet & Avon Canal, Newbury, 25th July 1939, *A. B. Jackson*.

(89) EAST PERTH. R. Isla near its mouth, 5th July 1881, *H. M. Drummond-Hay* (Herb. Perth Mus.), and *F. Buchanan White* (Herb. Perth Mus.); 11th July 1882, *A. Sturrock* (Herb. Perth Mus.); 11th July 1887, *R. H. Meldrum*, and *F. Buchanan*.

White (Herb. Univ. Glasgow); July 1887, *W. Barclay*. All these specimens were referred to *P. lucens*, and the plant was included under that species in Buchanan White's 'Flora of Perthshire' (1898), pp. 309-310. His own specimen in Herb. Univ. Glasgow, collected in 1887, was named "var. app. *P. decipiens* Nolte" by A. Bennett. Actually the plant is a state of $\times P. decipiens$ approaching much closer to *P. lucens* than to the other parent species, *P. perfoliatus*.

$\times P. ZIZII$ Koch ex Roth (*P. gramineus* $\times$ *lucens*; *P. angustifolius* auct. brit.).

(27) EAST NORFOLK. Sutton Broad, 5th Aug. 1915, *M. Pallis*. Ludham Bridge, Ludham, 18th July 1923, *F. Druce* (Herb. F. Druce).

(54) NORTH LINCOLN. Folly Drain, Haxey, 11th Aug. 1939, *C. I. & N. Y. Sandwith*.

(65) NORTH-WEST YORK. Semer Water, 1886 (no collector indicated) (Herb. Cartwright Mem. Hall, Bradford).

(100) CLYDE ISLES. Loch Fad, Bute, 24th June 1847 (no collector indicated) (Herb. Univ. Glasgow). Loch Ascog, Bute, 1st Sept. 1898, *R. Turner* (Herb. P. Ewing, Glasgow).

(105) WEST ROSS. Loch Coultrie, Applecross, 15th July 1937, *G. Taylor*.

(111) ORKNEY. Muckle Water, Rousay, 23rd July 1921, *H. H. Johnston*, Ref. 1343; 22nd Aug. 1921, *H. H. Johnston*, Ref. 1402. Both these gatherings were recorded as *P. lucens* by A. Bennett ex Johnston in Bot. Soc. & Exch. Club Brit. Is. vi. 580 (1922) and in Trans. & Proc. Bot. Soc. Edin. xxviii. 113 (1922).

(H 36) TYRONE. Lough Neagh, Arboe, June 1880, *S. A. Brenan*; 1880, *C. H. Waddell* (Herb. Queen's Univ., Belfast).

P. PRAELONGUS Wulf.

(105) WEST ROSS. Loch Iain Oig, near Balmacara, 24th Aug. 1937, *A. Stewart Sandeman*.

(H 37) ARMAGH. Newry Canal, Goraghtwood, June 1893, *R. Lloyd Praeger*.

P. PERFOLIATUS L.

(78) PEEBLES. Portmore Loch, Eddleston, 9th July 1935, *G. Taylor*.

(105) WEST ROSS. Loch Achaidh na h-Ithinnich, near Duncraig, 21st Aug. 1937, *A. Stewart Sandeman*.

$\times P. LINTONII$ Fryer (*P. crispus* $\times$ *Friesii*).

(56) NOTTINGHAM. Nottingham Canal, Wollaton, 3rd Sept. 1937, *G. Taylor*. Chesterfield Canal, Misterton, 9th Aug. 1939, *C. I. & N. Y. Sandwith*. Chesterfield Canal, Gringley-on-the-Hill, 12th Aug. 1939, *C. I. & N. Y. Sandwith*.

$\times P. COOPERI$ (Fryer) Fryer (*P. crispus* $\times$ *perfoliatus*).

(20) HERTS. Old canal, Little Tring, Tring, 2nd Aug. 1939, *G. Taylor*; growing with both the parent species.

(24) BUCKS. Grand Union Canal, Broughton, Bierton with Broughton, 20th Aug. 1939, *A. H. G. Alston & N. Y. Sandwith*; both the parent species growing in the canal. Grand Union Canal, Aylesbury, 23rd Aug. 1939, *G. Taylor*; growing with both the parent species.

(45) PEMBROKE. R. Solfa, Whitchurch, 17th Aug. 1931, *C. I. & N. Y. Sandwith*. The material in Herb. Sandwith was named *P. perfoliatus* by Pearsall in 1931.

(83) EDINBURGH. Union Canal near Kingsknowe, Edinburgh, 4th Aug. 1902, *W. E. Evans* (Herb. Evans). Union Canal, Slateford, Edinburgh, 4th Oct. 1937, *G. Taylor*. Union Canal, Hermiston, Currie, 24th Sept. 1932, *G. Taylor*, named *P. perfoliatus* var. *ovatifolius* by Pearsall in 1932; 4th Oct. 1937, *G. Taylor*.

(84) LINLITHGOW. Union Canal, Winchburgh, Kirkliston, 7th June 1939, *G. Taylor*. Union Canal, Woodcockdale, Linlithgow, 7th June 1939, *G. Taylor*; growing with both the parent species.

P. DENSUS L.

(87) WEST PERTH. Lake of Menteith (no date or collector indicated), *Herb. Hambury*.

(106) EAST ROSS. Pond in garden of Spa Hotel, near Strathpeffer, Aug. 1937, *A. Stewart Sandeman*.

P. COMPRESSUS L. (*P. zosterifolius* Schumacher).

(20) HERTS. Old canal, Little Tring, Tring, July 1935, *A. H. Carter*; 3rd Aug. 1935, *E. C. Wallace* (Herb. Kew, Herb. Wallace, etc.); 4th Aug. 1935, *J. E. Lousley* (Herb. Lousley, etc.); 29th July 1939, *G. Taylor*.

(47) MONTGOMERY. Shropshire Union Canal, Welshpool, 23rd Aug. 1938, *S. Haines*.

P. ACUTIFOLIUS Link.

(11) SOUTH HANTS. Mottisfont, Aug. 1898, *R. Meinertzhagen* (Herb. Meinertzhagen).

P. OBTUSIFOLIUS Mert. & Koch.

(11) SOUTH HANTS. Fast-running chalk-stream, Mottisfont, Aug. (no year indicated), *R. Meinertzhagen* (Herb. Meinertzhagen).

(65) NORTH-WEST YORK. Stream south of Mickle Fell, 1861?, *Herb. Backhouse* (Herb. Edinburgh), named *P. gramineus*.

(83) EDINBURGH. Union Canal, Slateford, Edinburgh, 26th June 1905, *J. Fraser* (Herb. Fraser, Edinburgh). [According to Trail in Ann. Scot. Nat. Hist. 1899, 171 (1899), the species had been recorded in error from this vice-county.]

(99) DUMBARTON. Bowling, 10th Sept. 1881, *Gibson*, Ref. 7, named *P. pusillus* originally, but named *P. Friesii* by A. Bennett with subsequent notes "perhaps best referred to *pusillus*" and "or a $\times$?" (1917).

(111) ORKNEY. Howan, Birsay & Harray, Mainland, Aug. 1876, *J. W. H. Trail* (Herb. Univ. Aberdeen). [Trail in Ann. Scot. Nat. Hist. 1899, 171 (1899) indicated that the species had been recorded in error from this vice-county.]

P. FRIESII Rupr.

(83) EDINBURGH. Union Canal, Slateford, Edinburgh, July 1875, *W. W. Evans* (Herb. Edinburgh), named *P. obtusifolius* (?); 4th Oct. 1937, *G. Taylor*.

(84) LINLITHGOW. Union Canal near Drumshoreland Station, Uphall, 30th July 1937, *G. Taylor*. Union Canal, Winchburgh, Kirkliston, 7th June 1939, *G. Taylor*. Union Canal, Woodcockdale, Linlithgow, 7th June 1939, *G. Taylor*.

P. TRICHOIDES Cham. & Schlecht.

In the second of these notes (Journ. Bot. lxxvi. 166-171 (1938)) we reviewed the distribution of this species, adding seven new county records and suggesting that it had possibly been overlooked in some areas. We are now able to record it from ten more vice-counties, in eight of which it has been discovered during the past twelve months.

(2) EAST CORNWALL. Canal, Bude, Oct. 1919, *W. S. M. D'Urban*, named *P. pusillus*. This record has already been published in Martin & Fraser's 'Flora of Devon' (1939), p. 646.

(7) NORTH WILTS. Kennet & Avon Canal, Crofton, Great Bedwyn, 13th Aug. 1939, *G. Taylor*.

(8) SOUTH WILTS. Kennet & Avon Canal, Wilton, Grafton, 13th Aug. 1939, *G. Taylor*.

(20) HERTS. Old canal, Little Tring, Tring, 29th July and 2nd Aug. 1939, *G. Taylor*. Grand Union Canal near The Hoggery, Abbots Langley, 16th Aug. 1939, *G. Taylor*.

(22) BERKS. White Brook, Cookham, 23rd Sept. 1938, *J. E. Dandy*, Ref. 766; 5th July 1939, *J. E. Dandy & G. Taylor*.

(24) BUCKS. Grand Union Canal, Aylesbury, 23rd Aug. 1939, *G. Taylor*.

(35) MONMOUTH. Reens on Caldicot Level $1\frac{1}{4}$ miles north of Whitson Church, Aug. 1939, *B. Welch*.

(53) SOUTH LINCOLN. Drain near Crowland, 28th July 1883, *W. H. Beeby*, named *P. pusillus*.

(63) SOUTH-WEST YORK. Calder & Hebble Navigation by Salterhebble Bridge, Halifax, 20th July 1939, *G. Taylor*.

(99) DUMBARTON. Forth & Clyde Canal (west of Castlecary Bridge), Cumbernauld, 17th June 1939, *G. Taylor*; only floating material found.

P. PECTINATUS L. (incl. *P. interruptus* Kit.).

(70) CUMBERLAND. Stell, Rockcliffe Marsh, 12th May 1913, *F. A. Lees*. [This species was recorded from Bassenthwaite Lake (*W. Dickinson*) by Baker in his 'Flora of the English Lake District' (1885), p. 206, but according to W. Hodgson, 'Flora of Cumberland' (1898), p. 318, the plant was referred to "*Callitriche hamulata* (?)" by Baker on examining the original specimen.]

P. FILIFORMIS Pers.

(H 39) ANTRIM. Lough Neagh near The Three Islands, 4th Aug. 1938, *J. P. M. Brenan & N. D. Simpson* (Herb. Simpson, Ref. 38759).

NOTES ON BRITISH CARICES.—IV.

By E. NELMES.

CAREX VULPINA L.

1. *Taxonomy*.

AN article by Kern and Reichgelt*, in the Nederlandsch Kruidkundig Archief, 1937, reminds us that Haussknecht (Oesterr. Bot. Zeitschr. xxvii. 1877) re-established as a species the plant described by Rebertisch in 1804 as *Carex nemorosa*. In the interval this plant had been generally treated as a variety or even only as a form of what was commonly known as *C. vulpina* L.

Haussknecht was not more successful than Rebertisch in persuading European botanists to recognize the specific status of *C. nemorosa*. Lindberg, however (Medd. Soc. Fauna & Fl. Fenn. 1914), apparently without knowing of Haussknecht's published views, came to the same conclusion. Samuelsson (Svensk Bot. Tidskr. xvi. 1922) followed with a still more searching inquiry and a similar result.

Botanists, however, at least in western Europe, are still applying the name *C. vulpina* L. f. *nemorosa* (Rebert.) to a plant, fairly common in western and southern Europe, with an oblong, interrupted, compound-spicate inflorescence. Similar plants, with the same distribution, but producing a more compact inflorescence are taken to be the typical *C. vulpina* L.

The plant which Haussknecht, Lindberg, Kern & Reichgelt, and others have maintained to be the true *C. vulpina* L. occurs in eastern and northern Europe and becomes less common towards the west and south, where its allies (the plants already mentioned) take its place. Specimens have been seen by me from Bosnia, Hungary, Germany, Sweden, Holland, France, and England.

* Kindly translated from the original by Mr. W. C. Worsdell.

Samuelsson records it for France only from Paris and Toulon, but at Kew there is an immature plant collected by J. S. Gamble on a canal bank at Nancy which belongs to this species. For England Samuelsson knows it only from the neighbourhood of Oxford. He kindly informs me that this specimen was collected in 1881 by H. E. Garnsey, and is now in the herbarium of the Botanical Institute of the University of Vienna. Owing to the international situation I have been unable to see this specimen.

Until the early months of this year this eastern species did not appear to be represented from Britain in the Kew herbarium. In February, however, I noted among Mr. E. C. Wallace's annual gift of British plants to Kew some fine typical specimens of what the eastern taxonomists know as *C. vulpina* L., and which were collected in the previous June on the banks of the Adur and the Arun in West Sussex. Mr. Wallace has since informed me that he collected the plant in much the same localities in 1933. Shortly afterwards Mr. Willmott and I found it in the "*C. vulpina*" covers at the British Museum, gathered by C. C. Lacaita, in 1912, at Amberley Wild Brooks, which is also in West Sussex and not very far from Wallace's localities. Through the kindness of Mr. J. F. G. Chapple, I have ascertained that this plant is not represented in Druce's herbarium at Oxford. I looked for it in vain among the specimens of "*C. vulpina*" in the Rev. E. S. Marshall's collection of Carices at Cambridge some time ago, but more recently I had occasion to look through his cover of *C. paniculata* L., and there was a flowering specimen of what I think is the sedge, masquerading, under the handwriting of Kükenthal, as the hybrid *C. paniculata* × *C. vulpina* (*C. pseudo-vulpina* Richter). This specimen was collected by Marshall "by the Eden, below Chiddingstone, W. Kent, 2 May 1894," and is cited in the 'Pflanzenreich' as the hybrid.

I have since seen this species in fruit "by the Eden, below Chiddingstone" (only one plant noticed in a two-mile stretch of the river); at several spots on and near the Medway, between Tonbridge and Leigh, in West Kent; and friends and I have visited Lacaita's locality at Amberley, West Sussex, noting it in considerable quantity there. It appears to favour riversides and their vicinity, while the other species is usually found by smaller, shallower streams and ditches.

The chief contrasting characters of the eastern and western species are:—

Eastern Species.

Stem 3-winged, broad, with concave sides.

Leaves dark bright green, even when dry, broad.

Western Species.

Stem 3-angled, narrower, with nearly flat sides.

Leaves grey-green when dry, broad but narrower than in the eastern plant.

Eastern Species.

Inflorescence composed of dark rich shining brown spikelets, usually densely aggregated, but sometimes somewhat lax below, subpyramidal, rarely oblong, usually appearing ebracteate, with conspicuous dark brown auricles at the base.

Bracts very short, each scarcely as long as the spikelet, rarely as long or longer.

Glumes ovate, ending in a rather long bristle-like tip, dark brown with a dark green midrib.

Utricles brownish, ovate, ciliate on edges above, suberect to obliquely spreading, few-nerved on the swollen dorsal side, nerveless on the flat ventral side, shortly bidentate, with a deep broad groove on the back of the beak.

Note.—Utricles of this plant are very rarely faintly few-nerved on the ventral side.

Western Species.

Inflorescence composed of yellowish green or sometimes light brown spikelets, often less densely placed together and sometimes considerably interrupted below, oblong, rarely subpyramidal, usually conspicuously bracteate, auricles pale and quite inconspicuous.

Bracts setaceous, at least the lower ones longer than their spikelets, frequently much longer.

Glumes more elongate, ending in a shorter tip, bright brownish, with a pale green midrib.

Utricles greenish, ovate-lanceolate, sparsely ciliate on edges above, spreading, at length divaricate, larger than in the eastern plant, with a longer beak, distinctly several-nerved on both sides, bidentate, no deep broad groove on the back of the beak.

Note.—Utricles of this plant are sometimes indistinctly nerved on the ventral side.

This comparison may be usefully completed by a translated quotation from Kern & Reichgelt:—

"Samuelsson has added an anatomical character to all these differences: in *C. vulpina* most epidermis-cells of the utricle-wall are fairly isodiametric and thick-walled; in *C. nemorosa*, on the contrary, they are clearly elongate in the direction of the long axis of the utricles and thin-walled. Already with a magnification of 200 times this difference was distinctly indicated, and we have controlled all our plants to this character. Samuelsson rightly attributes great value to this character: 'With the help of this structural difference there was no difficulty in determining with complete certainty all hitherto doubtful individuals.'"

It may be repeated that the inflorescence of both the eastern and the western species varies from a compact, dense agglomeration of spikes to one of somewhat looser spikes in the former, and to one considerably interrupted towards the base in the latter. The interrupted inflorescence of the western plant appears to be partly at least the result of growing in partial shade, which is suggested by the accompaniment of less distinctly nerved utricles, more flaccid stems, and paler glumes.

The more striking and constant of the characters which differentiate the eastern plant from our western one are stouter stems, greener and broader leaves, darker brown inconspicuously bracteate inflorescence, and smaller scarcely divaricate utricles,

with a shorter beak, on the back of which is a conspicuously deep and broad groove.

Finally, specimens which appear to be hybrids between the two species were collected from the Medway, near Tonbridge, and at Amberley Wild Brooks, but further study will be necessary before the precise identity of these plants can be determined.

The supposed hybrid from the Medway resembles the eastern plant, but has a greener and rather looser inflorescence, and its utricles are rather strongly nerved on both sides. Typical plants of both the eastern and western species occur at no great distance from it.

That at Amberley stands nearer to the western species, but its glumes and utricles are browner, and the utricles also appear to be slightly grooved on the back of the beak. There is also an indefinable touch of the eastern species about its inflorescence, and it occurs with this species in considerable quantity at one or two spots. A plant of the western species with a rather interrupted inflorescence was seen in a hedge near by.

2. Nomenclature.

Before analysing the diagnosis and citations of *C. vulpina* L., Sp. Pl. 973-4 (1753), a few general remarks may be made on the nomenclature of this group.

Kern & Reichgelt, in their recent paper, adopt the name *C. nemorosa* Rebert. for the western species, and *C. vulpina* L. for the eastern one. They do not specially discuss this nomenclature.

Kreczetowicz (Flora U.R.S.S. iii. 151 (1935)) uses the name *C. compacta* Lam. for the western plant, placing *C. nemorosa* Rebert. (1804) in synonymy as a later homonym (*C. nemorosa* Schrank: 1789; Lumn.: 1791).

Lamarck, however, shows clearly that he is choosing what he considers a more appropriate name for the plant known to him as *C. vulpina* L. *C. compacta* Lam., therefore, is a superfluous name for *C. vulpina* L. and cannot legitimately be used (Art. 60 of the International Rules of Botanical Nomenclature, ed. 3, 1935).

Certain names, however, occur in post-Linnaean works on the flora of Europe of which some may refer to this species, while others are referable to one or another member of the "*C. muricata*" group.

An investigation of these names suggested that there were two with greater claims for consideration here than any of the others: *C. intermedia* Retz. and *C. Otrubæ* Podp.

The type of *C. intermedia* Retz. was borrowed from Lund. It consists of two inflorescences, one with ripe fruits and the other with fruits less advanced but fully developed. These

specimens are both of the eastern plant with abnormally long basal bracts. Retzius, in fact, in the second edition of his Fl. Scand. Prodr. reduced his species to a variety of *C. vulpina* L.

In the course of their paper, Kern & Reichgelt state that they have seen the plant described by Podpera under the name *Carex Otrubæ* (Publ. Fac. Sci. Univ. Masaryk, no. 12, 15 (1922)) as a hybrid between "*C. vulpina* L. and *C. contigua* Hoppe," but that in their opinion it is *C. nemorosa* Rebert.

Dr. Širjaev, Masaryk University, Brno, has recently presented to Kew a fruiting culm from co-type material of *C. Otrubæ* Podp. An examination of this leads me to concur with the opinion that this plant is conspecific with the western plant.

The name *Carex Otrubæ* Podp. is, therefore, apparently the correct name of this species.

CAREX VULPINA L. Sp. Pl. 973-4 (1753).

CAREX spica supradecomposita inferne laxiore: spiculis androgynis ovatis sessilibus glomeratis: superne masculis. Hort. cliff. 438. Fl. succ. 750. Dalib. paris. 286. Roy. lugdb. 74. Gmel. sib. 1. p. 146. t. 32.

Carex palustris major, radice fibrosa, caule exquisitè triangulari, spica brevi habitiore compacta. Mich. gen. 69. t. 33. f. 13. 14.

Gramen Cyperoides palustre majus, spica compacta. Bauh. pin. 6. Moris. hist. 3. p. 244. s. 8. t. 12. f. 14 [i. e., 24.]. Habitat in Europæ paludibus nemorosis.

A. Diagnostic Phrase and Type Specimens.

The diagnosis, *Carex spica supradecomposita inferne laxiore. spiculis androgynis ovatis sessilibus glomeratis: superne masculis*, in Sp. Pl., applies equally well to the eastern and western species which have both been known as *C. vulpina* L., and less well to the material in the Clifford herbarium which is the plant known to-day as *C. arenaria* L. The description of this in Hort. Cliff. differs slightly from the Sp. Pl. diagnosis as follows:—*Carex spica supradecomposita: spiculis androgynis ovatis sessilibus confertis: superne masculis*.

The material of *C. vulpina* in the Linnaean herbarium consists of a single inflorescence, immature, and without leaves, but undoubtedly conspecific with the eastern plant discussed above.

B. Citations.

(1) *Carex spica supradecomposita: spiculis androgynis ovatis sessilibus confertis: superne masculis*. Hort. Cliff. 438. As mentioned above, the specimen in Hort. Cliff., a single fruiting culm, is the plant universally known as *C. arenaria* L. The description fits this species fairly well, but not so well as it does either the eastern or the western "*vulpina*"; and the Hort.

Cliff. citations point strongly in their direction, particularly towards the western plant.

(2) *Carex spica supradecomposita inferne laxiore: spiculis androgynis ovatis sessilibus glomeratis: superne masculis*. Fl. Suec. 750. This description, as stated above, applies equally well to the eastern and western species which have both been known as *C. vulpina*.

The habitat "in vepretis et juxta aquas" also covers that of both species.

Linnaeus concludes his account in Fl. Suec. with "Obs. Culmus crassus, firmus; spica conglomerata, udique hispida, crassa." This appears to point rather to the eastern species, and especially perhaps to the rather immature specimen in the Linnaean herbarium.

(3) Dalib. paris. 286. The diagnosis of Linnaeus is given by Dalibard, except that the word "glomeratis" becomes "conglomeratis." Dalibard's plant is almost certainly the common western one: the other has been recorded from very few localities in France.

(4) Roy. lugd. 74. Royen uses the Hort. Cliff. diagnosis, and refers to Micheli (see below). Here again, although the plant cannot be identified with certainty, it is much more likely to be the western than the eastern one.

(5) Gmel. sib. I. p. 146, t. 32. Gmelin's diagnosis is identical with that of the 'Species Plantarum.' His plate is a poor representation of the eastern species or, possibly, of *C. colchica* Gay or *C. pycnostachya* Kar. & Kir., quite unrelated species. It much more resembles these than it does the western plant. It may be added that the picture applies better to the eastern plant actually in the Linnaean herbarium than to more mature plants of this species in herbaria. Ledebour, in his Commentary, identifies Gmelin's plate as *C. vulpina* L. On the other hand, Gmelin's description includes that of the western plant, as he refers to "Folliculi . . . striati. Omnibus fere spicis aristis similia foliola subsunt."

(6) *Carex palustris major, radice fibrosa, caule exquisita triangulari, spica brevi habitore compacta*. Mich. gen. 69, t. 33, f. 13, 14. Micheli had three distinct plants here, and Linnaeus combined them. The description of the first of these is the above quotation: it is not figured. The second, illustrated by fig. 13, was described as "*Carex palustris major . . . spica longa, divulsa, seu interrupta*," and the third, by fig. 14, as "*Carex palustris media . . . spica brevi, compactione*."

Micheli's first species appears to be a robust form of the western plant with an unusually thick inflorescence. One scarcely dares to suggest that he had the rare eastern plant before him!

Fig. 13 of Micheli's plate 33 shows a large inflorescence, with interrupted and elongated lower spikes. Having in mind only

the shape of the inflorescence, particularly as shown in the plate accompanying the paper by Kern and Reichgelt referred to above, it would probably be concluded that this was the eastern plant. This opinion would tend to be confirmed by comparison with the oblong inflorescence which represents the western plant on the same plate. In spite of this I consider fig. 13 of Micheli's plate 33 represents a form of the western plant with interrupted spikes and a somewhat pyramidal inflorescence. It is a very good match of specimens which I have collected in Gloucestershire, and which I have seen from other parts of Britain. This plant has more characters in common with *C. nemorosa* Rebert., I think, than with the eastern species. The western species occurs in Italy, Micheli's country, where the eastern one is almost certainly scarce.

The inflorescence in fig. 14 represents, I think, the compact "spiked" form of our western plant. There is one rather long bract, situated at the base of the inflorescence, which, with one or two less conspicuous ones, usually occurs in that form, and which does not normally occur in *C. spicata* Huds. (*C. contigua* Hoppe) and its allies, the only other plants which could otherwise be reasonably considered in identifying the picture. It should be mentioned, however, that Hudson cites this figure, with Micheli's diagnosis, under *C. spicata* in the second edition of 'Flora Anglica.'

(7) *Gramen Cyperoides palustre majus, spica compacta*. Bauh. pin. 6. It is likely that this diagnosis covers both the compact form of our western "*C. vulpina*" and *C. spicata* Huds.

(8) *Gramen Cyperoides palustre majus, spica compacta*. Moris. hist. 3, p. 244, s. 8. t. 12, f. 24. This figure shows a typical plant of the western species, with most of the spikes long setaceous-bracteate. This is to be expected in a work on the British flora, as the eastern species appears to be much less common than the other in most parts of Britain.

Summary.

1. The diagnostic phrase of *C. vulpina* L., *Carex spica supradecomposita inferne laxiore: spiculis androgynis ovatis sessilibus glomeratis: superne masculis*, Sp. Pl., equally fairly well describes the looser spiked forms of the eastern and the western species which have been discussed in this paper. The phrase "inferne laxiore" does not fit the specimen in the Linnaean herbarium, but this may be due to its immaturity, as Swedish specimens of this species which I have seen have slightly interrupted lower spikes.

2. This type specimen in the Linnaean herbarium is the eastern European plant which Haussknecht, Lindberg, Samuelsson, and others have considered to be the true *C. vulpina* L., and is specifically distinct from the plant, common in western Europe,

which most botanists in this area have accepted without criticism as Linnaeus's species.

3. *Carex spica supradecomposita*: *spiculis androgynis ovatis sessilibus confertis*: *superne masculis*, Hort. Cliff., does not quite accurately describe the specimen in the Clifford herbarium to which it appears to apply, and which is known to-day as *Carex arenaria* L.

4. The citations given under *Carex vulpina* in Sp. Pl. 973-4 represent both the eastern and the western species, but not one of them seems to apply to the plant in the Clifford Herbarium.

There appear to be several other reasons for eliminating this plant from the consideration of the application of the name *C. vulpina* L.: (1) It is described more accurately under the name *C. arenaria* on p. 973 in Sp. Pl.; (2) the citations under the above diagnosis in Hort. Cliff. do not apply to this plant but to the others under discussion; and (3) the habitat of *C. vulpina* L. in Sp. Pl., "paludibus nemorosis," excludes it.

Linnaeus appears, therefore, to include both the eastern and the western species in his conception of *C. vulpina*, but there are indications from his observations that he was more familiar with the eastern than with the western plant. In addition to this the specimen in his herbarium is the eastern plant. It may also be noted here that the inflorescence of Linnaeus's plant is strikingly similar in colour to that of a fox's coat.

The deciding argument, however, for applying the name *C. vulpina* L. to the eastern plant appears to be Art. 52 of the International Rules of Botanical Nomenclature, ed. 3, 1935: "When a species is divided into one or more species, etc." Although Hudson (1762) and other western botanists applied the name to the western plant they did not suspect that it involved another species. Eastern botanists, however, such as Haussknecht, did recognize that the name *C. vulpina* was being applied to two distinct species, and restricted it to the eastern plant, calling the other *C. nemorosa*.

AMBIGUOUS ELM NAMES.—

II. ULMUS MINOR MILL.

By R. MELVILLE, Ph.D., F.L.S.

THE first reference to *Ulmus minor* Miller is in vol. 2 of Miller's 'Gardeners' Dictionary,' published in 1739. In this volume Miller includes three elms that were not described in the first edition of the 'Dictionary.' The first of these is described as follows:—

"*Ulmus minor folio angusto glabro*. The smooth narrow-leaved elm, by some called the upright narrow-leaved elm."

Later in the text the following additional information is given:

"The first of these sorts is very common in some parts of Hertfordshire and in Cambridgeshire where there is scarce any other sort of elm to be seen. This makes a very handsome upright tree and retains its leaves as late in the autumn as the common small-leaved elm, which is called the English Elm by the nurserymen near London."

The "English Elm" referred to here is *U. sativa* Mill.

In the sixth edition of the 'Dictionary' the elms of vol. 2 (1739) are included after the nine sorts described in ed. i. No. 1 of vol. 2 becomes no. 10 of ed. vi., the only other change being the addition of the phrase:

"but it doth not come out so early,"

extending the comparison already made with *U. sativa*.

Further changes are made in ed. vii. (1759); nos. 6 to 9 of ed. i. are omitted and no. 10 of ed. vi. becomes no. 6. The diagnosis is altered to read:—

"6. *Ulmus foliis oblongo-ovatis glabris acuminatis duplicato serratis*." "This is the *U. minor*.... The smooth narrow-leaved elm...."

The wording of the text is also changed:—

"The sixth sort is found growing in hedge-rows in several parts of England. The branches of this sort have a smooth greyish bark and grow erect. The leaves are narrow and more pointed than those of the English Elm and are smoother; they are later in coming out in the spring than those, but continue longer in the autumn; this has been by some called the Irish Elm."

The reference to the English Elm is again to *U. sativa* Mill.

In the eighth edition of the 'Dictionary' (1768), from which the binomial *U. minor* dates, the only change made was the addition of the specific epithet "(minor)" after "6. *Ulmus*."

There is very little of diagnostic value in Miller's description of *U. minor*. It is at first said to be common in parts of Hertfordshire and Cambridgeshire, but later "in several parts of England." Certain hybrid elms growing in Hertfordshire would fit the description of an upright tree with erect greyish branches and narrow pointed leaves. These, however, are segregates common in particular localities, but with a limited range. Several authors have taken *U. minor* to be *U. Plotii* Druce, but the typical form of this species does not extend into Hertfordshire and Miller did not mention the pendulous branches so characteristic of *U. Plotii*. The statement that some call it the Irish Elm is confusing and probably mere hearsay. An Irish origin for *U. minor* is not consistent with the other information in the 'Dictionary.' With

these points in mind, the use of the name *U. minor* by botanists since Miller's time may now be examined.

Hunter in Evelyn's 'Sylva' (1786) merely repeated Miller's diagnosis. After this, *U. minor* appears to have been ignored by British botanists until 1868; in the interval the following make no mention of it: Smith in Sowerby and Smith, 'English Botany' (1808), and 'English Flora' (1824); Lindley, 'Synopsis British Flora' (1829); W. J. Hooker, 'British Flora' (1830); C. C. Babington, 'Manual of British Botany' (1843); W. J. Hooker and G. A. W. Arnott, 'British Flora' (1860). Reichenbach adopted the name in his 'Icon. Fl. German.' (1850), and gave an illustration of a continental elm that appears to represent an elm different from any of the British forms. His synonymy indicates that he had adopted a very broad interpretation of *U. minor*, since it included *U. campestris* E. B. 1886 (= *U. diversifolia* Melville) and *U. tortuosa* Host. Syme's edition of Sowerby and Smith's 'English Botany' (ed. 3, 1868) included *U. minor* as a synonym of *U. suberosa* α *genuina* which by reference to Engl. Bot. t. 1886 (1808) is *U. diversifolia* Melville (see Melville in Journ. Bot. lxxvii. 138 (1939)).

Modern British interpretations begin with Ley (Journ. Bot. xlviii. 70 (1910)) who gives *U. minor* as a synonym of his *U. glabra* Mill. var. *minor*. A specimen of this in Herb. Druce at Oxford, collected by Ley, appears to be a hybrid of *U. Plotii* Druce with *U. carpinifolia* Gled. (*U. nitens* Moench., *U. glabra* Mill.). Another specimen in the same herbarium collected by Ley and labelled "*U. glabra* Mill." is a narrow-leaved segregate of *U. Plotii* $\times$ *U. glabra* Huds. Probably Ley would have included *U. Plotii* and various small-leaved hybrids of it in his *U. glabra* var. *minor*.

Druce held the opinion that *U. minor* was the Cornish Elm, *U. stricta* Lindl., basing his opinion (Rep. Bot. Exch. Club, 1911, 31 (1912)) mainly on the habit as described by Miller in ed. viii. of the 'Dictionary' and probably overlooking the additional information given in other editions. The extent of Druce's confusion on this question is evident from his reply to A. B. Jackson's criticism of his identification of *U. minor* with *U. stricta* (Rep. Bot. Exch. Club, 1930, 294 (1931)). Jackson had pointed out the fallacy of Druce's view, since *U. stricta* is not found in the counties of Hertford and Cambridge except occasionally as a planted tree. In spite of this, Druce held his ground and used *U. minor* for the Cornish Elm in his 'Comital Flora' (1932). He had previously used it in his 'List of British Plants,' ed. 2 (1928).

In 1912, Moss in criticising Druce's newly described elm, *U. Plotii*, put forward another interpretation of *U. minor* (Gard. Chron. li. 234 (1912)). Apparently he assumed from the similarity of the phrase names that Miller had taken his *U. minor* from Plot's 'Natural History of Oxfordshire' (1677) without

acknowledging the author. It is true that the figure illustrating Plot's account of his elm suggests *U. viminalis* Lodd. as Moss pointed out, but Druce had based his identification of *U. Plotii* with the elm described by Plot on specimens collected by Plot now in the Herb. Dubois at Oxford and in the Sloane Collection in Herb. Mus. Brit. At the same time Moss (*loc. cit.* p. 216, and Cambridge Brit. Fl. 1914) used *U. sativa* Mill. to embrace *U. Plotii* Druce and certain other small-leaved elms.

While Moss took up *U. sativa* for the group of small-leaved elms centred around *U. Plotii*, Henry (Elwes and Henry, 'Trees and Shrubs of Great Britain and Ireland,' 1913) adopted *U. minor* for the same group. There is no doubt of this, as both Moss and Henry cite Druce's material and photographs, while Henry cites *U. sativa* Moss non Mill. as a synonym of *U. minor*.

Later authors using *U. minor* Mill. sec. Henry for this group of elms include Gilbert Carter, 'Catkin-bearing Plants' (1930); and Gilmour and Stearn, Journ. Bot. (1932), Suppl. 20. Butcher in Butcher and Strudwick, 'Further Illustrations of British Plants,' uses *U. minor* Mill. and illustrates *U. Plotii* Druce. Bancroft (Journ. Bot. lxxvi. 342 (1937)) also uses *U. minor* Mill. to include *U. Plotii*, *U. minor folio angusto scabro*, Goodyer (= *U. stricta* var. *Goodyeri* Melville in Journ. Bot. lxxvi. 115 (1938)) and various other elms from E. Anglia, S. Wales, Europe, and W. Asia. Gilmour and Stearn in their synonymy include *U. sativa* Mill., *U. campestris* Sowerby and Smith, Engl. Bot. t. 1886 (= *U. diversifolia*) and all the other forms named above.

There is no specimen of *U. minor* in Miller's herbarium in Herb. Mus. Brit., so that the name is a *nomen dubium*. There are, however, a number of specimens in the Sloane Collection that give some indication of the manner in which *U. minor* was interpreted in Miller's day. Sir Hans Sloane's identifications are shown by his annotations of his copy of Ray's 'Historia Stirpium,' which refers to Goodyer's *U. minor folio angusto scabro*, and not the form Miller later identified with it. The following are mentioned, the first number referring to the volume and the second the page:—

- 83, 121 (1) A small leaved epicormic shoot or sucker—indeterminable.
- (5) Part of an adult shoot. A hybrid of *U. glabra* Huds. with some small-leaved elm.
- 98, 167. A sucker or epicormic shoot with rough, narrow leaves, sharply serrated—indeterminable.
- 126, 38 (verso) (2) from Maldon, Essex. A shoot with normal leaves bluntly serrate, small, narrow, with subcordate base, bearing strong proleptic shoots with very narrow rough leaves. One of the small-leaved Essex elms related to *U. Plotii*.

- 126, 39 (4) Collected near Christchurch. A sucker or epicormic shoot, which from the shape of the narrow rough leaves and locality may be *U. stricta* var. *Goodyeri*. (Herb. Buddle.)
- 152, 259 (3 a & 3 b) Suckers or epicormic shoots—indeterminable, but two different elms.
- 168, 358 A sucker or epicormic shoot with narrow rough leaves—indeterminable. (Herb. Plukenet.)

Identifications of these were written on the pages by A. B. Jackson and A. J. Wilmott in 1927 as follows:—83, 121 (1 & 5); 152, 259; 168, 358, all "*U. sativa* (Moss)" with qualification "possibly" or "may be"; 98, 167; 126, 39, "possibly" or "may be *U. viminalis*"; 126, 38, "Cornish Elm."

One striking conclusion can be drawn from these old specimens, that early botanists used *U. minor* mainly for suckers or epicormic shoots, as six of the eight specimens are such shoots. Although such material is at present indeterminable, I have no doubt that several distinct elms are represented. Of the other two, one is a hybrid of *U. glabra* Huds. and the other a local small-leaved Essex race. It is evident therefore that there has never been any uniformity in the application of the name *U. minor* from the earliest times.

From the foregoing it is obvious that there is great confusion in the application of the name *U. minor* Mill. It is therefore proposed that the name *U. minor* should be rejected as a permanent source of confusion and error under Art. 62 of the International Rules of Botanical Nomenclature and be listed as a *nomen ambiguum*, on the following grounds: 1. Early botanists used the name for suckers and epicormic shoots of various elms. 2. Miller's description is indefinite and no type-specimen exists. 3. Later botanists have used the name for a number of elms, the seven most important being 1. *U. diversifolia* Melville, 2. as a variety of *U. glabra* Mill. (*U. carpinifolia* Gled.), 3. *U. stricta* Lindl., 4. *U. viminalis* Lodd., 5. *U. Plotii* Druce, 6. *U. sativa* Mill., 7. *U. stricta* var. *Goodyeri* Melville.

ARCTIC PLANTS IN THE BRITISH ISLES: ENUMERATION OF THE SPECIES AND VARIETIES.

BY NICHOLAS POLUNIN,

Herbarium, Department of Botany, Oxford University.

VERY recently in 'Nature' (cxliv. pp. 352-4, August 26, 1939) I published an account and analysis of the sixty-two species or geographical varieties of vascular plants in the native British flora which are now known to persist north of the 75th parallel

of latitude and hence to be truly arctic in their affinities. These plants were classified according to their most characteristic habitat in Britain, which is almost always comparable, if not identical, with that occupied in the Far North. But whereas the resulting groups were outlined and the numbers of their component species and varieties given, it was impossible to include the names and other details of the individual plants. These are now given below, the arrangement within each group being according to Druce's 'Comital Flora.' The nomenclature is, however, brought up to date and into line with my forthcoming 'Botany of the Canadian Eastern Arctic.—Part I. Pteridophyta and Spermatophyta'*, although sufficient synonyms are included to allow direct reference to Druce's work. The figures immediately following the plant names give some idea of the distribution of the various entities in the British Isles, since they represent the number of vice-counties in Great Britain and Ireland (in the latter case preceded by H=Hibernia) within which the plant concerned is now known to be native. All doubtful records have been ignored.

1. PLANTS OF OPEN SOIL OR ROCK CREVICES.—Competition generally negligible whether conditions are predominantly dry or damp.

(a) Of general arctic distribution including high latitudes (c. 80° N.).

Silene acaulis—23, H5.

Cerastium alpinum s.l.—20.

Arenaria rubella—5.

Sagina intermedia Fenzl (*S. nivalis* (Lindbl.) Fries);

S. caespitosa of recent British authors, not (J. Vahl) Lange—1.

Dryas octopetala—18, H10.

Saxifraga aizoides—33, H6.

S. oppositifolia—35, H7.

S. caespitosa L. (*S. groenlandica* L.)—5, H2.

S. cernua—1.

S. rivularis—4.

S. nivalis—16, H1.

S. Hirculus †—9, H6.

Polygonum viviparum †—35, H4.

Oxyria digyna—31, H8.

* In connection with this work it is desired here to publish the following new combinations: *Salix arctica* Pall. var. *kophophylla* (Schneider) comb. nov. (*Salix anglicorum* Cham. var. *kophophylla* Schneider in Bot. Gaz. lxvi. 130 (1918)); *Saxifraga nivalis* L. f. *labradorica* (Fernald) comb. nov. (*Saxifraga nivalis* L. var. *labradorica* Fernald in 'Rhodora,' xix. 142 (1917)).

† Frequently to be found in closed communities.

Juncus triglumis s.l.—25.

J. biglumis—4.

Carex Bigelowii Torr. ex Schwein. (*C. rigida* Good. ;
C. concolor of authors, not R.Br.)—38, H15.

C. bipartita All. (*C. Lachenalii* Schk. ; *C. lagopina*
Wahlenb.)—4.

C. rupestris—6.

Alopecurus alpinus—7.

Poa glauca—12.

Equisetum arvense—112, H40.

E. variegatum—33, H17.

Cystopteris fragilis (" *Filix-fragilis* ")—90, H34.

Lycopodium Selago *—89, H40.

25

(b) Of fairly wide arctic distribution (e. g. ; N. Greenland
and Ellesmere, or Spitsbergen and Novaya
Zemlya).

Arenaria uliginosa—1.

Sedum roseum—44, H18.

Salix herbacea—37, H17.

Juncus castaneus—9.

Kobresia simpliciuscula (Wahlenb.) Mackenzie *
(*K. bipartita* of authors, not (All.) Dalla Torre ;
K. caricina Willd.)—6.

Carex saxatilis—14.

C. capillaris *—18.

C. atrofusca—1.

Deschampsia alpina—17, H3.

Poa alpina—16, H2.

Woodsia alpina—6.

11

Total=36

(c) Extending far north only in Spitsbergen—tempered
by Gulf Stream.

Arabis alpina—1.

Potentilla Crantzii—20.

Salix reticulata—5.

Luzula arcuata (Wahlenb.) Sw. (*Juncoides arcuatum*
"(Sw.)" Druce)—6.

4

Total=40

* Frequently to be found in closed communities.

2. PLANTS OF SEASHORE AND LAKE MARGINS.—Community open,
competition again at a minimum.

Ranunculus trichophyllus var. *eradicatus*—rare on
mountains. To 76° 30' N. in W. Greenland.

Cochlearia groenlandica L. (*C. scotica* Druce)—
17, H5. General arctic distribution.

Arenaria peplodes—81, H24. Fairly wide arctic
distribution.

Hippuris vulgaris—89, H40. To 76° 49' N. in
E. Greenland.

Mertensia maritima (L.) S. F. Gray (*Pneumaria*
maritima (L.) Hill)—33, H8. Fairly wide arctic
distribution as reduction phase.

Carex aquatilis (including var. *stans*)—30, H13.
General arctic distribution.

C. maritima Gunn. (*C. incurva* Lightf.)—17.
General arctic distribution.

7

Total=47

3. PLANTS CHARACTERISTIC OF OTHER HABITATS, but frequently
found in open areas in both the North and South.

Caltha palustris—112, H40. Wet places to 76° N.
in Novaya Zemlya.

Astragalus alpinus—3. "Meadows" to 76° N. in
Novaya Zemlya.

Senecio palustris—8. Marshes, etc., to 75° 36' N.
in Siberia.

Campanula rotundifolia—111, H31. "Meadows,"
polymorphic, of fairly wide arctic distribution.

Myosotis alpestris—2. Very frequently in open,
to 76° N. in Novaya Zemlya.

Bartsia alpina—6. "Meadows" to 76° N. in
W. Greenland.

Poa pratensis s.l.—112, H40. Ubiquitous, poly-
morphic, of general arctic distribution.

Festuca rubra—112, H40. "Meadows", poly-
morphic, of fairly wide arctic distribution.

8

Total=55

4. MARSH OR "HEATH" PLANTS.

Rubus Chamaemorus—42, H2. W. Spitsbergen
only.

Vaccinium uliginosum L. var. *alpinum* Bigel.

(subsp. *microphyllum* Lange)—rare on mountains.
General arctic distribution.

Betula nana—14. Fairly wide arctic distribution.

Empetrum nigrum L. var. *hermaphroditum* (Lange) Soerensen (*Empetrum hermaphroditum* ("hermaphroditicum") Hagerup)—2 or more. Fairly wide arctic distribution.

Tofieldia palustris—18. W. Spitsbergen only.

Eriophorum angustifolium—112, H40. General arctic distribution.

Calamagrostis neglecta (including var. *borealis*)—5, H4. W. Spitsbergen only.

7

Total=62

The more important conclusions to be drawn from the above statistics are as follows: an overwhelming majority of the sixty-two * native British vascular plants which reach high latitudes grow chiefly in the absence of competition—both towards their northern limit where the vegetation is generally open, and towards their southern limit where under natural conditions it is almost always closed. No fewer than forty-seven (75.8 per cent.) are plants predominantly of open soil (or rock crevices, which are ecologically similar in that competition is generally lacking), another eight being frequently found in such situations both in the north and in the south (total 88.7 per cent.).

It may accordingly be said that truly arctic vascular plants are usually perennial dwarfs which can propagate vegetatively or flower and ripen seed in the short cool summer obtaining north of 75°, and can endure cold and rapid changes in water-relationships, but are unable to withstand competition. They flourish in the Far North, where the communities are generally open; to the south they rather naturally persist chiefly where conditions prevent the growth of ranker dominants, and where the growing season is not too long and warm for their normal metabolism. Thus in the British Isles the majority are rare alpine or rock crevices or other "open" habitats. It is without doubt only the post-Pleistocene persistence of such habitats in Britain which has allowed the survival (or perhaps in some instances recent introduction) of so considerable an arctic element in the British flora.

* This is an addition of five (which just qualify) to my previous analysis (see Proc. Linn. Soc., Session 151, pp. 131-2 (1939)).

OBITUARY.

REV. DR. THOMAS SIMCOX LEA, D.D.

THE Rev. T. S. Lea was the eldest son of the Rev. F. S. Lea of Tedstone Delamere, Hereford, and was born 21 April, 1857. He went to Haileybury School in 1869, where I first met him, to Hertford College, Oxford, 1877; he rowed in the College boat and was champion swimmer 1881. He was ordained in 1881, but went for his health to Australia in 1884, where he collected plants in Sydney, Adelaide, Port Darwin, Port Augusta, and other localities. His collections are in the Department of Botany, British Museum, and contained a number of new species described later in the *Journal of Botany*. After visiting New Zealand he went to Hawaii, where he collected plants, and then to the United States. On hearing that I was making an expedition to Fernando de Noronha, Brazil, in 1887, he came down to Pernambuco and joined me at his own expense. His energy and skill in collecting and preserving botanical, zoological, and mineralogical specimens in the island and mainland of Pernambuco added very greatly to the success of the expedition. He returned to England with me (1887) and took up his clerical duties again, first as Vicar of Widnes, and after taking other livings retired to Exmouth, Devon, where he resided till his death on 2 August, 1939. He published various articles on the expedition to Brazil in local papers and the Geographical Society's Journal, and "Notes on the Botany of Widnes," Trans. Liverpool Soc. xiv. 295, "Seaweeds at Exmouth," Devon Assoc. Adv. Sci. lix. 248 (1927), and an 'Introduction to the Herbarium of Kidderminster Museum.'

His name is associated with *Guetarda Leai* Ridl., a tree discovered by him in Fernando de Noronha, and *Phyllanthus Leai* sp. Moore, an Australian species.—H. W. RIDLEY.

BOOK-NOTES, NEWS, ETC.

THE 'Palestine Journal of Botany,' Rehwoot Series, vol. ii. no. 1, contains three interesting biographical notes by J. Reichert. The first is an obituary notice of Otto Warburg (1859-1938), the author of the well-known 'Die Pflanzenwelt.' A student of de Bary and Pfeffer, he became interested in botanical exploration and was soon recognised as one of the foremost authorities on the phytogeography of the tropics. Later he devoted himself to the problems of the agricultural development of the German colonies. He became interested in Zionism, and from 1911 to 1920 was President of the Zionist organization. "In 1917 the German Minister of Foreign Affairs published a declaration in support of Zionism, promising, in the event of

German victory, the opening of the gates of Palestine to the Jews for development and settlement there." At the end of the War a new President was elected, and Warburg was excluded, like other German Jews, from political influence, but he was invited by J. Volcani to collaborate with him in the foundation of an Agriculture Research Station in Palestine. He interested himself also in the taxonomy of Palestine plants.

The second notice is of Richard Falck ("to his 65th birthday"). Falck has a world-wide reputation for his researches on *Merulius lacrymans* and other fungi associated with the rotting of timber. Falck's beginning as a mycologist is worth mention. He was sent for his military service to Breslau, where Oscar Brefeld was Professor of Botany. He asked permission of Brefeld to work in his laboratory. Brefeld later made him his assistant, and, being blind in one eye and having overstrained the other, relied on him for the detailed examination of the Smut fungi with which he was then working. Falck became Professor of Technical Mycology at the College of Forestry, Hannoversch-Muenden, and was dismissed in 1933. In 1936 he was invited to Poland.

The remaining notice is of Jacob Joseph Taubenhaus (1884-1937). It relates a strange history of a poor lad who left Palestine at the age of 16, was passionately devoted to agriculture, and made his name in American Phytopathology, but who for thirty-seven years was unable to interrupt his work to take holiday sufficient to visit his native land.

In July last Mr. C. Broome forwarded a specimen of the giant puff-ball, *Lycoperdon giganteum*, measuring 32" x 30" (circumference). It was found at his house in Streatham, London, on a concrete bottom fifteen inches below the floor-boards, in a fairly dry position, though the house is built on clay. The discovery of the fungus in such a position naturally at first gave rise to a certain amount of concern, such as that recorded by Mr. A. D. Cotton (Journ. Ecol. xvi. 182 (1928)), where workmen, finding several specimens under the floor-boards at a house in Kew "mistook them at first for a series of human skulls." Mr. Broome informs me that he did not notice any mycelial cords; it is therefore probable that the mycelium passed through cracks in the concrete.—J. R.

DEPARTMENT OF BOTANY.—In order to lessen, so far as possible, the risk of damage from hostile aircraft, the whole of the types, the Sloane Herbarium, and certain other historical collections, original drawings, manuscripts, and valuable books have been moved. The material is stored in such a way that it can be consulted if necessary—every precaution has been taken for its proper conservation.

It has been thought best to pack and move all specimens on loan to the Department.—J. RAMSBOTTOM.

STUDIES OF BRITISH POTAMOGETONS.—VIII.

By J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

VIII. *POTAMOGETON GRIFFITHII* AND *P. MACVICARII*.

POTAMOGETON GRIFFITHII A. Benn. was originally described and figured in Journ. Bot. xxi. 65-66, t. 235 (1883) from specimens collected by J. E. Griffith in Llyn Anafon, Carnarvon, an isolated tarn situated in the valley of the Afon Anafon some three miles south-east of Aber. In A. Bennett's judgment the plant represented a distinct species, and although other authorities subsequently declared it to be a hybrid he remained firm in his opinion to the end of his days. The existence of these divergent views concerning the plant invites an inquiry into its systematic position: is *P. Griffithii*, as its author thought, an "isolation species" confined to a small lake in North Wales, or is it a hybrid? Or, as a third possibility suggested by the case of *P. Drucei**, is it referable to a species well known outside Britain?

The type-specimens of *P. Griffithii* were obtained on three visits paid to Llyn Anafon by Griffith in 1882. From Bennett's original account in the *Journal of Botany* we learn that when he received the first specimens he was strongly inclined to refer them to "*P. longifolius* Bab." (= $\times$ *P. Zizii* †), but on receipt of a supply of material in the fresh state and with floating leaves he was forced to reject this idea and later thought that the plant might possibly be a hybrid between *P. praelongus* and *P. rufescens* (= *P. alpinus*), though he was "a decided opponent of referring every uncertain plant to a hybrid origin". Griffith, however, had specially searched Llyn Anafon for either of these species without success, and so Bennett described *P. Griffithii* as a species. "It is difficult to believe", he wrote, "in a plant being wholly confined to a single Welsh lake, and the alteration that may take place by isolation should be well considered, especially after the evidence Mr. F. Day has brought together from the zoological point, *i. e.*, among the British *Salmonidæ*." Subsequently, in 1885, Bennett (in Bot. Exch. Club Brit. Is. Rep. 1884, 114) stated that he had had *P. Griffithii* growing with *P. praelongus* and *P. alpinus* for three years, and had assured himself that Griffith's plant was not *P. praelongus*. He hoped to succeed in getting his living specimens to fruit that year, but though he grew them for a few more years without achieving this result ‡ he did not revise his opinion that *P. Griffithii* represented a species.

* *P. Drucei*, like *P. Griffithii*, has been regarded as a plant endemic to Britain; but, as we pointed out in the fourth of these notes (pp. 56-62 *supra*), it cannot be distinguished from the widely distributed *P. nodosus*.

† See the sixth of these notes, pp. 161-164 above.

‡ A series of cultivated specimens preserved in his herbarium (now at the British Museum) shows that the plant flowered but did not produce fruit.

In 1897 Ascherson and Graebner (Synopsis. Mitteleur. Fl. i. 317) treated *P. Griffithii* as a hybrid of *P. alpinus* and *P. praelongus*. They pointed out that it is intermediate in its characters between these two species (resembling *P. praelongus* in habit but very much recalling *P. alpinus* in the form of the leaves), and added that the abortiveness of the pollen and fruit make its hybrid origin even more probable. Bennett, however, in Journ. Bot. xli. 166 (1903) said that he could not accept this conclusion, his opinion being based on long cultivation of the plants side by side.

Fryer in 'Potamogetons of the British Isles', pp. 34-36 (1898), was non-committal about *P. Griffithii*. He remarked that because the plant seemed unable to produce ripe fruit it had been, somewhat hastily, assumed to be a hybrid, and that on such evidence as existed he did not subscribe to that opinion but inclined to think that it might be, if not a distinct species, an extreme state of *P. alpinus*. In the next paragraph, however, he stated that many points in the life-history of the plant seemed to make his opinion almost untenable, and he concluded his account with the observation that "we must leave the determination of its true character to some enterprising botanist who may gather fresh roots to be tested by cultivation". Six years later the opinion was attributed to Fryer by H. and J. Groves (in Babington's 'Manual of British Botany', Ed. 9, p. 437) that *P. Griffithii* was a hybrid of which *P. polygonifolius* was one of the parents ("*P. polygonifolius* × — ?"). This opinion was repeated in the tenth edition of the 'Manual' (1922) and in other works, but Fryer himself does not seem to have published it.

Graebner in 'Das Pflanzenreich', vol. iv. 11 (1907), p. 74, placed *P. Griffithii* in his subsection *Alpini*. He regarded it as a plant of doubtful origin, although on p. 133, in his enumeration of hybrids, he added that it was probably *P. alpinus* × *praelongus*.

In Hagström's 'Critical Researches' (1916), p. 149, *P. Griffithii* was reduced to × *P. nerviger* Wulf. (which he considered to be *P. alpinus* × *praelongus*) with the statement that "The English specimens are also evidently this hybrid, but the stem-anatomy comes much nearer to *P. praelongus* than it does in the preceding [i. e., typical × *P. nerviger* from Lithuania]". Later in the same account Hagström said that the hybrid origin of *P. Griffithii* "is beyond all doubt and may nowadays be disputed in earnest by nobody". Nevertheless Bennett ventured to do so in a review of Hagström's work in Journ. Bot. lvii. 15-16 (1919). Laying stress on the isolated situation of Llyn Anafon, and stating that *P. praelongus* was not known from Carnarvon while *P. alpinus* grew "only in one spot, thirty miles away", he maintained that *P. Griffithii* was "a case of isolation exactly similar to that of *Salmo nigropinnis* (the black-finned trout), which also occurs in

these isolated Welsh Lakes"*. He drew attention again to the fact that he had had *P. Griffithii* growing for many years along with *P. alpinus* and *P. praelongus*; and he added, incidentally, that Fryer had suggested that it might be "a *perfoliatus*, *polygonifolius*, or *praelongus* hybrid". Bennett did not accept the reduction of *P. Griffithii* to × *P. nerviger*, and later said so very emphatically in Bot. Soc. & Exch. Club Brit. Is. viii. 36 (1927), where he once more asserted his view of the Welsh plant.

Druce in Bot. Soc. & Exch. Club Brit. Is. viii. 639-640 (1929) stated that he had twice visited Llyn Anafon but failed to find any other species than *P. oblongus* (= *P. polygonifolius*). At his request A. Wilson had also investigated the lake, in Aug. 1928, and found only *P. Griffithii* and *P. polygonifolius*†. Wilson had further informed him that there was a prospect of the lake being dammed and converted into a reservoir with the consequent disappearance of most, if not all, of the interesting vegetation‡.

Pearsall in his 'Notes on Potamogeton' (in Bot. Soc. & Exch. Club Brit. Is. ix. 402 (1931)) accepted Hagström's reduction of *P. Griffithii* to × *P. nerviger* and agreed that the evidence for hybridity was conclusive. He considered that the plant was probably vestigial—both parents having disappeared—and declared that Bennett's contention that it was an "isolation species" would not bear examination, as the easy and rapid transport of aquatic plants by birds rendered isolation impossible.

Having examined numerous specimens of *P. Griffithii*, some collected in Llyn Anafon and others cultivated by Bennett and Fryer, we are in full agreement with Ascherson and Graebner, Hagström, and Pearsall that the plant is a hybrid between *P. alpinus* and *P. praelongus*. It combines so perfectly the characters of those two species § that we can form no other opinion

* It may be mentioned as a point of interest that in C. Tate Regan's 'Freshwater Fishes of the British Isles' (1911), p. 55, *S. nigripinnis* is treated merely as a form of the common trout, *S. trutta*.

† We have seen examples of *P. polygonifolius* from Llyn Anafon; also specimens of *P. natans*, collected by C. Bailey in 1884, E. F. Cooper in 1890, and C. P. Hurst in 1908.

‡ At our request Mr. N. Woodhead visited Llyn Anafon in July this year, but was prevented by adverse weather conditions from reaching the station of *P. Griffithii*. He was able to inform us, however, that the water-level of the lake was raised several feet by the construction of a dam at least eight years ago.

§ The "Leaf-bearing Stipules" (i. e., stipular sheaths adnate to juvenile leaves) observed in *P. Griffithii* by Fryer and described by him in Journ. Bot. xxvi. 57-58 (1888) are represented by homologous structures in both *P. alpinus* and *P. praelongus*, as well as in other large-leaved species of Potamogeton. Fryer (loc. cit.) stated that a plant of *P. Griffithii* which he was growing produced several vigorous stems from the stolons and on each "the lowest stipule was closely clasping, and furnished on its back with a narrow linear-spathulate coriaceous leaf". His herbarium material shows that the degree of adnation varies and the example which he figured in 'Potamogetons of the British Isles', t. 23 fig. 1, represents an extreme condition. In the same work (t. 20 figs. 1-2) he figured similar sheaths at the base of young growths of *P. alpinus*.

of its origin, especially as it appears unable to produce fruit. Certainly neither of the parent species has been recorded from Llyn Anafon, and *P. praelongus* has not even been reported from Carnarvon, but both are found in other parts of North Wales, and if they do not now occur in Llyn Anafon there is no reason why they should not formerly have done so, the water being of suitable depth as pointed out by Pearsall (*loc. cit.*).

Although we agree with Hagström in his view of the hybrid origin and parentage of *P. Griffithii*, we cannot accept his reduction of it to $\times P. nerviger$. We have examined some of Wolfgang's original specimens of the latter plant, and as it has acute leaves we hold that it cannot possibly be a hybrid between *P. alpinus* and *P. praelongus*, both of which have the leaves obtuse or rounded (and often more or less cucullate) at the apex. In our opinion $\times P. nerviger$ is a hybrid between *P. alpinus* and *P. lucens*, as suggested by G. Fischer in *Ber. Bayer. Bot. Ges.* xi. 46 (1907). For the Welsh plant, therefore, regarding it as *P. alpinus* $\times$ *P. praelongus*, we retain the name $\times P. Griffithii$.

P. Macvicarii A. Benn. was described as a new hybrid by Bennett in *Ann. Scot. Nat. Hist.* 1907, 106–108 (1907) from material collected by S. M. Macvicar in two hill lochs in Westernness. One of these, Lochan na Creige Duibhe, in Ardnamurchan, occupies a depression in deep peat and is drained by the Allt Eas an Tailleur flowing into Kentra Bay; the other, Loch Dow*, lies a few miles northward in Moidart. Bennett's account was based primarily on the material from Lochan na Creige Duibhe, which was collected in Aug. 1897 and sent by Macvicar under the name *P. praelongus*. Macvicar in a letter referred to it as "a long narrow-leaved *P. praelongus* from Ardnamurchan", adding that it was the longest-leaved form he had seen; he remarked also that "The only other *Potamogetons* in the loch which could be seen were *P. natans* and *P. polygonifolius*, but of course there may be others". Being unable to match the plant with *P. praelongus*, and influenced by the fact that specimens of *P. polygonifolius* from the same region had submersed elongate leaves very like some of its young growths, Bennett treated it as a hybrid of *P. praelongus* and *P. polygonifolius*.

Probably on account of the comparative inaccessibility of the recorded stations, *P. Macvicarii* was entirely neglected by collectors until further material was obtained by G. Taylor from Lochan na Creige Duibhe in June 1932†, and, furthermore, it appears that during the same period (1907–1932) no fresh study was made of the existing herbarium specimens. Where the plant was mentioned in literature Bennett's formula of *P. praelongus* $\times$ *P. polygonifolius* was accepted without comment, as in Graebner's monograph in 'Das Pflanzenreich', vol. iv. 11

* This, we suspect, is the same as An Dubh-lochan, on Smearisary Hill.

† On this occasion no other *Potamogeton* could be seen in the water, which was deep and peat-stained.

(1907), p. 139, and in the index to Hagström's 'Critical Researches' (1916), p. 272. Neither of these foreign authorities had any material at hand for examination. Pearsall in his 'Notes on *Potamogeton*' (in *Bot. Soc. & Exch. Club Brit. Is.* ix. 387 (1931)) also included *P. Macvicarii* without expressing any critical opinion, but in 1932 the receipt of Taylor's specimens from Lochan na Creige Duibhe stimulated his interest and led him to examine Macvicar's original examples in the British Museum Herbarium. The results of his examination were published in *Journ. Bot.* lxxi. 45–47 (1933), and in them Bennett's interpretation of Macvicar's material was challenged for the first time. Pearsall decided that the plant was referable to *P. alpinus*. He enumerated the reasons which led him to such a conclusion, and while it is unnecessary for us to deal with all the points mentioned we must give particular notice to two of his remarks. "For leaves of this length and L/B ratio", he wrote, "only two species can be admitted—*praelongus* and *alpinus*"; also: "Only *praelongus* and *alpinus*—among species—have their two principal lateral veins following the leaf-margin in a parallel curve at the blunt apex and very suddenly turning inward to form an 'arch' with the midrib (which often does not quite reach the actual tip)." Pearsall thus was specially considering *P. praelongus* and *P. alpinus* in relation to *P. Macvicarii*; yet the idea seems to have escaped him that the last-named plant might be a combination of these very species. We are convinced that *P. Macvicarii* is such a hybrid, *i. e.*, that it is referable to $\times P. Griffithii$. In fact the specimens agree exactly with corresponding states of the Llyn Anafon plant, and it is satisfactory to know that, whatever its fate in the classical locality, $\times P. Griffithii$ is to be found elsewhere in Britain. It is strange that Bennett, who had described and so carefully studied $\times P. Griffithii$, should have failed to perceive that *P. Macvicarii* is the same plant; and that while he so firmly maintained that the former was an "isolation species" and denied its hybrid origin, he should have treated *P. Macvicarii* as a hybrid with the improbable parentage *P. praelongus* $\times$ *P. polygonifolius*. Equally remarkable is Pearsall's reduction of *P. Macvicarii* to *P. alpinus*, especially when account is taken of his knowledge of $\times P. Griffithii$ and of his emphatic statements published in 1931 (see above) in which he was at such great pains to refute Bennett's opinion of that plant.

$\times P. Griffithii$, including *P. Macvicarii*, is therefore known from three small hill lakes—one in Carnarvon, and two not far apart in Westernness. As already mentioned, neither of the parent species, *P. alpinus* or *P. praelongus*, has been found in Llyn Anafon, though they both occur in other parts of North Wales. Nor, apparently, has either of them been reported from Lochan na Creige Duibhe or Loch Dow, but they are both known from lochs in the vicinity: we have seen material of *P. alpinus* from

Loch na Draipe, and specimens of *P. praelongus* from Loch Bealach na Gaoithe and Loch na Bairness, all collected by Macvicar himself. We have no evidence that $\times P. Griffithii$ occurs outside Britain.

Following is the synonymy of $\times P. Griffithii$, with references to the literature and a summary of the known distribution.

P. ALPINUS $\times$ *PRÆLONGUS*==

$\times P. GRIFFITHII$ A. Benn. in Journ. Bot. xxi. 65, t. 235 (1883); *op. cit.* lvii. 15 (1919); in Bot. Exch. Club Brit. Is. Rep. 1884, 114 (1885); *op. cit.* viii. 36 (1927); in Watson Bot. Exch. Club Ann. Rep. 2, 8 (1886).—Hook. f. Stud. Fl. Brit. Is., Ed. 3, 433 (1884).—Webster in Trans. Bot. Soc. Edin. xvii. 31 (1887).—Fryer in Journ. Bot. xxvi. 57 (1888); in Fryer & Benn. Pot. Brit. Is. 34, tt. 22–23 (1898).—J. E. Griff. in Bot. Exch. Club Brit. Is. Rep. 1887, 192 (1888); in Watson Bot. Exch. Club Ann. Rep. 4, 13 (1888); Fl. Anglesey & Carnarvon. 140 (1895).—H. & J. Groves in Bab. Man. Brit. Bot., Ed. 9, 437 (1904); *op. cit.*, Ed. 10, 437 (1922).—Graebn. in Engler, Pflanzenr. iv. 11, 74 (1907).—Pearsall in Bot. Soc. & Exch. Club Brit. Is. v. 707 (1920).—Druce in Bot. Soc. & Exch. Club Brit. Is. viii. 639 (1929); Comit. Fl. 313 (1932).—A. Wils. in Bot. Soc. & Exch. Club Brit. Is. viii. 928 (1929).

P. alpinus $\times$ *praelongus* Aschers. & Graebn. Synops. Mitteleur. Fl. i. 317 (1897).—A. Benn. in Journ. Bot. xli. 166 (1903).—Graebn. in Engler, Pflanzenr. iv. 11, 133 (1907).

P. Macvicarii A. Benn. in Ann. Scot. Nat. Hist. 1907, 106 (1907).—Druce in Bot. Exch. Club Brit. Is. ii. 259 (1908).—Pearsall in Bot. Soc. & Exch. Club Brit. Is. ix. 387 (1931); in Journ. Bot. lxxi. 45 (1933).

P. polygonifolius $\times$ *praelongus* Graebn. in Engler, Pflanzenr. iv. 11, 139 (1907).

P. nerviger (non Wulf.) Hagstr. Crit. Res. 149 (1916) pro parte, quoad pl. angl.—Pearsall in Bot. Soc. & Exch. Club Brit. Is. ix. 402 (1931).

Vice-county Distribution:—

(49) CARNARVON. Llyn Anafon, Aber.

(97) WESTERNNESS. Loch Dow, Moidart. Lochan na Creige Duibhe, Ardnamurchan.

In conclusion, it may be mentioned that another British plant has been regarded as a possible hybrid of *P. alpinus* and *P. praelongus*. This was originally collected by Miss C. E. Palmer in the Basingstoke Canal at Odiham, North Hants, in June 1880, and was referred to *P. alpinus* $\times$ *praelongus*? by Bennett in Journ. Bot. xlv. 175 (1907). Later it was named *P. Palmeri* and *P. alpinus* var. *Palmeri* by Druce. We have seen numerous specimens from the locality, and consider that there is no justification whatsoever for regarding the plant as a hybrid: it is *P. alpinus* pure and simple.

FERN NOTES.—II.

By A. H. G. ALSTON, M.A., F.L.S.

THE AFRICAN SPECIES OF *BOLBITIS*.

The species of *Bolbitis* are often extremely variable, and the same species may have either simple or pinnate fronds. In *B. auriculata*, for example, the fronds may be either simple or pinnate. The form with simple fronds has been described as a distinct species by Baker. A fine series of specimens recently sent on loan from Coimbra University to the British Museum (Natural History) has, however, shown that it is only a juvenile state of *B. auriculatus*. M. Georges Le Testu has also kindly loaned specimens of the two species described by the late Prince Roland Bonaparte. I wish to acknowledge my indebtedness both to M. Le Testu and to the authorities at Coimbra for their assistance.

To clear up the differences between the various species a key and list of synonyms is given.

I have been unable to find the type of *B. Rawsoni* (Bak.) Ching at Kew.

Terminal pinnae lobed, or fronds simple:

Fronds bipinnatifid 4. *B. bipinnatifida*.

Fronds pinnate or simple:

Gemmæ present, borne at apex of frond:

Fronds always simple 1. *B. gaboonensis*.

Fronds pinnate:

Fertile pinnae completely covered by sporangia 2. *B. Laurentii*.

Central portion of fertile pinnules without sporangia 3. *B. Boivini*.

Gemmæ wanting (or rarely axillary):

Fronds simple or pinnate 5. *B. fluviatilis*.

Fronds pinnate:

Lateral veins rather prominent 6. *B. auriculata*.

Lateral veins not prominent, pinna narrower than in *B. auriculata* 7. *B. Heudelotii*.

Terminal pinnae not lobed:

Gemmæ borne at base of terminal pinna 8. *B. gemmifera*.

Gemmæ borne at apex of terminal pinna (or wanting):

Lateral veins prominent 9. *B. acrostichoides*.

Lateral veins not prominent 10. *B. salicina*.

1. *B. GABOONENSIS* (Hook.) Alston in Journ. Bot. lxxii. Suppl. p. 3 (1934). *Acrostichum gaboonense* Hook. Sp. Fil. v. 270 (1864); Sadeb. in Jahrb. Handb. Wiss. Anstalt. xiv. Beih. 3, 18 (1897). *Leptochilus gaboonensis* (Hook.) C. Chr. Ind. Fil. 385 (1905). *Campium gaboonense* (Hook.) Copel. in Phil. Journ. Sc. xxxvii. 401, f. 51 (1928).

CAMEROONS: *Staudt* 449 (BM); *Bipinde*, *Zenker* 2456 (BM), 3806 (BM).

GABON: Gaboon R., *G. Mann* 1049 (type, K).

BELGIAN CONGO : *Vanderyst* 4643 (BM), 4645 (BM); *Christen Smith* (BM).

ANGOLA : Belize, *Gossweiler* 7647 (BM). *Cungulungulo*, Golungo Alto, *Welwitsch* 155 (BM).

2. *B. Laurentii* (Christ) Alston, comb. nov. *Acrostichum Laurentii* Christ in Bull. Soc. Belg. xxxvi. 2, p. 94 (1897); De Wild. & Durand in Ann. Mus. Congo, i. 33, t. 17 (1898). *Leptochilus Laurentii* (Christ) C. Chr. Ind. Fil. 386 (1905). *Chrysodium Boivini* Mett. ex Kuhn, Fil. Afr. p. 51 (1868), p.p.

BELGIAN CONGO : Lurambo, *Laurent* (ex De Wild.); Bamanga (Lualaba), *Laurent* (ex De Wild.).

ANGOLA : in umbrosis editis sylvarum montis *Cungulungulo*—*rarius* in montibus de Queta, *Welwitsch* 156 (BM).

3. *B. Boivini* (Mett.) Ching in C. Chr. Ind. Suppl. iii. 47 (1934), excl. syn. *L. Laurentii*. *Chrysodium Boivini* Mett. ex Kuhn, Fil. Afr. p. 51 (1868), p.p. *Acrostichum Humblotii* Bak. in Journ. Bot. xxii. 144 (1884). *Leptochilus Humblotii* (Bak.) C. Chr. Ind. Fil. 385 (1906). *Campium Humblotii* (Bak.) Copel. in Phil. Journ. Sc. xxxvii. 333 (1928).

COMORO ISLANDS : Mayotte, *Boivin* (type).

MADAGASCAR : *Humblot* 300 (K); Be Kilus Mts., *Last* (BM).

Boivin's specimen is at Vienna, but I have seen a sketch at Berlin, which is sufficient to show that was the same as *Acrostichum Humblotii* Bak.

4. *B. BIPINNATIFIDA* (Mett.) Ching in C. Chr. Ind. Suppl. iii. 47 (1934). *Chrysodium bipinnatifidum* Mett. ex Kuhn, Fil. Afr. p. 50 (1868). *Campium bipinnatifidum* (Mett.) Copel. op. cit. p. 377, f. 30.

SEYCHELLES : Mahé, *Rawson* (BM).

Also reported from Réunion by Kuhn.

5. *B. FLUVIATILIS* (Hook.) Ching in C. Chr. Suppl. iii. 48 (1934). *Acrostichum fluviatile* Hook. Sp. Fil. v. 274 (1864). *Campium fluviatile* (Hook.) Copel. op. cit. p. 399, t. 32. *Acrostichum phanerodictyon* Bak. in Bol. Soc. Brot. iv. 156, t. 2, f. e (1886). *Leptochilus grossidentatus* Bonap. Notes Ptérid. xiv. 217 (1923).

GOLD COAST : *Burton & Cameron* (K).

CAMEROONS : Bipinde, *Zenker* 4119 (BM); between Njoke and Malende, *Schlechter* 12874 (BM).

FERNANDO PO : *Mann* 442 (K).

GABON : Djengila, *Le Testu* 1570 (Hb. Le Testu).

S. TOMÉ : Angolares, *Quintas* Fl. Afr. 68 (BM).

PRINCIPE : *Curror* (K), *Barter* 1897 (K).

6. *BOLBITIS AURICULATA* (Lamk.) Alston in Journ. Bot. lxxii. Suppl. 1, p. 3 (1934). *Acrostichum auriculatum* Lamk. Encycl. i.

36 (1783). *A. mascarense* Spreng. Syst. iv. 37 (1827). *A. Labrusca* Christ in Ann. Mus. Congo, ser. 5, i. 10 (1903).

SIERRA LEONE : Kalu Yeyie, forest near Pendembu, *Dawe* 534 (K).

NIGERIA : Okomu Forest Reserve, Benin Prov., *Richards* 3316 (BM); Shasha Forest Reserve, Ijebu Prov., *Richards* 3393 (BM), 3242 (BM).

BRITISH CAMEROONS : Victoria, *Kalbreder* 24 (BM).

CAMEROONS : Batanga, *Bates* 369 (BM); Bipinde, *Zenker* 4044 (BM); Yaunde, *Zenker & Staudt* 294 (BM), 627 (BM).

FERNANDO PO : *Mann* (BM).

S. TOMÉ : Monte Café, *Welwitsch* 58 (BM); *Moller* Fl. Afr. 66 (BM); Drogo Vaz, *Quintas* (BM).

BELGIAN CONGO : Lukolola, *Laurent* (Brussels).

PORTUGUESE CONGO : Buco Zan, Maiombe, *Gossweiler* 6591 (BM); Nkanda Mbaku, *Gossweiler* 9037 (BM).

ANGOLA : Quilombo Quiacatabia, Golungo Alto, *Welwitsch* 153 (BM).

UGANDA : Mabira Forest, *Miss Longfield* 13 (BM); Bugongo Forest, *Sangster* 87 (BM), 192 (BM); Ruwenzori, *Scott Elliot* 7096 (BM); Buwe R., Bunyoro, *Sangster* 292 (BM).

COMORO ISLANDS : Johanna, *Hildebrandt* 1803 (BM).

MADAGASCAR : Be Kilus Mts., *Last* (BM).

BOURBON : *Commerson* (BM).

MAURITIUS : *Commerson* (BM); *Sieber* 24 (BM); *Bojer* (BM); Pl. Wilhems, *Rawson* (BM); Grand River, *Rawson* (BM).

One of the specimens at the British Museum bears the note "Dum recens odorem spargens anisatum."

7. *BOLBITIS HEUDELOTII* (Bory) Alston in Journ. Bot. lxxii. Suppl. p. 3 (1934). *Gymnopteris Heudelotii* Bory ex Fée, Acrost. p. 84, t. 45 (1845). *Campium angustifolium* Copel. op. cit. p. 396, t. 31.

SENEGAMBIA : *Heudelot* 805 (K).

SIERRA LEONE : *Purdie* (BM), *Don* (BM); between Regent and Bathurst, *Johnston* (BM).

GOLD COAST : Boëm, *Mischlich* (BM).

NIGERIA : *Preuss* 363 (BM); Buea, *Mildbread* 9404 (K).

CAMEROONS : Yaunde, *Zenker* 530 (BM), *Zenker & Staudt* 81 (BM); Sanaga, *Zenker* 1467 (BM).

BELGIAN CONGO : Mayumbe, *Flamigni* 7 (BM).

PORTUGUESE CONGO : R. Lufo, *Gossweiler* 7965 (BM).

PORTUGUESE EAST AFRICA : near Mbane Village, Manjanga County, 3000 ft., *Kirk* (K); Majila, 1000 ft., in stream, *Kirk*; Kurumadzi, R. Jihu, 2000 ft., *Swynnerton* 834 (BM); Myamkuwha R., Mafusi, 3000ft., *Swynnerton* 833 (BM).

8. *BOLBITIS GEMMIFERA* (Hieron.) C. Chr. Ind. Suppl. iii. 48 (1934). *Leptochilus gemmifera* Hieron. in Engl. Bot. Jahrb.

xlvi. 345 (1911). *Acrostichum punctatum* var. *angolense* Carruth. in Cat. Afr. Pl. Welw. ii. 2, 277 (1901). *Campium gemmiferum* Copel., *op. cit.* p. 397, f. 48.

BELGIAN CONGO : *Louis* 589 (BM).

ANGOLA : *Cungulungulo*, *Golungo Alto*, *Welwitsch* 157 (BM).

UGANDA : *Mabira Forest*, *Miss Longfield* 16 (BM) ; *Kipayo*, 4000 ft., *Dummer* 698 (BM).

TANGANYIKA : *Niomkolo*, *Carson* (K). *Usambara*, *Peter* 16901 (BM).

9. BOLBITIS ACROSTICHOIDES (Afz.) Ching in C. Chr. Ind. Suppl. iii. 47 (1934). *Hemionitis acrostichoides* Afz. ex Sw. in Schrad. Journ. 1800, 2, 17 (1801). *Leptochilus longiflagellatus* Bonap. Notes Ptérid. iv. 68 (1917). *Campium longiflagellatum* (Bonap.) C. Chr. Cat. Pl. Mad. Ptérid. p. 32 (1932).

SENEGAL : *Heudelot* 702 (K) (date 1848).

FRENCH GUINEA : *Isles de Los*, *Belcher* (BM).

SIERRA LEONE : *Afzelius* (BM), *Don* (BM) ; *Nichol Brook*, near *Freetown*, *Johnston* (BM).

NIGERIA : *Mt. Patti*, *W. R. Elliott* 31 (K) ; *Mapanza*, *Kalbreyer* 160 (BM).

OUBANGUI : *Poste de la Nana*, *Chevalier* 6253 (K).

CAMEROONS : *Bipinde*, *Zenker* 4120 (BM).

FERNANDO PO : *Barter* (K).

BELGIAN CONGO : *Kisantu*, *Vanderyst* 30593 bis (BM).

ANGOLA : *Cabundo Valley*, *Pungo Andongo*, *Welwitsch* 154 (BM) ; *R. Luachino*, *Dundu*, *Young* 547 (BM).

SUDAN : *Nabambisso*, *Schweinfurth* 3043 (BM) ; *Gubbihi*, *Schweinfurth* 2235 (BM) ; *Laboni forest*, *Imatong Mts.*, *Thomas* 1742 (BM).

UGANDA : *Budongo Forest*, *Bunyoro*, *Sangster* 190 (BM).

MADAGASCAR : *Be Kilus Mts.*, *Last* (BM).

10. BOLBITIS SALICINA (Hook.) Ching in C. Chr. Ind. Fil. Suppl. iii. 50 (1934). *Acrostichum salicinum* Hook. Sp. Fil. v. 265 (1864). *Leptochilus diversibasis* Bonap. Notes Ptérid. xiv. 216 (1924).

SIERRA LEONE : *Barter* (K).

LIBERIA : *Gola Forest*, *Bunting* (BM).

NIGERIA : *Oban*, *Talbot* (BM).

FERNANDO PO : *Mann* 133 (K).

GABON : *Miodunga*, *Le Testu* 1589 (Hb. Le Testu).

BELGIAN CONGO : *Matamfu*, near *Kipako*, *Vanderyst* 31409 (BM).

POLYPODIUM LANCIFOLIUM Alston.

Mr. F. Ballard has kindly drawn my attention to the fact that this name is preoccupied by a species described by the late Capt. C. R. W. K. van Alderwerelt van Rosenburgh. I

therefore substitute the name *Polypodium aichmophyllum*, nom. nov., a Greek epithet having the same significance as the Latin one.

Arthropteris cameroonensis Alston, nom. nov. *Nephrodium punctulatum* Bak. Syn. Fil. p. 261 (1867), non Desv. (1827).

This appears to me to be a distinct species, confined to a small area in W. Africa. The pinnules are less deeply cut than in *A. orientalis* and *A. monocarpa*.

NOTES ON SOME SPECIES OF THE GENUS TECTARIA IN TROPICAL AFRICA.

The species of *Tectaria* are rather large ferns, and consequently often inadequately collected. The rhizomes appear to be of special value for distinguishing the species.

Tectaria Buchholzii (Kuhn) Copel. appears to me to be more properly referred to *Dryopteris*, near *D. securidiformis* (Hook.) C. Chr., and *Aspidium Thonningii* Schum. is *Arthropteris orientalis* (Gmel.) Posth. The type-specimen of *Aspidium aquapimense* Schum. appears to have been lost, but from the description it seems to be a species of *Dryopteris*.

1. TECTARIA VARIANS (Moore) C. Chr. Ind. Fil. Suppl. 3, 186 (1934), p.p. *Dictyopteris varians* Moore in Gard. Chron. 1863, p. 1108. *Aspidium varians* (Moore) C. Chr. Ind. Fil. 96 (1934), p.p. *Polypodium sparsiflorum* Hook. Sp. Fil. v. 92 (1864). *Aspidium sparsiflorum* (Hook.) Diels, Nat. Pfl. i. 4, 185 (1899). *Tectaria sparsiflora* (Hook.) Alston in Journ. Bot. lxxii. Suppl. p. 3 (1934).

NIGERIA : *Old Calabar*, *Mann* 213 (BM) ; *Oban*, *Talbot* (BM) ; *Mamfe*, *Rosevear* (BM).

CAMEROONS : *Rudatis* 87 (BM) ; *Bipinde*, *Zenker* 2570 (BM).

SPANISH GUINEA : *Sierra del Crystal*, *Mann* 1634 (K).

ANGOLA : *Maiombe*, near village *Caio*, *Gossweiler* 7724 (BM). *T. varians* was misinterpreted by Christensen.

2. TECTARIA BARTERI (J. Sm.) C. Chr. Ind. Fil. Suppl. iii. 177 (1934). *Aspidium Barteri* J. Sm. Ferns Brit. & For. p. 286 (1866). *Nephrodium Barteri* (J. Sm.) Bak. Syn. Fil. p. 299 (1867). *Dryopteris Barteri* (J. Sm.) O. Ktze. Rev. Gen. Pl. ii. 812 (1891).

NIGERIA : *Victoria*, *Mann* 23 (BM) ; *Barombi*, *Preuss* 358 (BM) ; *Johann-Albrechtshöhe*, *Staudt* 447 (BM) ; *Mamfe*, 800 ft., in rain forest, *Rosevear* (BM).

FERNANDO PO : *Mann* (BM, type).

3. TECTARIA ANGELICIFOLIA (Schum.) Copel. in Phil. Journ. Sci. Bot. ii. 410 (1907). *Polypodium angelicaefolium* Schum. in Vid. Selsk. Afh. iv. 228 (1829). *Aspidium angelicifolium* (Schum.)

C. Chr. Ind. Fil. 64 (1905). *A. gaboonense* Kuhn, Fil. Afr. p. 133 (1868), nomen nudum. *Tectaria gaboonensis* (Kuhn) C. Chr. Ind. Fil. Suppl. iii. p. 179 (1934).

This species can readily be distinguished from *T. macrodonta* (Fée) C. Chr. and its allies by its creeping rhizome.

4. *Tectaria camerooniana* (Hook.) Alston, comb. nov. *Polypodium cameroonianum* Hook. Spec. Fil. v. 104 (1864). *Aspidium varians* C. Chr. Ind. Fil. p. 96 (1905), excl. syn. Moore non Mett.

NIGERIA: Cameroon Mt., 3000 ft., Mann 1362 (type K); Johann-Albrechtshöhe, Staudt 448 (K).

S. TOMÉ: *Moller Fl. Afr.* 44 (BM); *Exell* 293 (BM), 294 (BM).

5. *Tectaria puberula* (Desv.) C. Chr. in Dansk Bot. Ark. vii. 67 (1932). *Aspidium puberulum* Desv. Prodr. p. 245 (1827), non Gaudich.

ZANZIBAR: Utume, *Vaughan* 2148 (BM).

PEMBA: Mile 5, road from Chake to Weti, *Vaughan* 2058 (BM).

Previously recorded from the Comoro Islands and Madagascar.

6. *Tectaria gemmifera* (Fée) Alston, comb. nov. *Sagenia gemmifera* Fée, Gen. p. 313 (1850-2). *T. coadunata* var. *gemmifera* (Fée) C. Chr. in Dansk Bot. Ark. vii. 67 (1932).

This common African fern appears to me to be quite different from the Asiatic *T. macrodonta* (Fée) C. Chr., which has pubescent, non-gemmiferous fronds.

NEW GUINEA FERNS.

I have recently worked out a number of collections from New Guinea. As the war may eventually prevent completion of this work, it is considered advisable to publish certain new names which have been written on sheets.

Acrophorus loxoscaphoides (Bak.) Alston, comb. nov. *Polypodium loxoscaphoides* Bak. in Journ. Bot. xxviii. 107 (1890). *Dryopteris loxoscaphoides* (Bak.) C. Chr. Ind. Fil. 276 (1908). *Leucostegia loxoscaphoides* (Bak.) C. Chr. Ind. Fil. Suppl. iii. 120 (1934).

The type is an exceedingly poor specimen, but this appears to be the correct disposition of it. Christensen suggests that *Dryopteris subdigitata* Brause is the same.

Arthropteris Webbiana (Hook.) Alston, comb. nov. *Nephrodium Webbiana* Hook. Spec. Fil. iv. 85 (1862). *Arthropteris dolichopoda* v. A. v. R. in Nova Guinea, xiv. 5 (1924). *A. Kingii* Copel. in Phil. Journ. Sc. Bot. vi. 80 (1911). *Polypodium Wollastonii* Ridl. in Trans. Linn. Soc., Bot. ix. 262 (1916).

This species was originally described from Amboina, and should be kept distinct from the African *A. orientalis* (Gmel.) Posth.

Asplenium ludens Bak. var. *dareoides* (Ros.) Alston, comb. nov. *A. multilineatum* Hook. var. *dareoides* Ros. in Fedde Repert. x. 326 (1912). *A. remotum* Moore var. *dareoides* (Ros.) Hieron. in Engl. Bot. Jahrb. lvi. 146 (1920).

A. remotum Moore is a Polynesian species which does not occur in New Guinea. *A. ludens* Bak. was originally described from the Solomon Islands.

Dennstaedtia novoguineensis (Ros.) Alston, comb. nov. *D. Smithii* var. *novoguineensis* Ros. in Fedde Repert. x. 323 (1912).

This appears to be a good species, though belonging to a critical group. It is at once distinguished from *D. Smithii* by its spiny rachis.

Dennstaedtia delicata (F. Muell.) Alston, comb. nov. *Dicksonia delicata* F. Muell. Descr. Pap. Pl. iv. 77 (1876). *Dennstaedtia penicillifera* v. A. v. R. in Bull. Jard. Bot. Buit. ser. 2, no. 28, 17, t. 1 (1918). *Hypolepis grandifrons* Gepp in Gibbs, Dutch N.W. N. Guinea, 195 (1917).

F. Mueller's name appears to be the oldest for this species. There is an authentic specimen at Kew.

Ithycaulon cicutarioides (Bak.) Alston, comb. nov. *Davallia cicutarioides* Bak. in Journ. Bot. xxviii. 106 (1890). *Davallia Forbesii* Carruthers ex Gepp in Journ. Bot. lxi. Suppl. p. 59 (1923). *Saccoloma caudatum* Copel. in Phil. Journ. Sci. xxx. 327 (1926). *Ithycaulon caudatum* Copel. in Univ. Calif. Publ. Bot. xvi. 80 (1929).

Here again the type is scarcely recognisable, but appears to come here.

Ithycaulon novae-guineae (Ros.) Alston, comb. nov. *Davallia novae guineae* Ros. in Fedde Repert v. p. 36 (1908). *Leptolepia novae guineae* (Ros.) v. A. v. R., Malayan Ferns, p. 283 (1909). *Oenotrichia novae guineae* (Ros.) Copel. Univ. Calif. Publ. Bot. xvi. p. 82 (1929). *Dennstaedtia acuminata* Ros. in Hedwigia, lvi. p. 350 (1915). *Ithycaulon acuminatum* (Ros.) Copel. in Univ. Calif. Publ. Bot. xii. p. 395 (1931).

I have the types of both Rosenstock's species and compared them with good modern material collected by Mrs. Clemens.

Loxogramme subselliginea (Bak.) Alston, comb. nov. *Polypodium subselligineum* Bak. in Journ. Bot. xxviii. 107 (1890). *Loxogramme parallela* Copel. in Perkins, Fragm. Phil. Bot. 182 (1905). *Polypodium parallelum* (Copel.) C. Chr. Ind. Fil. p. 551 (1906).

Backer and Posthumus ('Varenflora voor Java') claim that *L. malayana* Copel. is also conspecific.

Lycopodium Archboldianum (Nessel) Alston, comb. nov.
Urostachys Archboldianus Nessel in Fedde Repert. xxxix. 61 (1935).

Lycopodium Brassii (Nessel) Alston, comb. nov. *Urostachys Brassii* Nessel, l. c. p. 62.

I have preferred to retain the genus *Lycopodium* in a broad sense.

Plagiogyria papuana (Brause) Alston, comb. nov. *Blechnum papuanum* Brause in Engl. Bot. Jahrb. lvi. p. 158 (1920).

Tectaria christovalensis (C. Chr.) Alston, comb. nov. *Polypodium christovalense* C. Chr. Ind. Fil. 328 (1905). *Gymnogramme palmata* Bak. Syn. Fil. p. 389 (1868), non *T. palmata* (Mett.) O. Ktze. *Aspidium quinquefoliolatum* C. Chr. Ind. Fil. Suppl. p. 9 (1913). *Tectaria diversisora* Copel. in Phil. Journ. Sc. xxx. 328 (1926). *Aspidium pentaphyllum* v. A. v. R. in Bull. Dept. Agr. Ind. Néerl. xviii. 16 (1908). *Campylogramma pteridiformis* v. A. v. R. in Bull. Jard. Bot. Buit. ser. 2, no. 24, 1 (1917); Nova Guinea, xiv. 10, t. 1, f. A (1924).

SOLOMON ISLANDS: S. Christoval, woods near Merkeria Harbour, not infrequent, Milne (K).

LOUISIADES: St. Aignan Island, MacGregor 107 (BM).

NEW GUINEA: Copland King 470 (Hb. Copeland); van Leeuwen 11354 (L); Treub (ex v. A. v. R.); Mamberano, Thomson 651 (L); Lam 703 (L).

Aspidium pentaphyllum has been reduced on the basis of Posthumus's identification of van Leeuwen's specimen.

REDUCTION OF THE ANDRŒCIUM IN *PLANTAGO LANCEOLATA* L.

BY J. F. HOPE-SIMPSON.

OBSERVATIONS made on a hundred plants of *Plantago lanceolata* grown in culture under uniform conditions have provided certain information about the incidence of reduced stamens in this species. The plants were collected at random from two small areas of chalk grassland in Berkshire—forty from Inkpen Beacon and sixty near Wantage. Of the hundred plants, twenty-six had stamens in some way different from the normal. These differences could be arranged in a series (not entirely linear) grading from the normal form to the virtual absence of stamens.

Types of Abnormal Stamen.

Forms scarcely differing from the normal have anthers which are slightly narrower, distinctly yellow-green instead of just tinged with yellow at maturity, and containing plentiful pollen.

With reduction in the size of the anthers, there is an increase in their greenish colour, a decrease of normal pollen, and the filaments are progressively shorter. In more extreme examples, in which the stamens scarcely project from the corolla, the filament is not distinct from the anther, but merges into it.

Still more reduced types have the stamen represented by a mere strip of greenish tissue retained within the flower. This vestige takes various forms, even in flowers of the same inflorescence. In one spike examined, the position of the stamens in most of the lower flowers is occupied by irregular-shaped elongated processes of the same length as the narrow corolla segments. In a flower nearer the apex of the same inflorescence there arise from the corolla tube eight processes, of two kinds, which do not alternate regularly; four are somewhat fleshy and branched, and four are narrow and simple. In another plant the "andrœcium" consists of small, thin, brownish white scales, attached in some flowers to the inside of the corolla tube, in others to its rim among the corolla segments, which are irregular in size and number (five in one of the few flowers dissected) and not always clearly distinguishable from the stamen vestiges.

One plant among those grown in culture has large anthers which are never exerted nor dehiscent; they are full of pollen of which about 30 per cent. of the grains are normal and the rest small and empty. The corolla segments of this plant remain closed together instead of diverging in the normal manner, and are probably the cause of the stamens failing to emerge, since the filaments elongate fully, and in so doing become curved in a hoop form.

Variation in Stamens on the same Plant.

The type of stamen on one plant is not necessarily uniform. Besides the variation in the very reduced forms already quoted, eight of the twenty-six abnormal plants were observed to have some more or less normal flowers as well as the reduced ones. During the first summer in cultivation five of these eight plants have altered through the season, the direction in four of them being at first towards a higher proportion of normal, or more normal, flowers. Knuth (1909), who gives early references to reduced stamens in *P. lanceolata*, quotes Ludwig as finding change through the season to be in the opposite direction. Actually the condition in these variable plants appears to fluctuate to and fro, since the changes observed earlier in the summer have not entirely been maintained.

Reduction of Stamens in Relation to Locality.

A distinctly higher proportion of plants with anthers more or less reduced is shown by the collection of plants from one locality than by that from the other. Of forty plants from near

the top of Inkpen Beacon, Berks, four (10 per cent.) show reduction of male fertility to some extent. Among sixty plants from an area of downland near Wantage the number is twenty-two (37 per cent.). This difference may be a matter solely of local distribution, or it may be connected with ecological factors. The variation of the plants in relation to the habitats where they were collected will be dealt with in a later publication.

More or less reduced forms similar to those described above appear to be very common, at any rate in Oxfordshire and Berkshire. Turrill (1919), Watson (1921, 1936, 1937), and Rilstone (1935) have given descriptions of forms which appear to correspond closely with some, but by no means all, of the reduced forms among the plants from the Berkshire Downs.

Inheritance of Reduced Stamens.

Pollination tests on six normal plants showed self-sterility. In each test two spikes on the same plant, at suitable stages, were bagged together, and a third was bagged with a spike from another plant. The crossed spikes produced abundant seed, the selfed ones, none. If this condition were also true of the "*anthoviridis*" plant used as a parent in Dr. Watson's experiment (1937), the seedlings which he obtained would have resulted from unsuspected crossing, in which case the high proportion of offspring with reduced stamens appears to point to the condition being dominant. Self-sterility may, however, not be universal.

Correlation with Other Characters.

The occurrence of a reduced andræcium may be correlated with other characters in *Plantago lanceolata*. Records of these have been made and will later be worked out more fully. Meanwhile reference may be made to three characters, although the observations may have no exact genetical significance, since the various stamen forms may not all be due to the same gene.

The reduced-stamen plants appear to be rather late in the start of flowering. 35 per cent. of the normal plants were at anthesis on May 8th, 1939, while only 15 per cent. of the abnormal ones had reached this stage (both figures calculated omitting six plants whose stamens were so reduced in size that they may have been overlooked).

In the five plants with the most reduced stamens the corolla lobes remain more or less converged. In three of these they are small, and when the fruit ripens it projects from the corolla instead of being sheathed by the tube as in normal flowers.

Leaf-shape, as expressed by measurements of breadth and length, reveals no clear correlation with reduction of stamens. The ratio, length of longest leaf: width of widest leaf on the plant, has a mean of 11.3 for seventy-four normal plants and

12.3 for twenty-four plants with reduced stamens. This difference is insignificant in view of the great range of leaf-shape in *Plantago lanceolata*.

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 WATSON, W. Journ. Bot. lix. 355 (1921); lxxiv. 22 (1936); lxxv. 231 (1937).

NOTES ON THE FLORA OF ANGOLA.—V.

By A. W. EXELL, M.A., F.L.S.

Triumfetta Hundtii Exell & Mendonça, sp. nov. (Tiliaceae). *Herba* perennis, 50 cm. alta, caulibus erectis stellato-setosopilosis et stellato-tomentosis, ramulis in axillis bractearum foliacearum nonnunquam bifidarum vel trifidarum, 12–18 × 4–7 mm., ortis. *Folia* petiolata, petiolo 3–4 mm. longo dense stellato-setoso-piloso, stipulis lanceolatis, 10 × 2 mm., stellato-pilosulis, lamina ovato-lanceolata apice acuta margine serrata basi rotundata, ad 3.5 × 2 cm., supra dense stellato-setoso-pilosula scabrida subtus stellato-tomentosa. *Flores* breviter pedicellati, pedicello ad 4 mm. longo, bracteolis filiformibus 4 mm. longis, in paniculas flavido-stellato-tomentosas dispositi. *Sepala* oblonga apice cucullata breviter cornuta, 12 × 4 mm., extus flavido-stellato-tomentosa intus glabra. *Petala* obovata unguiculata, 9–10 × 4.5 mm. unguicula pilosula excepta glabra. *Stamina* numerosa filamentis 7–9 mm. longis glabris. *Ovarium* pilosum stylo 8–9 mm. longo glabro. *Fructus* ignotus.

BENGUELA: between Ganda and Caconda, alt. 1700 m., *Hundt* 246 (Typus in Herb. Berol.).

"Bis 50 cm.; Blüte gelb."

This species is nearest to *T. iomalla* K. Schum. (ex descript.) from Mussumba (Belgian Congo), but differs in having much larger flowers, the sepals being 12 mm. long instead of 7 mm. in *T. iomalla* and the petals 9–10 mm. long instead of 6 mm.

REVIEWS.

The Vegetation of Craven in Wharfedale, with its Adjacencies in Aire and Ribble. By F. ARNOLD LEES, edited by A. A. DALLMAN. Pp. 111. T. Buncle & Co. Ltd.: Arbroath, 1939. (Reprinted from the 'North Western Naturalist,' xii.–xiv.: 1937–9.) Price 5s. net.

THE author, having published his well-known 'Flora of West Yorkshire' in 1888, actually completed a work on 'The Vegetation of Yorkshire' in 1911, but was unable to arrange for its publication. JOURNAL OF BOTANY.—VOL. 77. [OCTOBER, 1939.] Y

cation. He later condensed much information from it into the present work, the MS. of which, after his death in 1921, was deposited in the Leeds Reference Library. It has now been published with only slight editing. The result is a booklet full of interesting notes on all kinds of matters connected with the plants of Yorkshire. One may or may not agree with this or that view, expressed in the author's sometimes rather florid but vivid and individualistic language—he likes the unusual word and is quite prepared to coin new ones,—but the freedom and freshness of expression are a pleasure in these days when it seems to be considered that scientific publications should have all the life cut out of them. Although I should not subscribe to the view that environment may be the cause of the differences in any *Cochlearias*, the description of the occurrence of *C. alpina* as "By Spring's spiriting rillets on the fell slopes, and grown grosser by the river in places" takes me back to the open country where I have seen it, better than more prosaic language would do.

There seems no particular point in criticising the work as one would a new county flora, for this booklet almost belongs to an age now past. Modern genetics and cytology have sometimes destroyed the author's view-point: modern nomenclature has no room for names suggested for "a . . . growth" of *Myosotis sylvatica* which "I think merits a formal name, say, *alpicola*, or better, *rupi-fallax*," and modern study may have reduced the author's views on, e. g., marsh orchids, to historical interest only, but nevertheless we have an account of the plants of the area useful to visitors to that very interesting part of England, full of intriguing notes to be read when the day's outing is done. A considerable number of these notes are concerned with "the real old rustic names" which "are passing into the Silence with their users, others of modern invention with Board School appreciation of new likenesses taking their place. Ruskin remarks somewhere in one of his discursive parentheses that 'Brook-lime' is applied in Derbyshire to a 'Water-cress with serrate leaves' (as a botanist he was never accurate) which must have been the node-flowered ditch umbellifer; while Orpine is another name, originally applied to a golden stonecrop, and later in Early English tomes, 'perversely' as Prior says, where ignorantly might be the truer adverb, to the purple 'Live-Long,' . . . a term I never knew to be applied to it in country folk-speech." With this illustration of the author's style, the work is left to the reader.

A. J. WILMOTT.

Flora of Devon. Edited by Rev. W. K. MARTIN and G. T. FRASER. Svo, pp. xv & 787, with 2 maps and 8 plates. Buncle & Co.: Arbroath, 1939. Price 25s.

IN July last this long-expected work was published, and we now possess a modern Flora of a county which has always boasted

its floral wealth. The preparation of this Flora has occupied many years and has passed through various vicissitudes. Its initiation was mainly due to the late W. P. Hiern, of Barnstaple, who up till his death in 1925 was amassing a large herbarium of Devon plants with this object in view. In 1930 the Botanical Section of the Devon Association carried the project a stage further, and nominated for the editorship of the proposed Flora the late Miss C. E. Larter, who for some years previously had been collaborating with Mr. Hiern. The work, however, progressed but slowly, and after Miss Larter's death in 1936 an Editorial Committee was appointed with the Rev. W. Keble Martin as Editor-in-Chief. An appeal for subscriptions was issued in 1937.

Almost from the beginning the compilation of the Flora was shared among a number of local botanists, and after Mr. G. T. Fraser became second editor the work was more energetically prosecuted, and all of the difficult genera were passed for revision to the experts whose names fill page xi. The Flora therefore differs widely from earlier similar works, which (except the new 'Flora of Sussex') have each been the production of a single individual. And it has correspondingly benefited from the wealth of expert knowledge utilised.

A perusal of the body of the book shows that the county has been thoroughly explored, and the records are unusually complete. But the reader who expects by its help to collect without difficulty the rarities he desires will often be doomed to disappointment. A wise discretion in this respect is generally observed, sometimes with a little paternal admonition, and a unique system of recording by parishes, often with no further details, will add zest to the collector's hunt. Parish names such as Doddiscombsleigh, Thorverton, and Heanton Punchardon will test the topographical knowledge of the average visitor. This method of parish records, which seems to have arisen from Hiern's system of labelling his specimens and would doubtlessly commend itself to the clerical mind of the senior editor, is an innovation in works of this kind. A large proportion of the records give simply the parish name without any authority, and these are perhaps the offerings of the "other contributors," whose names occupy pages 55-59 and have been omitted elsewhere from considerations of space. Numerous miscellaneous notes, rarely trivial and often of much interest, are interspersed through the text, and this main part of the work, as an account of the distribution of the plants of the county, will bear comparison with any that has preceded it. It is perhaps regrettable that the times of flowering are omitted throughout.

A salient feature of the Flora is its up-to-date nomenclature, for which the authorities at Kew and the Natural History Museum are offered special thanks in the preface. A few generic names, such as *Carara* for *Coronopus*, are observed for the first time in British botany. *Ruppia maritima* L. is now applied to *R. rostell-*

lata Koch, and not to *R. spiralis* as in the recent 'Flora of Sussex' and earlier works. It is noticed that the original spelling of *Euphorbia hyberna* is restored in the body of the work but not in the introduction, and the variety *tenuifolius* of *Lathyrus montanus* is erroneously cited as of Druce.

The introduction seems scarcely worthy of the main work. The geology and topography, giving an account of the districts into which the county is divided for the purposes of the Flora, are well done, and the ecological studies of selected regions are of interest, but no detailed analysis of the flora, nor any comparison with that of the adjacent counties, is attempted. The brief summary, giving 1226 species (exclusive of aliens) for Devon, as well as the biographical notices of deceased botanists who have worked in the county, are unfortunately placed at the end of the volume. The summary shows 1226 native or naturalised species and 390 aliens, and it is noteworthy, particularly in view of the greater present-day segregation of species, that the former total does not greatly exceed the corresponding figure in Davey's 'Flora of Cornwall' (1118) or Murray's 'Flora of Somerset' (1073). The new 'Flora of Sussex' shows 1413 admitted species with an addition of 245 aliens: some of the plants treated here as naturalised, however, are counted as aliens for Devon. It is questionable whether, in the interests of space, many of the 390 aliens, recent garden outcasts or the efflorescence of municipal dust-heaps and factory dumps, would not have been better placed in a separate category as in the Sussex Flora, where they are compressed within eight pages.

The botanical map furnished is scarcely adequate. It shows clearly the outlines of the very numerous parishes but hardly any other topographical features, and can be collated none too readily even with the 1" Ordnance Maps, where parish names are not printed. The frontispiece, a view of Slapton Ley, is attractive, and Mr. Martin's two plates of county specialities are pleasing, but the other illustrations seem of little value. A view across Braunton Burrows with tufts of *Scirpus Holoschoenus* in the foreground, a rocky bit of the East Lyn with a group of *Euphorbia hyberna*, or *Eryngium campestre* at the Devil's Point, Stonehouse, would have been more ideal.

The text is so accurate taxonomically that few points appear to invite criticism. There is some confusion between *Brassicella monensis* and *B. Cheiranthos*. The native plant of the Glamorgan cliffs is *B. monensis*, which was growing there very recently, and to this species the Woolacombe specimen should have been referred. The occurrence of *Polygala vulgaris* var. *grandiflora* Bab. on Dartmoor seems strange, and an independent confirmation of the records would appear desirable. *Sagina subulata* and *Melittis Melissophyllum* are hardly so common that habitats are superfluous, and *Chenopodium urbicum* is probably "rare"

in these days rather than "not very common." *Lithospermum arvense*, shown as an alien, might be better regarded as an old cornfield weed that has become rare or extinct, as in some other counties. The distribution of the oaks seems to need further investigation, for surely *Quercus petraea* is the dominant oak of the East Lyn valley and other similar stations in v.c. 4. It is curious to read that *Salix fragilis* is "apparently rather rare"—this can be said of few other southern counties in Britain. No mention is made of the red-flowered *Silene Cucubalus* growing on Plymouth Hoe, nor of the curious form of *Silene anglica*, with flowers approaching those of *S. quinquevulnera*, that occurs about Morthoe.

The above criticisms are really very minor ones in so large a volume, and the editors, with their two assistants and the Botanical Section of the Devon Association, have earned the gratitude of all British botanists by bringing to completion the laborious task of compiling a Flora worthy of the county and one that will stand in the first rank among its compeers. The printing and get-up of the book are excellent and very few misprints have been noticed.—H. W. PUGSLEY.

BACKER, Dr. C. A., en Dr. O. POSTHUMUS. *Varenflora voor Java. Overzicht der op Java voorkomende Varens en Varenmachtigen, hare Verspreiding, Oekologie en Toepassingen.* Vol. xlvii. 370 pp., 1 plate, 1 map, 81 text-figures. Buitenzorg, Java, 1939. Price 7.50 Guilders.

THIS new book on the Fern Flora of Java is extremely welcome. It gives illustrations and a key to the Ferns of Java, and should do much to facilitate their study. The ferns of this part of the world had been reduced to a state of chaos by the work of van Alderwerelt van Rosenburgh, and it is fortunate for botanical science that the authors have done so much to clear up his work and reduce his species to their proper position in synonymy. Some will probably think that this book takes even too broad a view of species—for example, only a single species of *Angiopteris* is recognised. Another innovation is that *Monachosorum subdigitatum* is placed under *Anogramma*. Double citation of authorities is not employed. The illustrations, though they are not original, should be of great assistance to those unfamiliar with the classification of ferns. The final chapter gives an interesting account of the distribution of ferns in Java. 475 species of ferns and 40 fern-allies, making a total of 515 are recorded from Java. Of these 94.6 per cent. occur in West Java and 66.2 per cent. in East Java. A hundred species are confined to W. Java and thirteen to E. Java.—A. H. G. ALSTON.

THE Essex Field Club has issued a "List of the Fungi of Epping Forest" by A. A. Pearson (price 6d.), a most useful list of one of the best-worked areas of the British Isles. The author has gathered together both old and newer records. The order of presentation is the usually adopted Friesian one, but the genera are split up following various continental authors. The reason for the omission of some of the old records and the significance of some of the newer names are given in a supplementary paper in the 'Essex Naturalist' (xxvi. 123-129 (1938)). The work will be much used by those attending the Epping Forest forays and is evidently carefully done, but it is surprising to find *Queletia mirabilis* and *Glischroderma cinctum* listed; and one might add the other interesting Gasteromycete, *Battarreia phalloides*.

Queletia mirabilis is one of the most remarkable fungi and apparently one of the rarest; so far as I know, it has been collected in only six places—four in France, one in the U.S.A., and one in England. It was named by Fries in 1868 from a collection made by Perdrizet de Vandoncourt near Pont de Souchaux and sent to him by Quélet. The British record is a peculiar one. W. Herbst found specimens in Pennsylvania, U.S.A., in 1891, 1892, and 1893 (growing as it did in all the French localities on a pile of old tan bark). He sent a box of specimens to Kew in 1893 where they were examined by G. Massee; the "loose spores and broken fragments were deposited on the ground among heaps of rotten leaves," and later in the season an abundant crop was collected "near the place."

Glischroderma cinctum is a small Gasteromycete which was described in 1869 by Fuckel from charcoal at Arnsbacher Brücke. It was found on charcoal heaps in the Wyre Forest by Mr. Carlton Rea in 1909, and not infrequently since. It has not been found elsewhere in this country and, though it is not unlikely to occur where charcoal is found, Epping Forest would seem a most unlikely place.

Battarreia phalloides. In this Journal (liv. 105, 198 (1916)) the recorded British occurrences of this peculiar fungus are listed as Norfolk, Suffolk, Cheshire, Surrey, Kent, Bucks, and Gloucester. I knew of no Essex record then, and have heard of none since (cf. 'Essex Naturalist,' xxiv. (1933)).—J. RAMSBOTTOM.

BOOK-NOTES, NEWS, ETC.

A "Précis de Mycophagie" by G. Portevin has been published by Paul Lechevalier, Paris, at 12 Fr. (with paper cover). It is vol. vi. of the series "Ce qu'il faut savoir en histoire naturelle"—what one must know "savoir pour manger les bons champignons." It should be useful to those wishing to cook edible fungi, as it contains 101 recipes. Most of the fungi grow in this country and the booklet could be recommended to those wishing to add a little

variety to their diet during the war, if only we as a nation could get out of our heads the idea that an edible fungus can be distinguished from a poisonous one by such nonsense as that the former "peels," and could learn to recognise the well-marked esculent species. Even the fungus-conscious French public, however, apparently need warning against poisoning and there are two coloured plates, one of "mortels" and one of "dangereux" species, and a chapter on what to do in cases of poisoning. There are twenty-four line figures and ninety-three figures.—J. R.

THE forestry herbarium of the Imperial Forestry Institute, Oxford, has been transferred to the University Department of Botany, but will remain for the present housed in the School of Forestry building. Mr. A. C. Hoyle, M.A., B.Sc., has been appointed University Demonstrator in Botany and Lecturer in the Department of Botany, and will relieve Dr. J. Burt Davy of the teaching of Tropical Systematic Botany; the latter is due to retire under the age limit, after fourteen years' work at the Imperial Forestry Institute.

DEPARTMENT OF BOTANY.—Though for the present the British Museum (Natural History) is closed to the general public, anyone wishing to work in the Department may do so. This arrangement will probably continue. The normal routine is now being followed so far as possible. The scientific staff will be reduced—already Mr. G. Tandy is commissioned in the R.N.V.R. and Dr. G. Taylor has been seconded to the Air Ministry,—but care and maintenance of the collections must be seen to, and so long as this continues botanists may consult the collections.

Mr. W. R. Philipson who was botanizing in Jamaica has returned to duty. (see p. 188.)

SOCIETIES AND THE WAR.

LINNEAN SOCIETY OF LONDON.—The Linnean Society will continue its usual activities so far as possible. The rooms will be closed half an hour before sunset and at mid-day Saturday. General meetings will be held at 2.30 P.M., on October 26th and November 9th, and at 2.15 P.M. on November 23rd. In making arrangements to carry on, the Council have had in mind not only the interests of the Society but also the necessity of providing a central meeting-place for biologists.

ROYAL MICROSCOPICAL SOCIETY.—The celebrations of the centenary of the Royal Microscopical Society this month have been postponed. There will probably be a curtailment of the number of Ordinary meetings. It is intended to continue with the publication of the Society's Journal.

BRITISH MYCOLOGICAL SOCIETY.—The Annual General Meeting and Autumn Foray of the British Mycological Society, which was to have been held at Chipping Campden in September, had to be cancelled because of transport difficulties. The London Meetings of the Society will probably be held, though no definite arrangements have yet been made.

BRITISH PTERIDOLOGICAL SOCIETY.—The issue of 'The British Fern Gazette' has been suspended and will probably not be resumed during the continuance of hostilities.

ESSEX FIELD CLUB.—Owing to the Stratford Museum being closed, the Essex Field Club has been compelled to suspend its meetings until national conditions become clearer.

GILBERT WHITE FELLOWSHIP.—The Gilbert White Fellowship has postponed all its activities until further notice.

QUEKETT MICROSCOPICAL CLUB.—The fortnightly evening meetings of the Quekett Microscopical Club have been suspended. Gossip meetings will be held on the third Saturday of each month at 2.30 P.M.

SOUTH LONDON BOTANICAL INSTITUTE.—The Institute will remain open so long as possible during the present emergency, and for the usual hours.

THE noise of war caused the Meeting of the British Association at Dundee to disperse on Sept. 1st instead of Sept. 6th. The Presidential Address by Professor D. Thoday to Section K (Botany) was on "The interpretation of plant structure." It was a general account of many matters of interest, particularly to those brought up on the belief in the all-embracing sufficiency of outward and visible "adaptations." Such an address is difficult to summarise in brief. After a short historical introduction there are three main headings—Structure and Function, The Phyletic Outlook, and Seedling Structure: each subject is treated so as to show how the way was paved to the modern position, and this in turn is commented on.

The Address stresses aspects of the study of development in which the activity of the living cells finds obvious expression. "Great as have been the advances in biochemistry, we are not yet furnished with the means of expressing in physico-chemical terms the delicacy and subtlety of the adjustments exhibited even in plants." And after a consideration of the adhesive disc and haustorium of a mistletoe seedling—"To think of the inheritance of such an adaptation to the parasitic mode of life merely in terms of chemical substances in chromosomes is at present to underestimate or ignore the complexity of it, for which as yet we have no adequate physico-chemical parallel."

NOTES ON BRITISH CARICES.—V.

By E. NELMES.

CAREX OEDERI Retz.

I.

Retzius described *Carex Oederi* in his Fl. Scand. Prodr. 179 (1779) as follows:—

"C. Oederi, spicis subquaternis sessilibus, capsulis globosis acutis. Fl. D. 371. P. ar.

Obs. Synonyma ab *Ill.* Oedero allata minime pertinent. *Flavæ* proxima, tamen distinctis; Cæspitose crescit, omnia minora, spicula mascula etiam sessili, Spica infima quidem bracteam habet, sed parvam. Capsulæ minime recurvæ. Prope Holmiam solo glareoso legi."

There are four specimens in the herbarium of Retzius which have been written up by him * or others as *C. Oederi*.

1.

One of them can be eliminated at once, in considering the question of the type of *C. Oederi*, as it bears the date 1805, which is 26 years later than the date of the description of this species, and it came to Retzius from Acharius, a contemporary Swedish botanist. This plant, incidentally, though immature and difficult to identify, belongs to *C. Oederi* as treated by Kükenthal in his monograph in the 'Pflanzenreich,' and probably represents the subspecies *oedocarpa* Anderss., which appears to be the commonest member of the "*flava*" group in western Europe.

2.

Two others of the four specimens under discussion do not at all closely agree with Retzius's account of *C. Oederi*. One of these deviates in having no rootstock; its stem is tall and slender, and it bears three spikes (one male and two female). The lower female spike has an extremely long though narrow bract; the bract of the other spike is smaller. It will be noted that these characters more or less conflict with the description of *C. Oederi*. The plant appears to be a weak specimen of *Carex lepidocarpa* Tausch. It does not match plate 371 of the Fl. Dan., cited at the end of Retzius's description of *C. Oederi*, which has five spikes and seems to me to portray the common form of *C. Oederi* (sensu Kükenth.) referred to above. The sheet is marked "dedit Ag.," which evidently refers to C. A. Agardh (1785–1859), a pupil of Retzius, and this specimen therefore, like the first, could not have been available to Retzius when he drew up his description of

* I have compared the handwriting on these sheets with what I think is likely to be that of Retzius, viz., "*Carex limosa* var. *pallida* N." on his own two sheets of this plant.

C. Oederi. It has been identified in two hands, neither of which appears to be that of Retzius, as "*Carex Oederi*" and "*Carex flava* v. *Oederi*."

3.

The third specimen of the four also consists of one flowering culm, and it too has three spikes, the male spike being stalked. The "capsules" are immature, erect, and cannot be said to be globose. The lower spike has a long and leafy bract, and the upper a smaller one. The leaves are recurved, an unusual character in a member of the "*flava*" group. The plant would probably come within Kükenthal's conception of *C. Oederi*, but it is too immature for precise determination. On the back of the sheet "*C. Oederi*" has been twice written: "*globularis*," crossed out subsequently, was an earlier identification. This handwriting, again, does not appear to be that of Retzius.

4.

The fourth specimen agrees with every part of the detailed description quoted above from the Fl. Scand. Prodr. It is *Carex pilulifera* L.

It has five culms, the majority of which bear four spikes, but one or two have three. The spikes are all sessile and the fruits are globose and acute. The plant is densely caespitose and the male spike is invariably sessile. The lowest spike of each culm has a small bract. The utricle is spreading, but scarcely recurved. Finally, the habitat given for *C. Oederi* Retz. agrees well with that of *C. pilulifera* L.

It is true that Retzius does not refer to the utricle of *C. Oederi* as being pubescent, but as he does not mention this character in his descriptions of *C. digitata*, *C. globularis*, *C. filiformis*, and *C. pilulifera*, its omission from that of *C. Oederi* is not surprising.

This fourth specimen, then, *C. pilulifera* L., is clearly the plant which Retzius had in front of him when he drew up his description of, and observations on, *C. Oederi*. This, in spite of the fact that the name *C. pilulifera* L., with an accurate description of this species, also appears in the 'Flora.' Retzius does not appear to have known the Carices well!

This suggestion that Retzius based his *C. Oederi* on the specimen of *C. pilulifera* L. is confirmed by the fact that he, in the second edition of the Fl. Scand. Prodr. (1795), completely sinks *C. Oederi* into *C. pilulifera* L. including the references to Fl. Dan. t. 371. He had already (K. Vet.-Akad. Handl. xiv. 314 (1793)) admitted his misidentification of the specimen of *C. pilulifera* L. under discussion.

On the back of the sheet is written "*Carex saxatilis*." The epithet "*saxatilis*" is crossed out and "*Oederi* Fl. D. 371" substituted. This is crossed out in turn and "*pilulifera* L."

given as the final determination. There is reason to believe that these alterations are in the handwriting of Retzius himself.

It should be mentioned that, strange as it may seem, Oeder's plate 371 in the Fl. Dan., though very probably representing a plant of the "*flava*" group, as mentioned above, bears a considerable resemblance to the fairly common bracteate form of *C. pilulifera* L. It may well have appeared so to Retzius.

Oeder called his plant *C. divisa*, using Hudson's diagnosis of that species. Some of his citations point to *C. divisa* Huds. and others to *C. ovalis* Good.

K. K. Mackenzie (N. Amer. Flora, xviii, 303 (1935)) refers to "Oeder's '*Carex divisa* Hudson,' on which *C. Oederi* Retz. is based." Presumably this statement is made on the grounds (1) that the only reference under *C. Oederi* is to Fl. Dan. t. 371, and (2) that Retzius named his species in honour of Oeder, the then author of 'Florae Danicae.'

It seems to me, however, that it would be justified only if Retzius's definition of *C. Oederi* covered the Fl. Dan. plant.

The description of Retzius is at variance with that of Oeder. Furthermore, as mentioned above, Oeder's name, *C. divisa*, and description are simply copied from Hudson. His citations refer to this and at least one other species, and his plate represents yet another plant. Finally, the plant to which Retzius's description has been shown to apply is quite distinct from any of those coming within the scope of Oeder's treatment.

Ehrhart and others, unhampered by rules of nomenclature, apparently decided to apply the name *Carex Oederi* to the group of plants which is represented by Oeder's plate, and which has borne it ever since.

SUMMARY.

It is clear from the evidence that Retzius described his *Carex Oederi* from a specimen of *C. pilulifera* L. in his herbarium.

Sixteen years later, in the second edition of his 'Flora,' Retzius deliberately placed his *C. Oederi* within *C. pilulifera* L., a species which he included in each edition.

The name *C. Oederi* Retz. is a synonym of *C. pilulifera*, and cannot be used in the current sense of Kükenthal and others.

II.

It becomes necessary to discover the correct name or names for the plants of this group, hitherto known as *C. Oederi* Retz., the limits of which students of sedges have found difficulty in defining.

Names which have to be considered include *C. viridula* Michx. (1803), *C. serotina* Méral (1821), *C. subglobosa* Mielichh. (1839), *C. tumidicarpa* Anderss. (1849), *C. flavidula* St.-Lag. (1867), *C. pullulans* Dulac (1867), and *C. divaricata* St.-Lag. (1884).

1.

C. viridula Michx. Fl. Bor.-Amer. ii. 170 (1803). This American plant is considered by a number of authorities, of whom Kükenthal is an important representative, to be only varietally distinct from the European plant which they recognized as *C. Oederi* Retz. These authorities, therefore, if they agree with my elimination of the name *C. Oederi* Retz., will place the European elements of this species as varieties of *C. viridula* Michx.

I am inclined to agree with Mackenzie (N. Amer. Flora, xviii. 302-3 (1935)), that *C. viridula* Michx. stands specifically outside the orbit of the European species, even when this is understood in the broad sense of Kükenthal and of Mackenzie himself.

2.

C. serotina Méral, Fl. Paris, ed. 2, ii. 54 (1821). From a study of the very full description, I consider that this plant is one of the elements of the variable species or group of species under discussion. It appears probable, therefore, that this name will replace *C. Oederi* in either a narrow or a broader sense.

Those of us who think that the group is composed of perhaps two ill-defined species will look for another name in addition to *C. serotina*, and may discover it among the remaining names above-mentioned. But the investigation will necessitate a searching of many post-Linnaean works on the flora of Europe, a careful examination of type and other specimens, and considerable further general study before it can be completed satisfactorily. It is hoped that it will be undertaken at an early date.

I am indebted to the Botanical Museum at Lund for the loan of the Carices from Herb. Retz. mentioned in this paper.

STUDIES OF BRITISH POTAMOGETONS. IX.

By J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

IX. *×POTAMOGETON BENNETTII* AND *×P. LINTONII*.

HYBRIDS of the "pusilloid" pondweeds are sufficiently rare to be of special interest whenever they occur. Among British examples are the two plants described by Fryer under the names *×Potamogeton Bennettii* and *×P. Lintonii*, each of which clearly has *P. crispus* for one parent and a "pusilloid" species for the other. The parentage originally suggested for *×P. Lintonii* has never been questioned, but the identity of the "pusilloid" parent of *×P. Bennettii* has, on the contrary, been disputed. Moreover, owing to the strong influence of their common parent, *P. crispus*, these two hybrids are very similar in superficial characters, especially when in the dried state; indeed, so great

is the similarity that some plants have been referred to both *×P. Bennettii* and *×P. Lintonii*. In these circumstances we undertook a study of the characters of the two hybrids with a dual object in view: to establish the identities of their "pusilloid" parents, and at the same time find some reliable structural difference which would facilitate the determination of specimens. The organs whose characters promised most help in achieving this were the stipular sheaths, which are of primary value in classifying the "pusilloid" species, though their structure is easily misinterpreted unless the proper technique and the utmost care are used in dissecting them. Our results are embodied in the present note, and as *×P. Lintonii* offers the simpler case it is conveniently dealt with first, though *×P. Bennettii* was described five years earlier.

×P. Lintonii was based by Fryer (in Watson Bot. Exch. Club Ann. Rep. 16, 21 (1900)) on material collected by C. Waterfall in July 1899 in the Chesterfield Canal at Renishaw, Derbyshire. It was named in honour of W. R. Linton, who was stated to have discovered the plant, though, in fact, it was collected in the same locality by T. Gibbs in 1897 and named *P. obtusifolius*. Linton himself, when seeing the plant growing, also supposed it to be *P. obtusifolius*, but later he thought that it was a hybrid between *P. crispus* and *P. Friesii*, and Fryer came to the same conclusion. Their view has been accepted without question, for *×P. Lintonii*, according to Linton, was found growing with *P. crispus* and *P. Friesii*, and it exhibits no character which would not be expected in a hybrid of these species. A character of special importance in confirming the parentage is afforded by the stipular sheaths. *P. crispus* is a species with open sheaths, whereas *P. Friesii*, like *P. pusillus* but unlike other possible "pusilloid" parents, has closed (tubular) sheaths. Consequently, in a hybrid between *P. crispus* and *P. Friesii* (or *P. pusillus*) we should expect the sheaths to show some evidence of a tubular structure. This proves to be so in *×P. Lintonii*: examination reveals that the sheaths (or at least a proportion of them) are tubular towards the base, though sometimes so very shortly that extra care has to be taken in dissecting them lest the tube should be accidentally split. The nervation and texture of the sheaths favour *P. Friesii* rather than *P. pusillus*, and as *×P. Lintonii* was found growing with the former species there can be no doubt that its parentage is *P. crispus* *×P. Friesii* as originally suggested by Linton and Fryer.

Our discussion of *×P. Lintonii* has so far been restricted to the typical plant from the Chesterfield Canal in Derbyshire. During the last twenty-five years, however, the hybrid has been reported from seven additional vice-counties, as follows (the first record being indicated for each): Surrey, by A. Bennett

ex C. E. Salmon in Watson Bot. Exch. Club, ii. 410 (1914); Armagh, by Bennett in Journ. Bot. lvii. 16 (1919), where by some mistake the county was given as Fermanagh; Stafford, by Druce in Bot. Soc. & Exch. Club Brit. Is. vi. 152 (1921); North Somerset, by T. H. Green in Bot. Soc. & Exch. Club Brit. Is. ix. 673 (1932); Leicester, by Druce ex Horwood & Noel, Fl. Leicester. & Rutland, 574 (1933); East Sussex, by Bennett ex Wolley-Dod, Fl. Sussex, 464 (1937)*; and Nottingham, in the seventh of these notes, p. 256 *supra*. The records from Surrey, Armagh, Stafford, and Nottingham are unquestionably correct; we have examined the plants concerned, and in every case dissection has shown the presence of the characteristic stipular sheaths with tubular bases. We are unable, however, to confirm the records from North Somerset ("Bath") and East Sussex ("Dykes at Lewes"), as we have not yet seen the specimens from these vice-counties. Nor have we seen the Leicester plant, from Saddington Reservoir, reported by Druce, but we have examined authentic specimens of $\times P. Lintonii$ from a neighbouring locality in the Grand Union Canal at Market Harborough, gathered by Druce in Aug. 1930 and recorded by him in Bot. Soc. & Exch. Club Brit. Is. ix. 374, 526 (1931) as *P. crispus* var. *serratus*. This identification was confirmed by Pearsall on p. 526, and it is interesting to observe that on the following page, in a note comparing $\times P. Lintonii$ from Stafford with the typical plant from Derby, he remarked that the former "more closely resembles *P. crispus*, f. *serratus*, and is, indeed, easily mistaken for it"! Another (unrecorded) Leicester station is in the River Trent at King's Mills, Castle Donington. A detailed vice-comital list of gatherings examined by us is given later in this paper, and it will be seen that the Surrey stations of $\times P. Lintonii$ are all in or near the water which flows down the Tilling Bourne through Shere and Albury to the River Wey at Shalford, and thence to the Thames at Weybridge; and that most of the Midland localities are in the River Trent and the Chesterfield Canal. Except for the Armagh locality, which is in the Ulster Canal, all the recorded stations of $\times P. Lintonii$ are in water-systems where *P. Friesii* is known to occur. The oldest specimen that we have seen was collected by H. C. Watson at Weybridge, Surrey (no date given); it was originally named *P. gramineus* (meaning *P. obtusifolius*), and has since been recorded under $\times P. Bennettii$ in C. E. Salmon's 'Flora of Surrey' (1931), p. 620.

$\times P. Bennettii$ was discovered in Aug. 1890 by R. Kidston and J. S. Stirling in a pond used for the storage of wood at Grange-

* Wolley-Dod, *op. cit.* 560, deleted the record in his "Addenda and Corrigenda" on the ground that it was "an error in identification, *sic* J. E. Dandy". This was an overstatement; I had merely suggested to him that the record was doubtful. I had not seen the plant.—J. E. D.

mouth, Stirlingshire. The material which they then obtained was sterile, but by paying further visits to the locality and carrying out a patient search they eventually secured complete flowering specimens in Aug. 1894. Fryer thereupon described and figured the plant in Journ. Bot. xxxiii. 1-3, t. 348 (1895), naming it $\times P. Bennettii$ after his friend Bennett, and expressing the opinion that it was probably a hybrid between *P. crispus* and *P. obtusifolius*. According to Fryer's account the original sterile specimens, gathered in 1890 and labelled *P. obtusifolius* by Kidston and Stirling, were referred to *P. crispus* by Bennett, but Fryer himself, much doubting this identification, suspected hybridity. Later, on seeing further sterile specimens collected in June 1893 (and again labelled *P. obtusifolius*), Fryer in *litt.* wrote "This plant is not *P. obtusifolius*, but is a form of *P. crispus* L. (possibly a hybrid?), and has been named *P. serrulatus*", and on the strength of this note Kidston and Stirling recorded the plant as *P. crispus* var. *serrulatus* (Regel & Maack)* in Stirling Nat. Hist. & Archaeol. Soc. Trans. 1893-94, 92 (1894). The receipt of the flowering specimens in 1894, however, enabled Fryer to decide that the plant was in all probability a hybrid of *P. crispus* and *P. obtusifolius*, and he accordingly described and figured it.

In 'Potamogetons of the British Isles', p. 55 (1900), Fryer repeated the opinion that $\times P. Bennettii$ was probably *P. crispus* $\times$ *P. obtusifolius*, though on the preceding page in describing the plant, and also on p. 47 in discussing hybrids of *P. crispus*, he suggested *P. Friesii* as a possible alternative to *P. obtusifolius* †. Ascherson and Graebner, Synops. Mitteleur. Fl. i. 349 (1897), and Graebner again in Engler, Pflanzenr. iv. 11, 133 (1907), accepted the parentage *P. crispus* $\times$ *P. obtusifolius*; but in 1916 Hagström (Crit. Res. 63-64) rejected *P. obtusifolius* as the "pusilloid" parent and substituted "*P. pusillus*" (meaning *P. Berchtoldii*) ‡. In doing this he was influenced by three important points which were decidedly against *P. obtusifolius* and in favour of *P. Berchtoldii*: (1) the filiform stem, evidently intermediate between *P. Berchtoldii* and *P. crispus*; (2) the narrow stem-leaves; and (3) the small winter-buds intermediate between the same two species. Hagström's formula has gained general acceptance, his arguments being plausible enough; but unfortunately they were based wholly on the morphology and anatomy of the hybrid, without regard to the distribution of its parents. The truth is that, although *P. crispus* occurs in the wood ponds at Grangemouth, neither *P. obtusifolius* nor *P. Berchtoldii* (the parents suggested by Fryer and Hagström respectively) has

* Based on *P. serrulatus* Regel & Maack. This name belongs to an eastern Asiatic species of the section *Adnati*, a group not represented in Europe.

† When he made this suggestion he could not yet have seen $\times P. Lintonii$, which he described as *P. crispus* $\times$ *Friesii* in the same year.

‡ See the first of these studies (Journ. Bot. lxxvi. 90-92).

been found there although the ponds have been well explored for Potamogetons by Kidston and Stirling and other botanists. Only two "pusilloid" species, *P. pusillus* and *P. trichoides*, have been collected in the ponds, and it therefore seemed to us more than probable that one of these was in reality the parent of $\times P. Bennettii$. The points emphasized by Hagström in rejecting *P. obtusifolius* do not exclude *P. pusillus* or *P. trichoides*, so we examined the hybrid for characters of more precise significance, and found them in the stipular sheaths (which, surprisingly, were not mentioned by Hagström) and the flowers. *P. pusillus*, as we have already stated, has tubular sheaths; hence if this species were a parent of $\times P. Bennettii$ the latter would be expected to have sheaths more or less tubular at the base as in $\times P. Lintonii$. Dissection shows, however, that the sheaths, unlike those of $\times P. Lintonii$, are all open and convolute, so that *P. pusillus* can be left out of consideration. The other possible parents, *P. obtusifolius*, *P. Berchtoldii*, and *P. trichoides*, all have convolute open sheaths as in the hybrid, but *P. trichoides* is distinguished by a very important floral character: its flowers tend to monogyny, the number of carpels per flower being reduced to three, two, or usually one, while in all the other species under consideration the flowers normally have the four carpels typical of *Potamogeton*. Examination of the flowers of $\times P. Bennettii$ shows that in the great majority of them the number of carpels is reduced to three or two: out of twenty-one flowers dissected by us as a sample, eleven had two carpels, nine had three, and only one had four*. This indicates most decisively that *P. trichoides* is the "pusilloid" parent of $\times P. Bennettii$, and it is therefore scarcely necessary to add that the three points put forward by Hagström in favour of *P. Berchtoldii* as parent species are equally valid for *P. trichoides*. In fact there appears to be no character of $\times P. Bennettii$ which would not be expected in a hybrid between *P. crispus* and *P. trichoides*, and as both these species occur in the same water as $\times P. Bennettii$ we are convinced that its real parentage is *P. crispus* $\times$ *trichoides*.

Apart from the original locality in Stirlingshire, $\times P. Bennettii$ has been recorded from Surrey by C. E. Salmon, Fl. Surrey, 620 (1931), and others; from Armagh by Praeger, Botanist in Ireland,

* These twenty-one flowers were in six spikes taken from Kidston and Stirling's 1894 gathering (A. Fryer, Ref. 3000, in Herb. Brit. Mus.). Three of the spikes were three-flowered; the other three were four-flowered. The following table gives details of the numbers of carpels in the flowers of the six spikes:—

2	3	3	3	2	2
3	2	2	2	2	3
3	2	3	2	2	3
			3	2	4

Fryer's enlarged figure of a flower in 'Potamogetons of the British Isles' (t. 33 fig. 3) shows two carpels.

482, 530 (1934); and from West Sussex by Wolley-Dod, Fl. Sussex, 464 (1937). We have not yet seen the plant from West Sussex, and so for the present must be content with the comment that the locality ("Rife, Bognor") is unlikely for $\times P. Bennettii$ as *P. trichoides* is not known from the neighbourhood. The records from Surrey and Armagh, however, are certainly errors: the plants from both these counties had previously been recorded as $\times P. Lintonii$ by Bennett, and, as we have indicated above in our discussion of that hybrid, his identifications are correct*. Thus, so far as we can at present ascertain, $\times P. Bennettii$ is known only from the type-locality at Grangemouth, Stirlingshire.

Below we give the synonymy of $\times P. Bennettii$ and $\times P. Lintonii$, with references to the literature and details of gatherings which we have examined. Records which we have not yet confirmed have already been mentioned in the foregoing part of this paper and are not included here. The gatherings are arranged under vice-counties, and all are represented in the British Museum Herbarium unless otherwise indicated.

P. CRISPUS $\times$ TRICHOIDES=

$\times P. BENNETTII$ Fryer in Journ. Bot. xxxiii. 1, t. 348 (1895); in Fryer & Benn. Pot. Brit. Is. 53, t. 33 (1900).—Stirling & Kidston in Stirling Nat. Hist. & Archaeol. Soc. Trans. 1894-95, 86 (1895).—H. & J. Groves in Bab. Man. Brit. Bot., Ed. 9, 441 (1904); op. cit., Ed. 10, 441 (1922).—Hagstr. Crit. Res. 63, fig. 24 B, E (1916).—A. Benn. in Journ. Bot. lvii. 16 (1919).—Druce in Bot. Soc. & Exch. Club Brit. Is. ix. 374, 527 (1931).—Pearsall in Bot. Soc. & Exch. Club Brit. Is. ix. 407 (1931); op. cit. x. 118 (1933) pro parte, excl. pl. ex Surrey.

P. crispus var. *serrulatus* (Regel & Maack) Stirling & Kidston in Stirling Nat. Hist. & Archaeol. Soc. Trans. 1893-94, 92 (1894), quoad pl. ex Stirling.

P. crispus $\times$ *obtusifolius* Aschers. & Graebn. Synops. Mitteleur. Fl. i. 349 (1897).—Graebn. in Engler, Pflanzenr. iv. 11, 133 (1907).

* The structure of the stipular sheaths leaves no doubt of this. In recording the Surrey plant as $\times P. Bennettii$ Salmon's 'Flora of Surrey' made no mention of the earlier record as $\times P. Lintonii$, and specimens subsequently collected in Surrey have therefore been referred without question to $\times P. Bennettii$. An article on $\times P. Bennettii$ published by Pearsall in Bot. Soc. & Exch. Club Brit. Is. x. 118-120 (1933) did nothing to clear up the confusion, as its author assumed that the Surrey plant was identical with the true $\times P. Bennettii$ from Stirlingshire and based his account on a mixture of the two. In the course of his discussion he stated that in his judgment "many of the faulty determinations of Potamogeton species in the past have been due to the critical examination of dried specimens with a lens only—rather than that of fresh plants under the microscope". Yet he could have separated the Surrey and Stirlingshire plants with ease if under a microscope he had dissected the stipular sheaths. Indeed, these important organs were not so much as mentioned in his article.

We have seen specimens from only one vice-county :—

(86) STIRLING. Wood pond, Grangemouth, 17th Aug. 1890, *R. Kidston & J. S. Stirling* (Herb. Univ. Glasgow); 12th June 1893, 24th Aug. 1894, and 1st Sept. 1897, *R. Kidston & J. S. Stirling*; Aug. 1930, *G. C. Druce*; 6th July 1937, *G. Taylor*.

P. CRISPUS × *FRIESII* =

× *P. LINTONII* Fryer in Watson Bot. Exch. Club Ann. Rep. 16, 21 (1900).—*W. R. Linton* in Bot. Exch. Club Brit. Is. Rep. 1900, 646 (1901); Fl. Derby. 290 (1903).—*Painter* in The Naturalist, 1902, 9 (1902).—*Druce* in Bot. Exch. Club & Soc. Brit. Is. iii. 131 (1912); *op. cit.* iv. 166 (1915); *op. cit.* vi. 152, 250 (1921); *op. cit.* ix. 374, 526 (1931).—*A. Benn.* ex *C. E. Salmon* in Watson Bot. Exch. Club, ii. 410 (1914); in Journ. Bot. Soc. 16 (1919).—*Pearsall* in Bot. Soc. & Exch. Club Brit. Is. ix. 406 (1931).—*Dandy & Taylor* in Journ. Bot. lxxvii. 256 (1939).

P. crispus var.—*Praeger* in Irish Naturalist, ii. 182 (1893).

P. crispus × *mucronatus* Graebn. in Engler, Pflanzenr. iv. 11, 133 (1907).

P. Bennettii (non Fryer) *C. E. Salmon*, Fl. Surrey, 620 (1931).—*Lousley* in Bot. Soc. & Exch. Club Brit. Is. x. 112 (1933); in Watson Bot. Exch. Club, iv. 234 (1934).—*Pearsall* in Bot. Soc. & Exch. Club Brit. Is. x. 118, 452 (1933) pro parte, quoad pl. ex Surrey.—*E. C. Wallace* in Bot. Soc. & Exch. Club Brit. Is. x. 772 (1934).—*Praeger*, Botanist in Ireland, 482, 530 (1934).

P. crispus var. *serratus* (non Gray) *Druce* in Bot. Soc. & Exch. Club Brit. Is. ix. 374, 526 (1931) pro parte, quoad pl. ex Leicester.—*Horwood & Noel*, Fl. Leicester. & Rutland, 573 (1933).

Vice-county distribution of gatherings examined :—

(17) SURREY. Ditch in field by the bridge, Weybridge (no date indicated), *H. C. Watson* (Herb. Watson, at Kew). *R. Wey* near Shalford, 7th July 1881, *W. H. Beeby* (Herb. Univ. Aberdeen), named *P. crispus* var. *serratus*. *Tilling Bourne*, Shere, 1909, *W. Biddiscombe*; 31st Aug. and 7th Sept. 1912, *C. E. Salmon*. *Tilling Bourne*, Albury, July 1914, *E. B. Bishop*; 9th Oct. 1932, *J. E. Lousley*, Ref. D. 15; 2nd Sept. 1933, *E. C. Wallace*; 9th Sept. 1933, *J. E. Lousley*, Ref. E. 4; 25th Sept. 1933, *T. J. Foggitt*, and *A. J. Wilmott*, Ref. 4554; 31st July 1937, *A. L. Still*.

(39) STAFFORD. Canal near Lichfield, 13th June 1920, *G. C. Druce*; 18th Sept. 1931, *T. J. Foggitt*. *R. Trent*, Burton-upon-Trent, Aug. 1930, *G. C. Druce*.

(55) LEICESTER. *R. Trent*, King's Mills, Castle Donington, 4th Aug. 1906, *W. Bell*, named *P. crispus*. *Grand Union Canal*, Market Harborough, Aug. 1930, *G. C. Druce*.

(56) NOTTINGHAM. Nottingham Canal, Wollaton, 3rd Sept. 1937, *G. Taylor*. *Chesterfield Canal*, Misterton, 9th Aug. 1939, *C. I. & N. Y. Sandwith*. *Chesterfield Canal*, Gringley-on-the-Hill, 12th Aug. 1939, *C. I. & N. Y. Sandwith*.

(57) DERBY. *R. Trent* near Drakelow, Sept. 1895, *T. Gibbs* (Herb. Derby Mus.), named *P. Friesii*. *R. Trent*, Trent Lock, Long Eaton, 9th Sept. 1937, *G. Taylor*. *Chesterfield Canal* near Eckington & Renishaw Station, 8th July 1897, *T. Gibbs*, named *P. obtusifolius*; July 1899, *C. Waterfall*; 1st Aug. 1900, *W. R. Linton*; Oct. 1911, *G. C. Druce*; 2nd Sept. 1937, *G. Taylor*.

(H 37) ARMAGH. Ulster Canal between Caledon and Battleford Bridge, July 1892, *R. Lloyd Praeger*.

A NOTE ON THE VEGETATION OF REDONDA, B.W.I.

By HAROLD E. BOX.

DR. H. A. TEMPANY, in a report on the phosphate industry of Redonda in 1915 (West Indian Bulletin, xv. 22–26), wrote :—

“Redonda is an island 1 mile in length and $\frac{1}{2}$ mile wide at the broadest part, rising at its highest point to about 1000 feet above sea-level. Physically it is steep and precipitous, and is surrounded by high cliffs which rise vertically from the sea and vary in height from about 200 to 600 feet. It is surrounded by deep water, but there is fairly good anchorage for vessels on the western side in about 11 fathoms of water, a short distance from the shore.

“The island is situated in latitude 16° 55' North, longitude 62° 16' West. The nearest adjacent islands are Antigua, Montserrat, Nevis, and St. Kitts, which are distant from it as follows: Antigua about 40 miles north-east, Montserrat about 15 miles south-east, Nevis about 25 miles north-west, and St. Kitts about 35 miles north-west. It forms part of the colony of the Leeward Islands, and for administrative purposes ranks as a dependency of Antigua; communication is, however, almost entirely with St. Kitts and Montserrat.

“Volcanic in origin, the island consists in the main of hard compact volcanic rock, apparently andesitic in character, and corresponding with volcanic rocks occurring in the adjacent islands of Montserrat, St. Kitts, and Nevis. Associated with this in places are layers of softer rock, apparently consisting of coarse compact volcanic ash, with included boulders, corresponding to the so-called Terrass deposits found in Montserrat.

“The island is, however, chiefly remarkable for the occurrence therein of deposits of phosphatic material . . .”

From about 1885 until some twenty years ago a commercial company worked at Redonda under licence from the Government at Antigua, but at the present time the island is abandoned, with no population. The only vertebrate life consists of countless numbers of wild birds and two endemic species of lizards. Nothing appears to have been written upon the vegetation other than a brief note by Tempany, who states that “The principal vegetable forms which occur are species of Prickly pear (*Opuntia*)

and Cacti, notably *Cereus*. It is, however, worthy of note that the silver fern (*Gymnogramme trifoliata*) and the gold fern (*Gymnogramme chrysophylla*) both occur fairly abundantly in places in sheltered crevices in the rocks. From the point of view of agricultural possibilities the island is entirely without value."

On 18th July, 1938, I visited Redonda from Antigua with the object of making a brief ecological survey, but owing to an accident to my leg I was not able to undertake any real exploration there. A number of plants were collected near the landing-place, however, and others observed with the binocular. It seems desirable to place on record a list of the species which have been identified, with my numbers where a specimen is available.

Polypodiaceae (A. H. G. Alston det.).

Pityrogramma Schaffneri (Fée) Weatherby ("Silver Fern")—1699.

P. chrysophylla (L.) Link ("Gold Fern")—1700.

Gramineae (A. Chase det.).

Digitaria horizontalis Willd.—1694.

Chloris barbata Sw. (*C. inflata* Link).—1696, 1697.

Valota insularis (L.) Chase.—1698.

Panicum maximum Jacq.—1693 (Guinea Grass; native of Africa).

Setaria setosa (Sw.) Beauv.—1695.

Cyperaceae (J. E. Dandy det.).

Cyperus planifolius Rich.—1691, 1692.

Agavaceae.

Agave sp.—noted.

Nyctaginaceae.

Boerhavia coccinea Mill.—1687.

Amaranthaceae.

Lithophila muscoides Sw.—1686.

Ficoidaceae.

Trianthema portulacastrum L.—1681.

Portulacaceae.

Talinum paniculatum (Jacq.) Gaertn.—1682.

T. triangulare (Jacq.) Willd.—1683. The form with yellow flowers.

Portulaca oleracea L.—1684.

P. phaeosperma Urb.—1685.

Annonaceae.

Annona squamosa L.—noted.

Capparidaceae.

Gynandropsis gynandra (L.) Briq.—noted.

Leguminosae.

Tephrosia cinerea (L.) Pers.—1680.

Euphorbiaceae.

Croton lobatus L.—1689.

Ricinus communis L.—noted.

Cactaceae.

Opuntia Dillenii (Ker-Gawl.) Haw.—noted.

O. triacantha Sweet—noted.

Cephalocereus Royenii (L.) Britton & Rose.—noted.

Melocactus sp. probably *M. intortus* (Mill.) Urb.—noted.

Plumbaginaceae.

Plumbago scandens L.—1688.

Compositae.

Wedelia calycina Rich. (*W. buphthalmoides* Griseb.).—1690.

The above plants were seen as lithophytes on ledges or in crevices of the precipitous sides of the island, though a few of the weeds were noted among loose rocks by the sea-shore. I was not able to examine the vegetation of the summit plateau, but it appears to consist of a growth of grass with occasional low shrubs, apparently all *Wedelia calycina*. There are no trees, and the most conspicuous plants are the tall Dildo, *Cephalocereus Royenii*.

ON THE IDENTITY OF TWO NEO-TROPICAL
SPECIES OF *ELEPHANTOPUS* L.

BY W. R. PHILIPSON, B.A.

I AM indebted to Mr. N. Y. Sandwith of the Kew Herbarium for drawing my attention to the first of these interesting plants. During his work on the 'Flora of Trinidad' he encountered a species of *Elephantopus* which he was able to identify as *E. carolinianus* Willd. as interpreted by Koster in Pulle's 'Flora of Surinam,' iv. (1938). While Sandwith agreed to the distinctness of this South American plant when compared with *E. mollis* Kunth he was unconvinced of its identity with the North American *E. carolinianus* Willd. I encountered the same problem while working with Mr. H. E. Box on the Compositae of Antigua, for the *E. scaber* L. recorded by Grisebach in his 'Flora of the British West Indies,' as gathered on that island by Nicholson, turned out to be "*E. carolinianus*" in the sense employed by Koster.

As I am unable to find that any unoccupied specific epithet has been applied to this plant, I now supply one and append a short Latin description.

Elephantopus pilosus, sp. nov.—“*E. carolinianus* Willd.” Koster in Pulle, Fl. Surinam, iv. 101 (1938). “*E. scaber* L.” Griseb. Fl. Brit. W. Ind. 354 (1861). *Herba* perennis 2–8 dm. alta caule strigoso. *Folia* sessilia, interdum sub-radicalia rosulata interdum caulina; lamina spathulata vel obovata basi sensim attenuata, circa 15×4 cm. (interdum 25×8 cm.), margine crenata, utrinque pilis dissitis circa 1–2 mm. longis prædita. *Inflorescentia* corymbosa; glomera circa 12×8 mm. quam bracteæ leviter breviora. *Capitula* 8×2 mm. tenuia; involucri squamæ circa 8, glabræ vel pilosæ, fulvæ nitentes. *Flosculi* 4; corollæ tubus 3 mm. longus, limbus 1.5 mm. longus glaber. *Achenia* 3 mm. longa circa 6-striata breviter pilosa; pappi setæ 5 mm. longæ, basi abrupte dilatæ.

I select as the type-specimen the sheet of *Hostmann* 875 in the British Museum Herbarium. I have seen the following specimens:—

BRAZIL: *Lea* 20 (BM); *Burchell* 8695, 9261, 9822; *Gardner* 2209, 3805; *Traill* 456; *Bolland* s.n. (Kew).

DUTCH GUIANA: *Berthoud-Coulon* 221 (BM); *Hostmann* 338, 488, 875 (BM, Kew); *Stockdale* 8840; *Samuels* 101 (Kew).

FRENCH GUIANA: *Sagot* 336 (BM).

BRITISH GUIANA: *Schomburgk* 18 (BM, Kew), 473; *De La Cruz* 2145; *Gleason* 484 84 (Kew).

TRINIDAD: *Broadway* 8028; collector's name undecipherable, locality Carenage (Herb. Trinidad).

ANTIGUA: *Nicholson* s.n. (Kew).

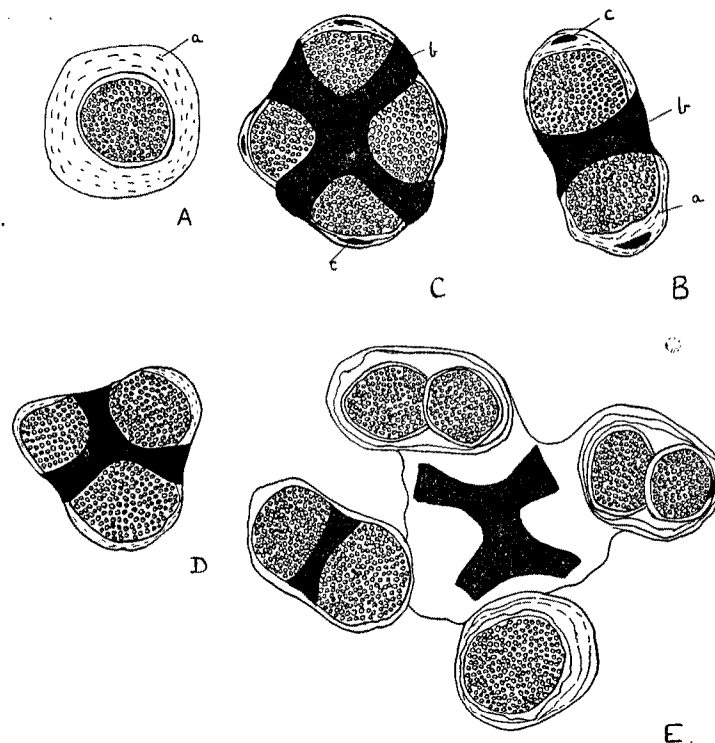
This species is distinguishable from *E. mollis* Kunth by the tomentum of the under side of the leaves; the hairs are scattered and long, resembling bristles, whereas in *E. mollis* they are short and closely set, giving a velvety texture to the leaf surface. There is also a tendency for the leaves to be crowded towards the base of the stem, often forming a rosette. The distinctions between the present species and the North American *E. carolinianus* are mostly set out by Koster, but I would add that the bases of the pappus bristles are shorter and more abruptly dilated in *E. pilosus* than in *E. carolinianus*.

This opportunity may be taken to correct the misapplication of the name *E. tomentosus* L. by Koster in ‘*Blumea*,’ i. 464 (1935) and in Pulle, l. c. p. 100 to the species *E. mollis* Kunth. The former species has a limited distribution in North America, while the latter is widespread in the tropics. These species may be distinguished by the same characters which serve to separate *E. mollis* from *E. scaber* (see Philipson in Journ. Bot. lxxvi. 302 (1938)), as the latter species differs from *E. tomentosus* only in its narrower and more scabrid leaves and in being confined to the tropics of the Old World (see Gleason in N.Y. Bot. Gard. iv. 241 (1906)).

A NEW BRITISH ALGAL RECORD: *GLOEOTAENIUM LOITLESBERGERIANUM* HANSGIRG.

By EDNA M. LIND
(University of Sheffield.)

IN the course of an investigation of algæ from the mud of a calcareous pond at Shireoaks near Sheffield *Gloeotaenium Loitlesbergerianum* Hansgirg, a member of the Chlorococcales, was recorded in May 1939.



Gloeotaenium Loitlesbergerianum. A, single cell. B, two-celled colony. C, D, four-celled colonies. E, formation of daughter colonies. a, calcite crystals; b, calcite bands; c, calcite pads. All $\times 290$.

The alga was first described from Austria by Hansgirg in 1887, and has since been recorded for many parts of the world, but not, apparently, for the British Isles.

Gloeotaenium Loitlesbergerianum occurs as single green cells 25μ in diameter or as two-celled ($70\text{--}90 \mu$) or four-celled colonies (figs. A–C). The cells are globose or ovoid, with a clear cellulose

wall, and lie in a wide stratified gelatinous sheath containing calcite crystals. In the multicellular colonies a thick dark brown or black band of calcite separates the cells from each other (figs. B, C). The four-celled colonies may have their cells arranged either in one plane (fig. C) or, more rarely, tetrahedrally (fig. D). In the former case calcite bands are laid down in the form of a maltese cross which is the most striking feature of the organism. In this form polar pads of calcite are often present in addition. On division each daughter cell divides into two or four cells, and splits away from the original colony surrounded by its own gelatinous sheath, leaving the black calcite bands behind (fig. E).

The alga has been described as occurring in moorland waters (2) and in calcareous waters (3). The present record is from a pond on the magnesium limestone with a rich bottom flora consisting mainly of *Chara* and *Hippuris*. The alga appeared on the sides of a jar in which mud from the pond had been kept for some weeks.

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MENTHA CRISPA L. AND M. LACERATA OPIZ.

By A. L. STILL.

M. CRISPA L. has been cultivated in gardens for many years. It was recorded from the Wooler Water in Northumberland and from Cammach Lane, near Settle, by John Tatham, and has appeared elsewhere, probably as a garden escape. Dr. E. H. Metcalf tells me that it figures in the catalogue of a well-known northern horticultural firm, from whom, I believe, he obtained the plant. He sent me stolons, and I have grown it in the garden for two or three years. Last year, and again this year, certain changes have appeared, which will be described later.

M. lacerata Opiz (Naturalientausch, 60 (1831)) is mentioned by Fraser in his paper "Menthæ Britannicæ" (B. E. C. 1926 Rep. (1937) pp. 223-4) as a variety of *M. spicata* Huds. He states that it occurred at Glenfarg, Perthshire, previous to 1855, and that it is cultivated at Kew and Oxford. From the Oxford Botanic Gardens I obtained stolons which flowered well, but after drying specimens I eliminated it to make room for others.

Fraser gives a full description of both plants; for present purposes the following summary is perhaps sufficient.

M. crispa L. (Sp. Pl. ed. 2, 805 (1763)). Leaves transversely and broadly oblong, subsessile or shortly petiolate ± deeply slashed and incise-serrate, curled and rugose, thinly hairy on both faces; laceræ and serratures 2-6 mm. deep. Spikes oblong, obtuse, stout, tapering slightly, interrupted at the base. The spike is usually solitary, but there may be one or two lateral ones.

M. spicata Huds. var. *lacerata* (Opiz) Fraser. Leaves ovate, cordate at the base, sessile, slashed, incised and serrate in a variety of ways, with long acute and entire points, strongly rugose, glabrous on both faces, laceræ 2-8 mm. long, often almost linear. Spikes numerous, freely produced, both on the main stem and its numerous branches in the upper portion, slender, elongating with age and becoming interrupted at the base. Fraser says "stout for *M. spicata*." In my plant from Oxford the spikes were more slender than those of most of my specimens of *M. spicata*.

Last year a stem appeared in the middle of my patch of *M. crispa* L. with the characters of *M. lacerata*. This stem with its stolons was separated and planted separately this year. It retained its characters, but before flowering it was sent to King's College, Newcastle, for the purpose of cytological study. This year several similar stems have appeared. One of these has all the characters of *M. lacerata* Opiz, with the deep lacerations and long narrow points of the leaves well shown. Some of the others have deeply slashed leaves, but the points are shorter. The spikes are the same, similar to those of *M. spicata*, and freely produced. I hope to grow these separately. At present the stems are not so robust as those of the Oxford plant, but I have reason to think that they may strengthen on independent cultivation. Certainly if such a plant were sent to me without any details of origin I should have no hesitation in naming it *M. spicata* Huds. var. *lacerata* (Opiz) Fraser. This "sport" is interesting because *M. crispa* L. has been the subject of much speculation. Fraser says "Smith thought it might be a variety of *M. viridis* or *M. piperita*. Bentham and H. Braun made it a variety of *M. aquatica* L." Topitz (Bot. Centr. xxx. 171 (1913) follows H. Braun. Fraser supposed it to be a hybrid of *M. spicata* Huds. and *M. aquatica* L. I think the occurrence of these "sports" makes the presence of *M. spicata* certain. The influence of *M. aquatica* is indicated by the stout spikes, like those of *M. piperita*, and by a slight tendency to form epigeal stolons. The conclusion is forced upon one that, in the course of cultivation, one of these "sports" occurred, and was selected by some "curious" herbalist of old time and grown on separately. If such a plant came to the notice of Opiz he would, of course, in the absence of information about its origin, describe it as a new species. Certainly a connection between the two plants would

never be suspected at sight. I may say that there is no possibility of these "sports" being either seedlings or the result of contamination from my previous colony of *M. lacerata*. It would be a help if those who administer the International Rules would indicate how such "sports" as this and the Hairy Peppermints should be named.

THE BRITISH BRYOLOGICAL SOCIETY.

BY ELEONORA ARMITAGE.

THE British Bryological Society held its Annual Meeting and Excursion at Fort William, Inverness-shire, from June 24 to July 1, 1939; thirty-four members and friends were present. A good deal of the Ben Nevis range and surrounding country was explored, beginning with the nearby Corpach Moss, and, owing to a drought of several weeks duration, it was easy to walk over the usually submerged areas. A striking feature was sheets of Cotton grass with huge dangling silvery heads; also the starry white flowers of the large Sundew. The first attack on the Ben Nevis *massif* took place up Glen Nevis, driving seven miles up a rough track, followed by a winding path to the top of the Glen and the Waterfall. The bryophyte flora was in an unusual state of desiccation, many plants crumbling to dust at a touch. Most of the well-known rarities were seen, and some additional records made for this rich area. The shores and woodland around Loch Linnhe occupied another day. A break in the weather delayed the ascent of Ben Nevis; when the summit was reached its rarities were hidden under the snow. The limestone rocks of Creag Aoil, near Fort William, added many species. Other parts of Lochaber were visited, Glen Roy, Glenfinnan, Ardour, &c.

The Annual Meeting took place on June 27 under the Presidency of Miss E. Armitage. At the conclusion of the business the President read her presidential Address on "*Naiadita*, a Rhaetic Bryophyte."

Owing to the War, no Meeting will take place in 1940, but it is hoped to meet at Aberystwyth in August 1941. The distribution and the publication of the Report will follow early in 1940.

The Lists, which follow, include the rarer species found, with localities; new records for v.c. 97 (Westernness) are starred.

SPHAGNA.

Arranged by Mr. A. Thompson; all are new records for v.c. 97 except those marked (v.c. 98).

Sphagnum Girgensohnii var. *robustum*, Pass of Glencoe (v.c. 98); var. *microcephalum*, Glen Nevis. *S. molle* var. *molluscoides*, Glen Nevis and moor near Tulloch Station; Clackaig Inn, Glencoe (v.c. 98). *S. compactum* var. *subsquarrosus*, Corpach Moss and Glen Nevis; var. *imbricatum*, Loch Linnhe and Ben

Nevis. *S. squarrosus* var. *subsquarrosus*, side of Ben Nevis. *S. amblyphyllum* var. *macrophyllum*, Camusnagaul and Glen Nevis. *S. recurvum* var. *parvulum*, Glen Nevis. *S. fallax* var. *laxifolium*, bog near Creag Aoil. *S. cuspidatum* var. *plumulosum*, Glen Nevis. *S. subsecundum* var. *robustum*, Glen Nevis. *S. auriculatum* var. *tenellum*, Fort William; var. *laxifolium*, Glen Nevis; var. *submersum*, bank of Red Burn, Ben Nevis; Pass of Glencoe (98). *S. crassicaudum* var. *magnifolium*, near Fort William and Arisaig; Pass of Glencoe (98); var. *intermedium*, Ben Nevis. *S. Camusii*, Arisaig. *S. papillosum* var. *sublaeve*, Corpach Moss.

TRUE MOSSES.

Andreaea alpina, *A. nivalis* and var. *fuscescens*, Ben Nevis. *Tetraphis Browniana*, Glen Nevis. *Ditrichum tenuifolium*, Fort William. *Seligeria pusilla**, Creag Aoil. *Rhabdoweisia crenulata**, Glen Nevis. *Campylopus flexuosus* var. *zonatus**, Glen Nevis. *Dicranum Schisti*, *D. Starkei*, *D. uncinatum*, *D. asperulum*, Ben Nevis; *D. Bonjeani* var. *rugifolium**, Corpach Moss. *Fissidens decipiens**, Creag Aoil. *Racomitrium ellipticum*, *R. ramulosum**, Ben Nevis. *Barbula rubella* var. *dentata**, Glen Nevis; *B. tophacea**, *B. spadicea**, *B. convoluta**, Creag Aoil. *Weisia curvirostris**, Sunart. *Trichostomum crispulum** and var. *brevifolium**, Creag Aoil; *T. tenuirostre*, Glen Nevis. *Zygodon Lapponicus*, *Z. conoideus*, Glen Nevis. *Ulota Hutchinsiae*, Ben Nevis. *Orthotrichum anomalum* var. *saxatile**, Ballachulish; *O. cupulatum**, Creag Aoil; *O. affine**, Coire Choille, Spean Bridge. *Schistostega osmundacea**; this very rare moss, only once before found in Scotland, in Stirlingshire, was discovered by Mrs. Combe of Achriabhach, Glen Nevis, in a cave at the head of Glen Nevis on July 24, after the visit of the B.B.S. *Splachnum sphaericum*, *S. ampullaceum*, Corpach Moss. *Tetraplodon mnioides*, Ben Nevis. *Aulacomnium androgynum**, Glen Nevis. *Conostomum boreale*, Ben Nevis. *Bartramia Oederi*, Creag Aoil; *B. pomiformis* var. *crispa**, Glen Nevis. *Philonotis seriata*, Glen Nevis. *Leptobryum pyriforme**, *Webera annotina* var. *erecta** and var. *bulbifera**, Glen Nevis. *Bryum filiforme*, *B. inclinatum**, Glen Nevis; *B. pendulum**, *B. atropurpureum* var. *gracilentum**, Fort William. *Cinclidium stygium**, desiccated, on dried marsh, Loch Oich. *Neckera pumila**, Loch Sunart; var. *Philippeana*, Glen Nevis. *Anomodon viticulosus**, Creag Aoil. *Orthothecium intricatum**, Creag Aoil. *Brachythecium glareosum** and *Eurhynchium Swartzii**, Creag Aoil. *Amblystegium Sprucei**, Glen Nevis. *Hypnum stellatum* var. *protensum**, Creag Aoil; *H. cupressiforme* var. *filiforme**, Glen Nevis; var. *tectorum*, Creag Aoil; *H. callichroum* and *H. molluscum* var. *condensatum**, Glen Nevis; var. *fastigiatum**, Creag Aoil; *H. molle*, Ben Nevis; *H. arcticum**, Glen Nevis; *H. Schreberi* c. fr., Glen Roy.

HEPATICS.

This is a very short list, nearly all from Ben Nevis and Glen Nevis. *Aneura latifrons*, *A. palmata*. *Marsupella Stableri*, *M. Pear-*

soni. Gymnomitrium obtusum, G. crenulatum, G. varians. Lophozia alpestris. Sphenolobus ovatus, S. exsectus, S. exsectiformis. Anastrepta orcadensis. Plagiochila punctata. Chiloscypus polyanthus. Nowellia curvifolia. Bazzania tricenata. Herberta Hutchinsiae. Scapania subalpina var. undulifolia, S. umbrosa. Pleurozia purpurea. Lejeunea patens. Harpalejeunea ovata.

At Creag Aoil:—*Metzgeria pubescens**, *Lophozia Mülleri*, *Scapania aspera*. On Corpach Moss:—*Odontoschisma Sphagni*, *Calypogeia Trichomanis*, *Scapania gracilis*. Near Fort William:—*Calypogeia fissa*, *Microlejeunea ulicina*, *Frullania germana*, Loch Linnhe; *F. fragilifolia*, Kinloch Leven.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

By A. W. EXELL.

Enneastemon fornicatus (Baill.) Exell, comb. nov. (Annonaceae).

Popowia fornicata Baill. in Adansonia, viii. 318 (1868).—Engl. & Diels in Engl., Mon. Afr. Pflanz.-Fam. & -Gatt. vi. 50, t. 19, f. B (1901).

Clathrospermum biovulatum S. Moore in Journ. of Bot. xv. 65 (1877).

KENYA. Seyidie: Mombasa, *Boivin* s.n. (Herb. Paris, n.v.); Mida Forest, *Gardner* 1426 (Herb. Kew); Arabuko, *Graham* 1979 (Herb. Kew); Mombasa, *Kirk* s.n. (Herb. Kew); Kilifi, *Moggridge* 126 (Herb. Kew); Diani or Kiwi, *Napier* 6212 (Herb. Kew); north of Mombasa, *Whyte* s.n. (Herb. Mus. Brit.); Shimoni, south of Mombasa, *Whyte* s.n. (Herb. Kew).

TANGANYIKA TERRITORY. Tanga: Amboni, *Holst* 2789 (Herb. Kew). Bagamoyo: near Bagamoyo, *Hildebrandt* 1294 (Herb. Mus. Brit.; Herb. Kew). Mafia Island, *Wallace* 733 (Herb. Kew).

ZANZIBAR. *Boivin* s.n. (Herb. Paris, n.v.); *Kirk* s.n. (Herb. Kew); French Island, *Kirk* 16 (Herb. Kew); Marahubi, *Vaughan* 2223 (Herb. Mus. Brit.).

Although this species has only six stamens it must undoubtedly be transferred to the genus *Enneastemon* as the six petals have a uniseriate insertion, the three opposite the calyx-lobes being folded inwards and partially concealed in the bud by the other three petals. Species of *Enneastemon* can always be distinguished by examining the flower-bud, in which triangular portions of the inwardly curved petals are always visible at the base of the bud between the three petals which partially enclose them. This has been carefully explained by Robyns and Ghesquière (in Ann. Soc. Sci. Brux. liii. sér. B, 164 (1933)), and is clearly shown in their figure of *E. affinis* (loc. cit.). In species of *Popowia* the petals are truly biseriate and in the flower-bud only the three petals of the outer whorl are visible, those of the inner whorl being completely concealed.

The diagnosis of the genus *Enneastemon* must now be modified as follows:—"Stamina uniseriata, plerumque 9 nonnunquam 6."

Some further African species still included in *Popowia* may have to be transferred to *Enneastemon*, but all the Asiatic species which I have examined have proved to be true *Popowia* species.

BRYOLOGICAL NOMENCLATURE.

A CORRECTION.

By H. N. DIXON.

IN the June number of this Journal I gave notice of some proposals on Bryological Nomenclature to be made at the next International Congress. These included a proposal to treat the name *Hypnum myosuroides* Hedw. as a Nomen Ambiguum. Dr. Sprague has, however, pointed out that, though the use of the combination *H. myosuroides* is rendered invalid for future use by Hedwig's name, the epithet *myosuroides* is not invalid under a different genus. As the earliest new combination for the species in question, after Hedwig, is *Isothecium myosuroides* Brid., Bry. univ. ii. 369 (1827), this will stand for it under that genus, or if the species be placed under *Eurhynchium* the combination will be *E. myosuroides* (Brid.) Bry. eur.

Proposal II., referred to above, will therefore be withdrawn.

SHORT NOTE.

THE BLACK POPLAR IN SUSSEX.—In the recently published 'Flora of Sussex' it is stated (p. 418) that the Black Poplar is not known to occur in the county. Most of the trees recorded as *P. nigra* have turned out to be the frequently planted hybrid *P. serotina* Hartig (*P. deltoides* × *nigra*). On October 24th last a single old tree of *P. nigra* var. *betulifolia* was found by Mr. Cecil Norman and myself by the roadside near Sheffield Park Station, apparently wild. Dissection of the flower buds revealed female catkins. In my experience the male tree of this species is much the commoner in Britain. This variety is distinguished by its pubescent branches and is the only form found wild in this country.

It is believed to be indigenous in the Eastern Counties, where very large trees are occasionally met with.—A. B. JACKSON.

REVIEWS.

The Leguminous Plants of Wisconsin. By NORMAN C. FASSETT, with drawings by RICHARD EVANS. 8vo, 157 pp. The University of Wisconsin Press, Madison. \$3.

THIS interesting and suggestive account is illustrated by numerous photographs and drawings dealing with the taxonomy, ecology, and distribution of the Leguminosae in Wisconsin.

There are several keys for the identification of the species, one based on the vegetative characters, one on the flowers, one on the fruits, one on the seeds, and finally another of a somewhat novel and original character is based on the epidermal outgrowths, and is by Miss Catherine Mose.

As to the distribution of the Leguminosae native to Wisconsin the author points out that if one examines the maps here presented one will be impressed by the fact that with the exception of a few species centring in the driftless area Wisconsin is at the margin of the range of almost all of them. Indeed, only five species range throughout the State from the northern to the southern border; these are *Vicia americana*, *Lathyrus ochroleucus*, *Lathyrus palustris*, *L. venosus* var. *intonsus*, and *Astragalus canadensis*. The largest block comprising some eighteen species consists of south-eastern woodland species reaching their north-eastern limit in Wisconsin or sometimes in Minnesota or North Dakota. These include *Amphicarpa bracteata*, *Apios americana*, etc. Of prairie species reaching their north-eastern limits in Wisconsin, Michigan, or Indiana there are six *Baptisia leucantha* etc. Five prairie species reach their eastern limit in Wisconsin, *Psoralea argophyllum* etc. A small group is nearly or wholly confined to marine beaches and to those of the Great Lakes. First among these is *Lathyrus japonicus* var. *glaber*. The last group includes heterogeneous types such as the arctic alpine *Astragalus alpinus*.

Harshberger in his 'Phytogeographic Survey of North America' points out that the distribution of the timbered and prairie tracts in Wisconsin illustrates the dependence of the forest growth on the geologic and historic conditions rather than those having to do with climate. In the northern part of the State is the region of dense forest, although, as the statistics show, this is not a region of large precipitation. Another area covered by silicious sandstone is the pine district of the State. Personally, I am particularly interested in the types of some of the older North American Botanists which are in the collection in the Department of Botany here and I wish the author could have given us an account of some of the earlier collectors in Wisconsin.

There are not a large number of Leguminosae in Wisconsin. In *Crotalaria* the author has only had one species *Crotalaria sagittalis*. When dealing with the Tropical African species I found the matter much more difficult and had to account for about three hundred; but the author is much to be congratulated on this useful little book on which much care and time and trouble have been expended.

E. G. B.

Moss Flora of North America north of Mexico. By A. J. GROUT.
Vol. I, pt. 4. Published by the Author, Newfane, Vermont.
July 1939.

THIS part ends Vol. I, and leaves, presumably, only one part more to complete the whole work. It includes the whole of the

Pottiaceæ group of the Pottiaceæ, three of the genera being undertaken by other bryologists, the important genus *Tortula* by Dr. W. C. Steere.

The illustrations, as in other volumes, are admirable.

The volume ends with five pages of Additions and Corrections, not only to Vol. I, but also to the remaining volumes. It seems a pity that the latter were not paged and issued separately, to be placed at the end of the work, as a student is hardly likely to consult the Pottiaceæ to find, e. g., a new species of *Calliergon*! It is also to be noted that Plates cxxiv-cxxix deal with various Pleurocarpous mosses, not with any included in Vol. I. It is hoped that when the work is finished a complete index will be given, or at least a supplementary index to the volume indices, which will provide references to these descriptions and figures which occur out of their normal position.

On p. 194 the new combination *Acaulon rubrum* (Röhl) is made, on the ground that the dating of our nomenclature from 1801 rules out, as pre-Hedwigian, *Phascum muticum* Schreb. *P. muticum* Brid. Sp. M., I, 1, however, dates from 1806, and is legitimate. The combination will, therefore, be *A. muticum* (Brid.) C.M. (1847).

Near the bottom of p. 195 *P. carnicolum* is a misprint for *P. carniolicum*.

Throughout the treatment of the genus the spelling *Pterygoneurum* Jur. is used, though it appears correctly on the title-page and in the synonymy as *Pterygoneurum*. It is true that Juratzka spells it in the former way, but this is surely a case of an "unintentional orthographic error" (Rules of Internat. Bot. Nomenclature, Art. 70); the Greek *πτερυγο-* cannot admit of any other transliteration than *Pterygo-*.

British bryologists will scarcely agree to the reduction of *Aloina ambigua* to a variety of *A. aloides*, especially as the author (Mrs. Craig) does not claim to know the species in the field.—H. N. D.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—The first general meeting of the session was held on Oct. 26th. The President, after outlining the measures taken to ensure the safety of the property of the Society, said: "Much careful thought has been given to the desirability of moving the headquarters of the Society. It is the unanimous decision of the Council that the Society should carry out its normal activities so far as is possible. This is in the best interest of Fellows, of the Society, and of the subjects in which the Society is interested. Apart from the communications at meetings it is absolutely essential that biologists should have an opportunity for informal meeting at some central place in London, and we are of the opinion that the Society will be doing

a work of national importance by keeping its rooms open and allowing them to be used by other Societies or bodies of biologists who are in need of such a meeting place either for formal or informal discussions. . . .

"Times are bad financially, and for many will doubtless get worse. The Council is determined that The Linnean Society of London shall do its utmost not only to fulfil its duties to its Fellows but to play whatever part it can in the present national emergency: the Linnean Society has the obligation of its eminence and its history. As one sign of our attitude I may point out that it has been decided not to move any books, however valuable, from the Library: the Linnean library has gone—everything else remains for consultation.

"May I suggest that no Fellow should regard the Fellowship as a luxury, but as something to be continued if at all possible. Perhaps some Fellow may be more fortunate than the majority and be faced with the prospect of excess profits. If so, I am sure our Treasurer will be able to suggest a way in which some of these may be applied to a charity—for many need the solace that a study of nature brings."

Professor T. M. Harris gave an interesting account of his investigations on British Freshwater Dinoflagellata, describing the methods by which he has added greatly to our knowledge of this peculiar group.

THE Editor of 'Chronica Botanica' (Dr. Fr. Verdoorn) writes that "from January 1940 onwards (in spite of the international situation) it will be possible to publish the 'Chronica' as a weekly. The number of pages will be increased to over 850 a year (with over 150 illustrations, chiefly in special quarterly illustrated numbers); and throughout two columns of small print will be used. The cost may have to be increased by 25 per cent., but not more." All botanists will wish Dr. Verdoorn every success. It is very difficult for those in belligerent countries to keep track of research work carried out in enemy regions, and doubtless difficulties are not restricted to them. Botanists as such are not at war, and the wish to follow the advancement of their subject wherever it may be accomplished is not in any way subversive. Obviously the scheme can be carried out only in a neutral country. It is to be hoped that botanists here will give Dr. Verdoorn support in every way they can—and that no additional international difficulties will arise to put an end to the present arrangements.

A LAPSE in proof-correcting has unfortunately left the word "holotypes" instead of "holotypus" after *Alchemilla pseudo-minor* on p. 250: there can, by definition, be only one holotype or lectotype specimen to a name.—A. J. W.

GROWTH AND TENSIONS BETWEEN THE NERVES IN THE LEAF-BLADE OF *TAMUS COMMUNIS* LINN.

By I. H. BURKILL, Sec. L.S.

THE reticulate venation of the Dioscoreaceae has caused systematists to suggest a transfer of the family to the Dicotyledons, so little is it such as Monocotyledons usually have, and so deserving of close study. For the purpose of such study I have used *Tamus communis*, the Black Bryony, as it is abundantly available to me; and I trust I have isolated a few characters which are purely mechanical from the growth forces which beget them.

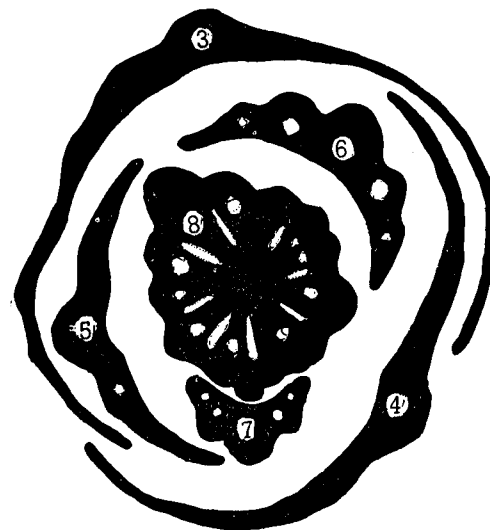


Fig. 1.—A section through a winter-bud at the level of the origin of the eighth emergence. The vascular bundles are indicated; that numbered 8 and the two rounded bundles on either side of it are the traces of leaf no. 8; the elongated are cauline bundles.

In this Journal (1937, p. 42) the new shoot of *Tamus communis* was figured at the stage it reaches in the south of England in February. The bud of such a shoot was taken and microtomed in order to supply data on the earliest stages of the leaf. Figs. 1 and 2, below, are from sections thus obtained. Fig. 1 cuts the third, fourth, fifth, sixth, and seventh foliar organs and the bracket-like base (soubassement foliare of Grégoire) of the eighth. The third, fourth, and fifth were destined to be arrested in growth, the third and fourth to remain scales, and the fifth to be sub-foliar. As the first and second foliar organs of this stem had in

February already become separated from the later organs by well-developed internodes (see figure in Journ. Bot. 1937), they do not appear in the section. This section, fig. 1, shows:—(a) that the axillary bud, seen as a protuberance in the axil of leaf no. 7, is actually on the axis; (b) that the base of the leaf-rudiment is not widely spread as in the majority of the Monocotyledons, but occupies upwards of one-quarter of the circumference of the axis; and (c) that the accident can happen of the edge of scale-leaf no. 3 slipping within the edge of scale-leaf no. 4.

Fig. 2, drawn on the same scale as fig. 1, cuts the bud closer to the apex. It passes through the axis just above leaf. no. 36

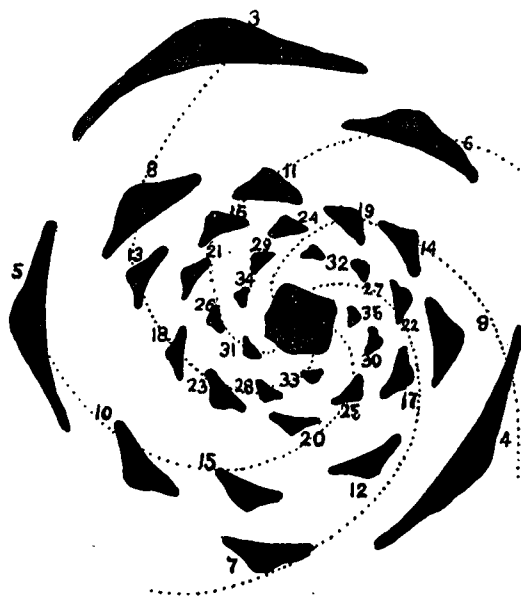


Fig. 2.—A section through the same winter-bud at the level of the origin of the thirty-seventh emergence. Five parastichies are apparent and are indicated by dotted lines.

which, being very small, does not project into the section; but leaf no. 37 is indicated by a relatively large protuberance on the axis, and this protuberance, like that of leaf no. 8 in fig. 1, occupies upwards of a quarter of the circumference.

Five parastichies can be recognized and have been indicated by dotted lines. It is appropriate with five that the foliar emergences should occupy less of the circumference than, say, one-fifth at their initiation or after a little growth, say, one-quarter: and this brings the size of the emergence into relation with the divergence which, in *Tamus*, varies commonly about

a higher fraction than is general in Monocotyledons; and so we find ourselves with three features in the leaf in which *Tamus* is not a typical Monocotyledon:—(i.) the narrowness of the bracket-like base of the leaf-rudiment, (ii.) the higher fraction of the divergence, and (iii.) the reticulation of the nerves.

But it remains to be added that some broad leaf-bases are produced in the Dioscoreaceae even to the extent of completely surrounding the axis, e. g., the calyptrate scale which makes a chamber for the bud. Breadth of base is a matter of relative growth; little growth of stem, big leaf-base; vigorous growth of stems, little leaf-base.

The protuberance no. 8 in fig. 1 has in its sector three more or less circular and two elongated vascular bundles. The former are the leaf-traces in progress from the leaf-base to the growing leaf; the latter are adjacent cauline bundles. All vegetative leaves and all leaf-scales which nearly approach leaves (see fig. 4) have three such leaf-traces; but a few scales at the bases of stems and bracts in general may go short in varying measure, because unwanted leaf-traces are not called into existence.

In passing it may be remarked that the bud of *Tamus* is not closely packed while growing up to the soil-surface.

Out of the many leaves in the bud sectioned, the seventh has been selected to supply the data in fig. 3 where thirty-two transverse sections show the stage reached by the vascular bundles. The distance between the sections in the two columns on the left and in the two columns on the right was 60μ . It was not necessary to figure freely the sections in the mid-length of the leaf and so those in the central column are 600μ apart. The whole leaf at the stage when cut was 3480μ long— $3\frac{1}{4}$ mm. The midrib had attained its full length, almost reaching the tip; the first lateral nerves were 600μ long and the second lateral nerves 300μ long. And what we learn is that the midrib is laid down from end to end of the young leaf well in advance of the nerves which follow. We learn also, that the young leaf has its growth in two phases; the differentiation of the midrib is part of the first phase, while the threading upwards of the lateral nerves is initiated in the second phase. There is nothing unexpected in the occurrence of two phases; the very abundantly studied coleoptile of *Avena* exhibits them in its elongation.

The outlines in fig. 3 show (d) that cordation begins very early, for it is already evident in leaf no. 7 at the third section, and (e) that the petiole has a contemporaneous differentiation, becoming evident in the second section as an intercalation between two loci of no elongation wherein are vascular commissures (sections 1 and 3), the one locus placed where the stem and petiole merge and the other where the petiole and leaf-blade merge.

It is not necessary to draw outlines of other young leaves, but it has to be stated (f) that, in the bud, from the thirtieth

rudiment forward vascular differentiation was not evident; (g) that the midrib appeared from end to end so abruptly as to be present in all its length in the twenty-ninth; (h) that the first lateral nerves became evident at the time when widening of the blade could be detected and in the bud were present up to and including the twelfth; and (j) that the second lateral nerves were present up to and including the ninth, as threads pushing their way up from below. The event (g) belongs to the first phase, and the events (h) and (j) to the second.

Ultimately the first lateral nerves attain the neighbourhood of the thickening with which the midrib ends and end in a thickening themselves near, but not quite in contact (see figs. 5 & 6).

Throughout development young nerves capture junctions with equally young nerves or nerves just a trifle older; but not

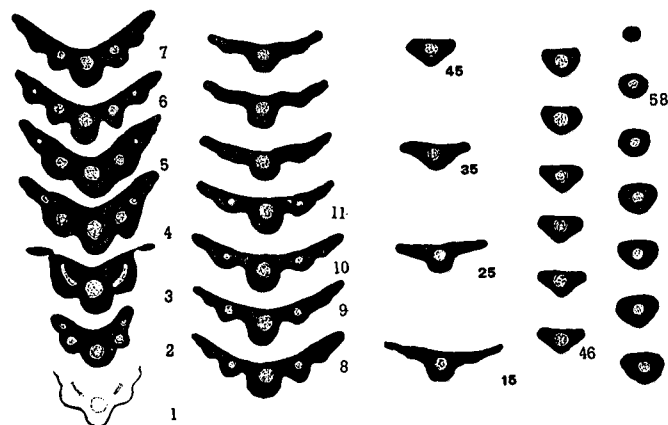


Fig. 3.—Sections of leaf no. 7 at intervals from the base to the apex, from 1 to 15 at $60\ \mu$ apart, from 15 to 45 at $600\ \mu$ apart, and from 45 to 59 again at $60\ \mu$ apart, the vascular development indicated.

with nerves decidedly older; and it seems that the first lateral nerves reach the neighbourhood of the apex too late to be able to capture a junction—at any rate, they do not, but, growth ceasing in the leaf-tip, throughout the life of the leaf rest in close approximation. This cessation of growth spreading down the blade hinders the second and third lateral nerves from approaching the apex. For it to spread down the blade is a Monocotyledonous feature.

Analysis of development suggests that all nerves pass through a stage of potentiality for capturing; but slackening growth may put a limit to the necessary approach. The tissues are the masters. They call out or stop vasculature to such an extent that morphologists who base conclusions on vasculature run great risks of error.

The association of commissural nerves with loci of no elongation cannot be discussed here; but fig. 4 shows the absence of commissural nerves in a leaf-scale at the top of the imperfect petiole where in fully formed leaves they invariably mark such a locus.

In the leaf-rudiments of the winter-bud under study, vascular tissue had newly appeared when the ratio of length to breadth was as seven to one. Thereafter growth in length and breadth kept this proportion until the leaf had elongated to three times

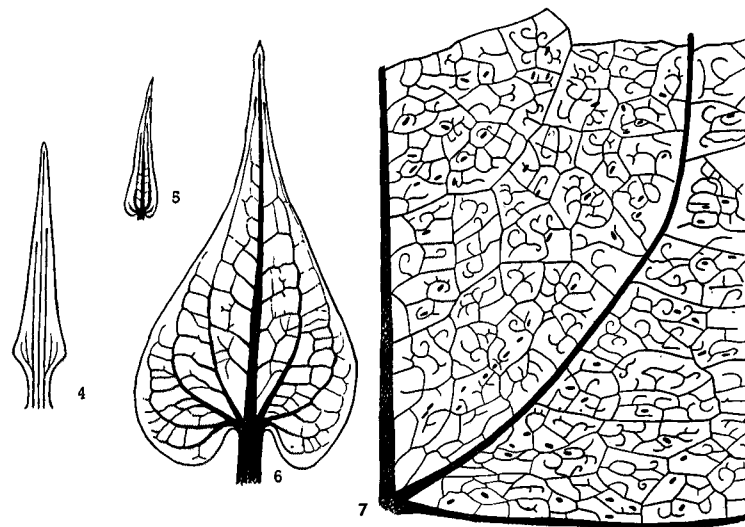


Fig. 4.—A scale-leaf from the base of a stem, $\times 10/3$, showing the course of the three leaf-traces to the blade, and that, transverse growth of the blade being arrested, they remain straight and parallel: they end in a slight thickening. Fig. 5.—A leaf 6 mm. long, showing the nerves developed at this stage, their cross-ties, and the arcuation resulting from the resistance of the cross-ties to the pushing upwards of the first lateral nerves, $\times 10/3$. Fig. 6.—A leaf 1.4 cm. long, showing the nerves developed at this stage and the arcuations into which growth forces them, $\times 10/3$. Fig. 7.—Part of a mature leaf with the base of the mid-rib on the left, showing the final development of the nerves and microscopic nervules and the position of raphides, $\times 10/3$.

what it was. Then the relative rates of the growth in the two dimensions began to change in favour of growth in breadth, and there is no subsequent reversal of this. Consequently the longer a leaf-blade maintains growth the more is the breadth likely to exceed the length (as it does in fig. 14). This leads me to mention that this is the reason why on a stem the lower leaves are likely to be relatively broader than the upper, and why it is possible by decapitating a shoot to force leaves into an extremely broad condition through over-nourishment.

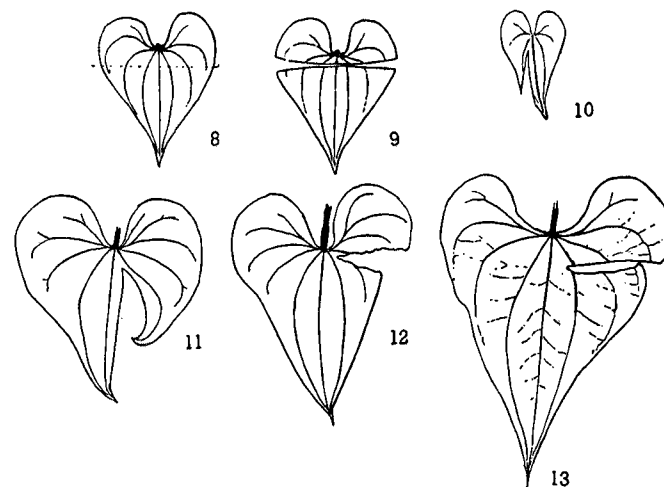
The rule of alteration of direction of growth holds good throughout the Dioscoreaceae and neglect to allow for it has vitiated the work of certain taxonomists who have been content to define species by upper leaves only.

To illustrate the further progress of nerve-formation figs. 5 and 6 are given. Fig. 5 was drawn from a young leaf 6 mm. long. In it the early thickening of the blade, from the base upwards along the course of the nerves, is indicated. Fig. 6 was drawn from a young leaf 1.4 cm. long. In it the fourth and fifth lateral nerves were well developed, and secondary and tertiary nerves were capturing junctions with similar or slightly older nerves, making thereby the network. The fully built-up network is drawn in figs. 14 and 15. Meanwhile, a microscopic set of nervules is forming, which can be seen only if the leaf be cleared, as for instance by bleaching in the sun after smearing with glycerine. These microscopic nervules are evenly curved and free at the ends (fig. 7). Why curved thus? It seems that they are too weak to capture junctions with the surrounding nerves, witness, for instance, how they fail to capture any junctions with the midrib. The midrib, it may be recalled, is free-ended, but at the time of its formation there is no vascular tissue for it to capture; and the first lateral nerves are free-ended as already mentioned, all three with thickening. Secondary and tertiary nerves are never free-ended, but pull and push on each other by means of junctions and commissural nerves. Then, as the nerves possess an evenly distributed tendency to straighten themselves, if this be resisted a curve results as even as their gradual decrease in size and their ties allow. Where junctions and commissures come into play the larger of any two nerves that are bound together maintains the straighter course, and the midrib as the largest of all keeps the straightest course. The thicker parts of the lateral nerves, *i. e.*, the parts towards the base of the leaf, are usually straighter than the thinner distal parts. The older a nerve, the sooner is it rigid, and age combines with size in shaping the network. Whatever power, if any, the turgidity of cells in the assimilating tissue between the nerves may have in a very young leaf, there is little or none in the older leaf as the slight bullation of these parts indicates. The margin of the leaf-blade is beyond the pull and push between nerves, and when the nerves are interacting to form the general character of the net, the leaf, quite independently of their pulls, is growing to its outline. Therefore in systematic work the outline of the blade and the nature of the network are separable characters. But, as will be noted later, the margin is capable of exercising a push.

The following paragraphs illustrate ways in which the nerves can be made to exhibit that tendency to straighten themselves which has been postulated. In studying the questions which

arose very numerous mutilations were made, from the results of which enough will be taken for illustration.

If a leaf at the time of its greatest rate of growth, say when about 3 cm. across, be taken and without removal from the plant be cut across as in fig. 8, the cut gapes as in fig. 9. This gaping is produced by the effort of the larger nerves to straighten themselves at the expense of the slightly bullate assimilating tissue. Fig. 10 is of a leaf mutilated in a different way. A stem was bent down into water and fixed; then the leaf figured was cut as indicated. The drawing was made eighteen hours later. It shows how the first lateral nerve on one side, having been freed from its ties to the midrib, so that it could straighten itself, caused the cut to gape; at the same time the opposing first



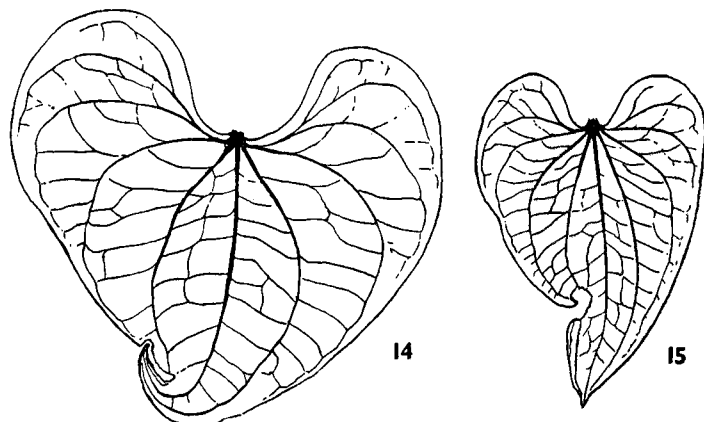
Figs. 8-13.—Leaves showing the effects of mutilations, $\times 2/5$.
For descriptions see the text.

lateral nerve was able to pull the thinner part of the midrib and the apex of the leaf out of line. Figs. 11, 12, and 13 are of leaves mutilated when very young and left to mature. In figs. 12 and 13 the auricle had been drawn out sideways. In fig. 11 the effort of the lower parts of the lateral nerves to straighten had straightened the lower and stronger basal part, but the growth of the margin had curved its upper part. The uncut first lateral nerve on the opposite side had pushed the apex crooked. Caution is necessary, however, in claiming the push of the margin here, for that part of the leaf-blade just above the cut may have been deprived of a source of auxin; but the claim that the attempt of the nerves to straighten brought the other disturbances about cannot be weakened.

In experiments where growth is allowed to continue there is obviously another factor, namely the drag of dead tissue along the cut. Allowance may be made for it in interpreting the shape given to leaf no. 11; but in leaves nos. 12 and 13 resistance from the dead edge would not have had the effect produced.

Any hedgerow rich in plants of *Tamus* will provide such leaves as shown in figs. 14 and 15. In these leaves during early growth, injury to the margin near the apex (it must be near the apex) upset the balance of pull and push between the two sides of the midrib and the apex was forced as the result into a hook.

Many fully grown leaf-blades have been measured along the midrib and along the first lateral nerves and along the second and third lateral nerves continuing the measured line to the



Figs. 14 & 15.—Leaves from hedgerows illustrating the most common malformations resulting from injury to the margin. The leaf on the right had ceased growth earlier than the leaf on the left and consequently is relatively narrow, $\times \frac{1}{2}$.

apex because it is not possible to fix a point where these end. The result is that the first lateral nerves are on the average 7 per cent. longer than the midrib, the prolonged line of the second laterals 20 per cent. longer than the first lateral nerves, and the prolonged line of the third lateral nerves 25 per cent. longer than the prolonged line of the second lateral nerves. This is a measure of their increasing curvature and related to their relative weakness whereto the curvature is to be ascribed. What these lateral nerves submit to, the still weaker secondary nerves submit to also, save for their ties; and by pulls the submarginal loops, *inter alia*, are produced.

The first lateral nerves have a reversed curve just under the apex, attributable to the cessation of growth there. It is possible to envisage the up-welling growth as under the influence of a

current of food brought up from below which weakens by withdrawals on the way, but it will be difficult to find proof. A sinuation of the margin lower down, characteristic of some, but not all, plants suggests that the slackening of growth from which that reversed curve results may be repeated.

NOTES ON NARCISSI.

BY H. W. PUGSLEY, B.A., F.L.S.

NARCISSUS MINOR L.

In my Monograph of *Narcissus* subgenus *Ajax*, published in Journ. Roy. Hort. Soc. lviii. 17-59 (1933), allusion was made to the curious fact that, although this species had been in cultivation for over three centuries, no certainly wild specimens could be traced in herbaria. Similar uncertainty obtains with *N. pumilus* Salisb. and *N. namus* Spach, although a plant akin to the former was obtained in Portugal by Dr. P. L. Giuseppi in 1932 (Mon. p. 46). In April, 1934, wild Portuguese specimens were received in Herb. Mus. Brit. from Dr. Giuseppi which differed from the plant resembling *N. pumilus* that he had collected in 1932. These appear practically identical with *N. minor*, bearing flowers only 27-30 mm. long and with the characteristic narrow, obovoid capsules of that species. The fruit of *N. minor*—a garden plant—is very uniform in its narrowly obovoid or pyriform shape. This may be seen equally in modern exsiccatae, in the Linnaean type-specimen, and in existing plates; and the feature is mentioned by Salisbury in Prodr. Chapel-Allerton, p. 220 (1796) under his *N. exiguus*. Such uniformity might be expected in a plant obtained by vegetative increase over a long period of cultivation. As the immature capsules of Dr. Giuseppi's specimens very nearly resemble those of authentic *N. minor* and no other points of difference are seen, the plants may be held conspecific, and the species can be thus located as a native of Portugal. This accords with the statements of Salisbury and Brotero cited in the Monograph (l. c. 44).

Daffodils resembling *N. minor*, however, have long been known from the south of France, and the specimens of this nature at Kew from near Grasse and Mentone are discussed in the Monograph (l. c. 44). My interest in these was renewed in April, 1937, by receiving from Miss M. S. Campbell similar living specimens from an undoubtedly native station in the Alpes-Maritimes. They were somewhat faded, but the following spring I visited the Riviera, and under Miss Campbell's guidance was enabled to see the living plant in two distinct stations not far from Grasse at altitudes of about 2500 and 3000 feet. Both localities were on calcareous ground, with more or less scattered scrub of *Quercus pubescens* Willd. The daffodils were in full bloom over a limited

area in company with *Crocus versicolor* Ker and *Erythronium Dens-Canis* L. at the higher station on 5th April, and the following day a little lower they were past their best and many had developed fruits. These plants were of very uniform stature and at once recalled *N. minor*; the majority had deep yellow flowers, but in both places a number of bicolors were present among them. An examination of the specimens then secured shows that while they clearly belong to the Series *Minores* and are most closely allied to *N. minor*, they differ in the shorter pedicels, the lower insertion of the filaments, and most notably in the form of the fruit. A large number of fruiting plants were observed, and while the capsules showed a certain degree of variation, they invariably tended to be globular, and no individual was found in which the fruit became obovoid or attenuate below as in *N. minor*. It therefore appears unlikely that the *N. minor* of gardens was ever obtained by selection from this wild plant of the Alpes-Maritimes, and evident that in spite of their general similarity the two plants are essentially distinct.

It has also been necessary to compare these specimens with the Riviera exsiccata named *N. minor* at Kew. Of the two examples from near Grasse the earlier (Jaury, 1820, ex Herb. Gay) is a dwarf plant, now in poor condition, that is presumably identical with my specimens and probably came from one of the stations that I visited. The later one (sent to Gay from Grasse in 1862) is much taller and more robust, and looks rather like *N. pumilus*; Gay states in correspondence attached to the sheet that he cannot separate it from the *N. Pseudo-Narcissus* of Vincennes. There were no plants like this among those that I saw growing. The specimens from near Mentone, or rather Ventimiglia, collected by Moggridge, are likewise relatively tall and coarse plants, obviously not referable to *N. minor*. They were flowering in the second half of April, and whether they belong to *N. pumilus* or to *N. Pseudo-Narcissus* is now hardly determinable. Reverchon's plant from the neighbouring Mont Aution (no. 134 in Herb. Mus. Brit.) is probably the same form: this was collected on 27th May, 1886—the late date perhaps due to the higher altitude (c. 6000 feet). It is evident that at least two distinct daffodils grow in the Alpes-Maritimes and the adjacent Italian mountains, one a dwarf early-flowering species belonging to the *Minores*, the other a larger, later-flowering plant whose affinity is still uncertain. None of these plants seems identical with the dwarf Pyrenean form described as var. *minoriformis* of *N. Pseudo-Narcissus* (Mon. p. 64).

It is proposed to describe the dwarf daffodil of Grasse as a new species, thus:—

***Narcissus provincialis* Pugsl., sp. nov.**

Exsicc. Pugsley, nos. 584 (type) and 586; Jaury, Grasse, 1820, as *N. minor*, in Herb. Kew.

Bulbus parvus, ovoideus. *Folia* sæpissime 2, rarius 3, $\pm$ *patentia*, 7–12 cm. longa, 3–5 (–6) mm. lata, leviter canaliculata. Scapus 8–16 cm. longus, suberectus ad nutans, gracilis, valde striatus; *pedicellus* porrectus, sursum curvatus, *gracillimus*, (3–) 5–10 (–12) mm. longus. *Flos* parvus, *horizontalis nutansve*, 30–40 (–45) mm. longus, aureus, fere concolor; *perianthii* tubus 12–15 mm. longus, $\pm$ anguste obconicus, *segmenta angusta*, oblongo-lanceolata, subacuta, vix imbricata, erecto-patentia, $\pm$ torta, quam corona paulo breviora vel eam æquantia; *corona* quam in *N. minore* paulo latior, *superne sensim dilatata*, *marginè lobis* contiguis vel *crispatim imbricantibus erecto-patentibus* irregulariter sed leviter fissis $\pm$ *sexlobato*. *Filamenta* 2–3 mm. *supra perianthii basin inserta*. *Capsula* 10–15 mm. longa, fere *subglobosa*, infra abrupte contracta, obtusissime trigona, vix sulcata.

Bulb small, ovoid, about 20 mm. long, with thin, pale brown scales. *Leaves* usually 2, more rarely 3, $\pm$ *spreading*, 7–12 cm. long, glaucous, slightly channelled throughout, 3–5 (–6) mm. broad, with rounded, slightly attenuate apex. Scape 8–16 cm. long, suberect or inclined, slender, slightly compressed but 2-edged, strongly striate. *Spathe* thinly membranous. *Pedicel* porrect and curved above, *very slender* (2–) 5–10 (–12) mm. long. *Flower* small, *horizontal or nodding*, 30–40 (–45) mm. long (excluding ovary), of a golden yellow, nearly concolorous; *perianth-tube* 12–15 mm. long, $\pm$ narrowly obconic; *perianth-segments* narrow, oblong-lanceolate, subacute, scarcely imbricated, erect-spreading, $\pm$ twisted, equalling or a little shorter than the corona; *corona* rather broader than in *N. minor*, *gradually dilated upwards with $\pm$ 6-lobed margin*, the lobes *erect-spreading*, contiguous or overlapping, irregularly crenate or crenate-serrate, $\pm$ longitudinally plicate. Stamens and style relatively short; *filaments inserted* 2–3 mm. above base of *perianth-tube*; stigma small, 3-lobed. *Capsule* 10–15 mm. long, *subglobose to broadly ellipsoid*, abruptly contracted to the slender pedicel, very obtusely trigonous and scarcely furrowed. Chalazal end of seed strongly appendiculate.

β . *bicolorans*, var. nov.

Exsicc. Pugsley no. 585.

Floribus bicoloribus, *perianthii* segmentis stramineis sæpe paulo latioribus minusque tortis, coronâ dilutius aureâ minus lobatâ a typo differt.

Differs from the type in its bicoloured flowers; *perianth-tube* light or greenish yellow; *perianth-segments* straw- or cream-coloured, often rather broader and less twisted; *corona* light yellow, less deeply lobed.

N. provincialis is most nearly allied to *N. minor* L., from which it differs by its rather narrower leaves, shorter and very slender pedicels, somewhat larger and typically almost concolorous flowers with a rather broader corona, filaments inserted lower

in the perianth-tube, and chiefly its more or less globose fruits. *N. pumilus* Salisb. is a larger plant, with broader leaves, rather larger flowers with more deeply lobed corona, and oblong fruits. *N. nanus* Spach is readily separable by its erect habit, broad foliage, and broader, bicoloured flowers.

NARCISSUS ODORUS L.

The occurrence of this species in a perfectly naturalized state near St. Austell, in Cornwall, was reported by F. H. Davey in this Journal in 1906 (xliv. 215), and repeated in the 'Flora of Cornwall,' p. 431 (1909). Several thousands of plants are stated to have been seen in and about a damp field. I remember hearing not long afterwards that a nurseryman had "bought the whole crop," and that, as far as possible, all of the bulbs had been dug up for sale. A few, however, escaped destruction, and a specimen was sent me in the spring of 1937.

Davey's identification of the plant with *N. odorus* L. is inaccurate, and it was more correctly listed in contemporary horticultural catalogues under the name of *N. heminalis*. *N. odorus* was originally described in Sp. Pl., ed. 2, 415 (1762), with a diagnosis "*N. spatha submultiflora, nectario campanulato sexfido laevi dimidio brevior petalis*," to which was added "Flos luteus, triplo major flore *N. Tazettae*, varians spatha uniflora et multiflora. Nectarium non fimbriatum, sed ore diviso lobis sex obtusis." There is a specimen in the Linnaean herbarium, which unfortunately is not at present accessible, that was recognized as agreeing with Linnæus's description by Salisbury (Prodr. p. 224) and by Haworth (Mon. p. 6). Curtis (Bot. Mag. no. 934) figures a one-flowered form, naming it *N. calathinus* L., which he regarded as synonymous with Linnæus's *N. odorus*. The plant is again figured in Burbidge and Baker's 'Narcissus,' plate xxiii (1875), and in Barr's horticultural catalogue of 1886, and was well known to gardeners of the beginning of this century. A form of it is commonly sold to-day as the Campanelle or Campanelle Jonquil. The salient features of the plant, as recognized by all authors, are its semi-terete rush-like leaves, its distant, waved perianth-segments, and its corona of only half their length with the margin divided into six rounded, subentire and spreading lobes.

The Cornish plant differs from *N. odorus* by its broader, imbricated perianth-segments, and more notably by its corona, which is infundibuliform or funnel-shaped and not campanulate, and at least two-thirds as long as the perianth, with an erect, nearly truncate and scarcely lobed margin. The corona is of a distinctly deeper yellow than the perianth. This plant agrees with Salisbury's and Haworth's accounts of *Philogyne heminalis* (Trans. Hort. Soc. i. 356 (1812), Narciss. Rev. 136 (1819), and Mon. Narc. 7 (1931)), and with the figure of *N. odorus* var. *heminalis* on plate xxiv of Burbidge & Baker's 'Narcissus'; and

it was sold by nurserymen in the early years of this century as *N. heminalis*. Salisbury, however, was not the first to distinguish it, for it had already been described by Poirét in Lamarck's 'Encyclopédie Méthodique,' iv. 427 (1798), under the name of *N. infundibulum*, and this name appears among the synonyms cited in Salisbury's original account (Trans. Hort. Soc. l.c.). Poirét's description seems to be almost unmistakable—"N. multiflorus; nectario infundibuliformi, calycem subæquante integro; foliis canaliculatis... spathes avec 2-3 fleurs jaunes... La corolle... segments ovales, obtus, arrondis... très souvent mucronés. La couronne infundibuliforme, presque aussi longue que les segments, tronquée et point frangée ni lobée à ses bords."

A third plant of this group, *N. trilobus*, is described by Linnæus (Sp. Pl., ed. 2, 417) as "*N. spatha submultiflora, nectario campanulato subtrifido integerrimo dimidio brevior petalis. Similis N. Jonquillæ sed nectarium cylindricum, longitudine plus quam dimidiæ petalorum, non crispum sed obsolete trilobum*." This is represented by a specimen in the Linnaean Herbarium, which Salisbury says is identical with Curtis's figure of *N. odorus* (Bot. Mag. no. 78). The corona is shown in this plate as distinctly crenulate and lobed, and is clearly different from that of *N. heminalis* and *N. odorus*.

The correct name of the Cornish plant would therefore appear to be:—

N. INFUNDIBULUM Poirét in Lamk. Encycl. Méth., Bot., iv. 427 (1798).

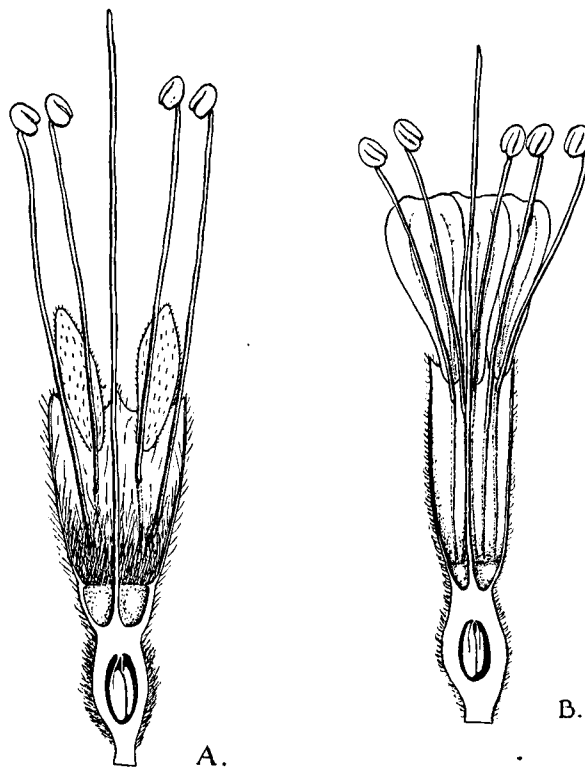
Philogyne heminalis Salisb. in Trans. Hort. Soc. i. 356 (1812); Haworth, Narc. Revis. 115 (1819); Mon. Narc. 7 (1831); *N. heminalis* Schultes, Syst. Veg. vii. 960 (1830); *Queltia odoros* γ *heminalis* Herbert, Amaryll. 314 (1837); *N. odoros* v. *trilobus* f. *heminalis* Baker, Amaryll. 6 (1888).

Narcissus odoros has been known as a garden plant since the sixteenth century, and this, as well as *N. trilobus* and *N. infundibulum*, was apparently recognized by Parkinson. It is likely that they were originally brought into cultivation as natural wild hybrids, and the parentage given by Rouy (Fl. Fr. xiii. 35 (1912)—*N. odoros*=*N. major* × *Jonquilla*, *N. infundibulum*=*N. muticus* × *Jonquilla*, and *N. trilobus*=*N. lorifolius* × *Jonquilla*—is not improbable, although *N. juncifolius* Req. might possibly be substituted for *N. Jonquilla* L. They all seem to occur occasionally as naturalized plants in the Mediterranean region from Spain to Dalmatia. Salisbury gives the Cevennes as the probable source of *N. infundibulum*. There are early specimens of *N. odoros* and *N. trilobus* in Herb. Mus. Brit. from Collinson's garden at Mill Hill, but *N. infundibulum* is not represented.

THREE NEW SPECIES OF *COMBRETUM* FROM MADAGASCAR.

By A. W. EXELL, M.A., F.L.S.

THE three new species here described are all closely related to *C. phaneropetalum* Bak. and to each other. They belong to Sect. *Trichopetalae* Engl. & Diels. Although two of them have glabrous petals, I cannot agree with Engler and Diels* that



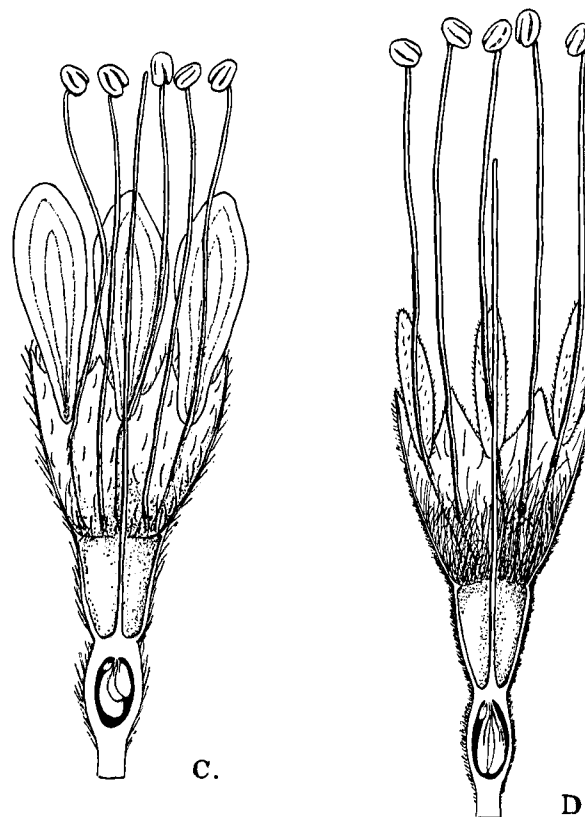
this character is a good one on which to separate their sections *Grandiflorae* and *Trichopetalae*, if, indeed, these sections are distinct enough to be kept apart. The affinity of these three new species and of *C. phaneropetalum* Bak. is clearly with *C. aculeatum* Vent. from north-eastern and eastern Africa.

It is unfortunate that each of the species described is represented by but a single gathering, but the differences are such

* See Engl. & Diels, Mon. Afr. Pflanz.-Fam., Gatt. III, 11 (1899).

(especially in the disk) that it is unlikely that they represent forms of a single variable species. Below is a summary of the main points of difference distinguishing the four species involved :

C. KAUDERNII Exell. *Leaves* hairy ; *inflorescences* corymbose ; *flowers* tetramerous ; *disk* cupuliform, 1×1 mm. ; *petals* 4×1 mm., hairy (fig. A).



Longitudinal sections of the flower, × 5.

A. *Combretum Kaudernii* Exell ; B. *C. phaneropetalum* Bak. ;
C. *C. Whitei* Exell ; D. *C. majungense* Exell.

C. PHANEROPETALUM Bak. *Leaves* hairy ; *flowers* mostly pentamerous ; *disk* minute ; *petals* 5.5×1.8 mm., glabrous (fig. B).

C. WHITEI Exell. *Leaves* hairy ; *flowers* pentamerous ; *disk* infundibuliform, 2.5-3×2 mm. ; *petals* 6.5×1.8 mm., glabrous (fig. C).

C. MAJUNGENSE Exell. *Leaves* almost glabrous; *flowers* pentamerous; *disk* infundibuliform, 3×1.8 mm.; *petals* 4×0.8 mm., hairy (fig. D).

Combretum Kaudernii Exell, sp. nov. (fig. A). *Frutex* scandens, ramulis sericeo-tomentosis demum glabrescentibus. *Folia* opposita petiolata, petiolo 4–5 mm. longo, sericeo-tomentoso, lamina lanceolato-elliptica vel oblongo-elliptica vel oblonga apice breviter acuminata acuta basi rotundata plerumque paullo cordata, $3.5\text{--}6 \times 1.7\text{--}2$ cm., supra appresse sericeo-pilosa subtus primo tomentosa demum sericeo-pilosula vel sericeo-pubescenti, costis lateralibus 5–6 paris. *Inflorescentiae* corymbosae, 4–12-florae pseudo-umbellatae in paniculis terminales bracteatas dispositae, inflorescentiarum bracteis foliaceis albidis in folia vera deorsum transientibus; floribus tetrameris breviter pedicellatis, bracteolis 2–3 mm. longis subulatis usque ovato-lanceolatis in bracteis foliaceas transientibus. *Receptaculum* superius infundibuliforme, $5\text{--}6 \times 2.5\text{--}3$ mm. extus tomentosum vel tomentellum, inferiore sericeo-tomentoso, 3×0.8 mm. *Discus* cupuliforme 1×1 mm. margine tomentoso vix libero ceteroque glaber. *Calycis lobi* deltoidei acuminati acuti 1 mm. longi. *Petala* anguste elliptica, 4×1 mm., pubescentia. *Stamina* 8, exserta, filamentis 9–10 mm. longis basin versus purpureis, antheris 1 mm. longis. *Ovarium* 2-ovulatum, stylo exserto, 15–16 mm. longo. *Fructus* 4-alatus ambitu orbiculare, $1.5\text{--}2$ cm. in diam., pubescens verisimiliter glabrescens, alis tenuibus, 7–8 mm. latis.

Hab. N.W. MADAGASCAR. Ste. Marie de Marovoay, fl. & fr., 1. ix. 1911, W. Kaudern s. n. (typus in Herb. Stockholm.).

This species differs from *C. phaneropetalum* Bak. in having relatively longer narrower leaves, whitish foliaceous bracts in the inflorescences, much smaller, pubescent petals, and tetramerous flowers grouped in corymbs instead of in short racemes. The fruits are also larger.

Combretum majungense Exell, sp. nov. (fig. D). *Frutex* scandens, ramulis primo sericeo-pilosulis mox glabrescentibus. *Folia* opposita petiolata, petiolo 8–12 mm. longo primo puberulo mox glabrescenti, lamina ovato-oblonga vel elliptica apice acuta nonnunquam breviter acuminata basi rotundata, usque 5.5×2.5 cm., primo sparse pilosula glutinosa mox in nervorum axillis subtus pilosula ceteroque glabra demum supra sparse verruculosa, costis lateralibus 5–6 paris. *Flores* pentameri breviter pedicellati vel subsessiles in racemos breves axillares 3–4 cm. longos bracteatos dispositi, bracteolis superioribus anguste ellipticis, 4×1 mm., tomentosis, deorsum in bracteis foliaceas ovato-oblongas usque 1.8×0.8 cm. demum sparse pubescentes transientibus. *Receptaculum* superius infundibuliforme, $7 \times 3\text{--}4$ mm., extus sericeo-tomentellum, intus dense

tomentosum, inferius $2.5 \times 0.8\text{--}1$ mm., tomentellum. *Discus* infundibuliforme, 3×1.5 mm. margine tomentoso haud libero ceteroque glaber. *Calycis lobi* triangulares, 1.5×1 mm. *Petala* 5, anguste elliptica, 4×0.9 mm., extus sericeo-pilosa intus puberula. *Stamina* 10, filamentis exsertis purpureis, 12–15 mm. longis. *Ovarium* 4-ovulatum (ovulo unico abortivo), stylo exserto, 14–17 mm. longo. *Fructus* ambitu ellipticus, 2.2×1.4 mm., pubescens, 5-alatus, alis tenuibus 5–6 mm. latis.

Hab. N.W. MADAGASCAR. Majunga, fl. & fr., 19. x. 1912, W. Kaudern s. n. (typus in Herb. Stockholm.).

This species differs from *C. phaneropetalum* Bak. in having nearly glabrous leaves, a much larger, better-developed disk, and much smaller, pilose petals.

Combretum Whitei Exell, sp. nov. (fig. C). *Frutex* verisimiliter nonnunquam scandens, ramulis primo dense sericeo-pubescentibus demum glabrescentibus. *Folia* (juvenilia) opposita breviter petiolata, petiolo 1–3 mm. longo dense sericeo-pubescenti, lamina ovale apice apiculata basi obtusa vel rotundata, $1.5\text{--}2 \times 0.8\text{--}1.2$ cm., supra pubescenti et minute verruculosa subtus pubescenti, costis lateralibus 4–5 paris. *Flores* pentameri breviter pedicellati, pedicello 1 mm. longo, in racemos 2–4 cm. longos terminales vel axillares dispositi vel paniculas breves formantes, bracteolis superioribus ovato-lanceolatis, $6\text{--}7 \times 2\text{--}3.5$ mm., pubescentibus deorsum in bracteis foliaceas ad 13×6 mm. transientibus. *Receptaculum* superius infundibuliforme, $6 \times 3\text{--}4.5$ mm., sericeo-pilosulum, inferius $3 \times 1\text{--}1.5$ mm., dense sericeo-pilosum. *Calycis lobi* anguste triangulares, 1.5×1 mm. *Discus* infundibuliforme, $2.5\text{--}3 \times 2$ mm., glaber, margine haud libero. *Petala* 5, anguste elliptica 6.5×1.8 mm., glabra. *Stamina* 10, filamentis exsertis, longioribus 12 mm. longis, brevioribus 9 mm. longis, antheris 0.7 mm. longis. *Ovarium* 4-ovulatum (ovulo unico abortivo), stylo exserto, 15 mm. longo. *Fructus* ignotus.

Hab. S.W. MADAGASCAR. Tulear: 50 miles south of Ankazobabo, fl., 3. x. 1929, E. I. White s. n. (typus in Herb. Mus. Brit.).

"Large bush."

This species is very near to *C. phaneropetalum* Bak., but differs distinctly in the structure of the flower. It has a well-developed infundibuliform disk $2.5\text{--}3$ mm. long, and the staminal filaments of the whorl opposite the sepals are inserted just above the margin of the disk. In *C. phaneropetalum* the disk is very poorly developed, and there is a gap of about 2 mm. between it and the insertion of the filaments.

The leaves in the specimen described are all young and may well attain greater dimensions at maturity. From the twisted appearance of the single branchlet which constitutes the specimen it seems probable that the species, although described by the

collector as a "large bush," would be a climber in suitable circumstances.

This species is named after my friend and colleague Dr. E. I. White, who collected it during a geological expedition to Madagascar.

I am grateful to the Director of the Botanical Department of the Natural History Museum of Stockholm for lending the material on which the two species *C. Kaudernii* and *C. majungense* are based.

STUDIES OF BRITISH POTAMOGETONS.—X-XI.

By J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

X. ANOTHER RECORD OF *×POTAMOGETON FLUITANS* FROM SOUTH HANTS.

In the summer of this year, as we reported in a recent note (p. 255 *supra*), the rare hybrid *×Potamogeton fluitans* was collected by P. M. Hall in the Moors River at Palmer's Ford, South Hants, and also higher up the river on the Dorset side. Since that note was published we have had the opportunity to examine the collection of *P. lucens* in the herbarium of the South London Botanical Institute, and included in it we found a series of specimens collected by F. Townsend in a tributary of the River Stour (*i. e.*, the Moors R.) near Hurn Station, South Hants, in June 1879, and named *P. lucens* "approaching var. *acuminatus*". The series comprises specimens not only of *P. lucens* but also of its hybrid *×P. fluitans*, and it is remarkable that such an interesting plant, gathered sixty years ago, should have remained unrecognized for so long, especially as Townsend's own 'Flora of Hampshire' and E. F. Linton's 'Flora of Bournemouth' have both appeared in the meantime. Townsend's locality near Hurn Station would, presumably, be about three or four miles below Palmer's Ford, where Hall found the hybrid.

By the generosity of the Council of the South London Botanical Institute one of Townsend's sheets of *×P. fluitans* is now in the British Museum Herbarium.

XI. *×POTAMOGETON DECIPIENS* IN SOUTH WILTS.

The first British record of *×P. decipiens*, published by Baker and Trimen in Journ. Bot. v. 71, t. 61 (1867), was based on material collected in the Kennet & Avon Canal between Bath and Bathampton, North Somerset, near the western end of the canal. In the summer of the present year, as recorded on p. 255 above, specimens of *×P. decipiens* were gathered in Berks at Burghfield and Newbury, towards the eastern end of the same canal. This suggested that the hybrid was likely to be

found also in the intervening Wiltshire stretch, and towards the end of August a careful search was made at intervals along the canal between the Wilts-Berks border and Savernake. In this region, however, the water had recently been cleaned out, and no *×P. decipiens* could be seen. The search was continued on 15th Sept. in the neighbourhood of Burbage, with the result that a single plant of the hybrid was discovered on the South Wilts side of the canal near Steep Green. At the time of collection several men were engaged in cutting the weeds from each bank, while a barge was completing the work of destruction in the deeper water. It is obvious that *×P. decipiens* should be looked for elsewhere in the Wiltshire section of the canal. Following is the formal new county record:—

(8) SOUTH WILTS. Kennet & Avon Canal near Steep Green, Burbage, 15th Sept. 1939, G. Taylor (Herb. Brit. Mus.).

RORIPPA ISLANDICA (OEDER) BORBÁS.

By T. A. SPRAGUE, D.Sc., F.L.S.

BORBÁS (1900) and Schinz and Thellung (1909) independently proposed the combination *Rorippa islandica* (Oeder) to replace *Rorippa palustris* (*Nasturtium palustre*). Actually the correct spelling of the generic name is *Rorippa* (*vide* Journ. Bot. lxxiii. 219 (1930)), so that the combination concerned should be cited as *Rorippa islandica* (Oeder) Borbás, Balaton Fl. ii. 392 (1900).

Fernald ('Rhodora,' xxxi. 17 (1929)) rejected the name *Rorippa islandica* on the ground that "Oeder did not unequivocally publish the binomial *Sisymbrium islandicum*, as has been asserted. Instead, Oeder merely designated the plant by a polynomial, with the queried word 'islandicum' in parentheses: '*Sisymbrium* (islandicum?), *siliquis brevibus*' etc. This is certainly not a clear publication of the binomial *S. islandicum*."

Examination of the 'Flora danica' shows that Oeder, from the beginning of that work, cited the nomina trivialia proposed by Linnaeus, inserting them in roman characters between the generic name and the remainder of the diagnostic phrase. Thus *Rubus Chamaemorus* L. (Fl. Dan. i. fasc. 1, t. 1 (1761)) appeared as "*Rubus*, Chamaemorus, *foliis simplicibus lobatis, caule unifloro*," followed by references to Linnaeus, 'Systema Naturae,' ed. 10 (1759), 'Flora Lapponica,' ed. 1 (1737), and 'Flora Suecica,' ed. 2 (1755). The Linnaean specific name and diagnostic phrase were preceded by the pre-Linnaean references arranged in chronological order, and were followed by the pharmaceutical and vernacular names, if any. Oeder (Fl. Dan. i. fasc. 2, 12 (1763)) pointed out that the names cited by him were arranged in chronological order, and that it was wrong to cite the 'Flora Danica'

by the first name given, as Linnaeus had begun to do in the second edition of the 'Species Plantarum.' Oeder asked that the plates in the 'Flora Danica' should be cited by their running number only, as the references to descriptions by other authors were supplied by him merely for purposes of comparison. By 1769, however, Oeder had definitely accepted the Linnaean system of binary nomenclature for species. His 'Nomenclator Botanicus inserviens Florae Danicae' gives the Linnaean equivalents of pre-Linnaean and pharmaceutical names, and of French, English, German, Swedish, and Danish vernacular names.

In numerous instances Oeder was unable to associate pre-Linnaean species with binomials proposed by Linnaeus, but did not propose new binary combinations for them—possibly because he was uncertain whether they should not be included under some Linnaean species. In 1761 Oeder figured a *Stellaria*—now identified as *Cerastium cerastioides* (L.) Britton—which he could not identify with any previously described species, but gave it no name and supplied no description of it (Fl. Dan. i. fasc. 2, 7, t. 92). In 1766 he figured, but neither named nor described, a new *Gnaphalium* (Fl. Dan. ii. fasc. 5, 4, t. 254)—this was subsequently described under the name *Gnaphalium norvegicum* Gunn. (Fl. Norveg. ii. 105 (1772)).

The first example of a new trivial name given by Oeder is *Sisymbrium islandicum* (Fl. Dan. iii. fasc. 7, 8, t. 409 (1768)). The only reasons for regarding *S. islandicum* as not validly published are that the epithet is followed by a "?" and is enclosed in parentheses. The presence of the mark of interrogation merely indicates that Oeder was doubtful whether his new species was sufficiently distinct from *S. sylvestre*: he added the remark, "Vereor autem ut a *S. sylvestri* satis differat." Many authors have expressed doubts whether new species of theirs might not prove to be forms of previously described ones, but this taxonomic doubt does not invalidate the publication of the specific names concerned. There remains only the inclusion of the new epithet *islandicum* within parentheses. The reason for this inclusion is not obvious: it might indicate that the trivial name *islandicum* was published tentatively by Oeder; it might, on the other hand, indicate that the trivial was new; or it might have been due to a misprint, if the trivial had been inserted by Oeder at the last moment. Various typographical errors occur in the 'Flora danica,' e. g., *Zostera marina* (i. fasc. 1, 5), *Lamium purpureum* (iii. fasc. 9, 6), *Sambucus nigra* (iv. fasc. 10, 3), *Lepidium latifolium* (l. c.)—trivial names printed in italics instead of roman characters.

If Oeder himself did not adopt the binary name *Sisymbrium islandicum*, why should he have published it? He could have designated the species merely by a specific phrase as in the previous

examples mentioned above. The conclusion that Oeder himself adopted the name *Sisymbrium islandicum* seems irresistible. A nearly parallel case is that of the name *Carex maritima* Gunnerus, Fl. Norveg. ii. 131 (1772), which has been accepted by Fernald ('Rhodora,' xxxv. 396 (1933)), in spite of the fact that the trivial *maritima* was published within parentheses. Some of Gunnerus's new species, e. g., *Ranunculus Ammanni*, *Orchis Koenigii*, *Gentiana islandica* (Fl. Norveg. ii. 103) had the trivials in parentheses, whilst others, e. g., *Gnaphalium norvegicum* (l. c. 105) and *Draba norvegica* (l. c. 106) had not. The Linnaean species *Herniaria glabra* had the epithet in parentheses in the 'Flora Norvegica,' ii. 116. Evidently no importance should be attached to these typographical inconsistencies.

Other binary names published by Oeder for new species, or for old ones lacking binary names, were *Lichen gyrosus* (Fl. Dan. iii. fasc. 8, 7, t. 463, fig. 2 (1769)), *Peziza polymorpha* (l. c. 8, t. 464), *Lichen groenlandicus* (t. 466), *Peziza radiata* (t. 469, fig. 2), *Lichen heclae* (t. 470, fig. 2), *Elvela atra* (fasc. 9, 7, t. 534, fig. 1), *E. aeruginosa* (l. c., fig. 2), *Embolus obvelatus* (l. c. 8, t. 536), *Anemone groenlandica* (l. c. iv. fasc. 10, 5, t. 566), *Ledum groenlandicum* (l. c. t. 567).

The occurrence, in the 'Flora Danica,' of a large number of species designated merely by polynomials might conceivably suggest that the binary names proposed by Oeder were illegitimate because "they were published in works in which the Linnaean system of binary nomenclature was not consistently employed" (Art. 68/4). Examination of the 'Flora Danica,' however, shows that this view is based upon a misapprehension: Oeder cited Linnaean binary names whenever he was able to identify his plants with Linnaean species. The occurrence, in the 'Flora Danica,' of a number of pre-Linnaean species which were not thus identified, no more invalidates the new binomials than the occurrence of unidentified species in a modern paper invalidates the names of new species published in it.

The data given above seem to justify the conclusion that the binary name *Sisymbrium islandicum* Oeder, Fl. Dan. iii. fasc. 7, 8, t. 409 (1768) was validly published.

Some of the binary names published in the 'Flora Danica' and 'Flora Norvegica' have been generally overlooked or ascribed to later authors. Owing to the titlepage of vol. iv. of the 'Flora Danica' bearing O. F. Mueller's name as editor, the fact that the first fascicle of that volume (fasc. 10: 1771) was issued by Oeder was overlooked, and *Anemone groenlandica* has been erroneously ascribed to O. F. Mueller. Similarly, the name *Ledum groenlandicum* has been ascribed to Retzius (1779 and 1795), although it appeared previously in the 'Flora Danica' (1771) and 'Flora Norvegica' (1772).

NEW SPECIES OF *POLYPODIUM* SECT. *CAMPYLO-
NEURUM*.

BY A. H. G. ALSTON, B.A., F.L.S.

WHILE working at a revision of this section I have found certain specimens previously referred to *P. angustifolium* Sw. which appear worthy of specific rank.

Polypodium (Campyloneurum) aglaolepis Alston, sp. nov.

Rhizoma repens, usque ad 6 cm. longum, 2.5 cm. crassum, leviter pruinatum, simplex vel ramosum, dense paleaceum, paleis subpersistentibus; paleae laxae imbricatae, obscure brunneae, valde nitentes, deliculae, laxae et uniforme clathrato-reticulatae, lineari-lanceolatae, 1 mm. latae, 5 mm. longae, apice attenuatae. Frondes numerosae, pendentes, circiter 35 cm. longae, 6-12 mm. latae; stipites straminei, 2-6 cm. longi, dorso leviter sulcati; lamina linearis, basin versus gradatim attenuata, basi anguste truncata, coriacea, marginibus leviter revolutis; integris; costae stramineae subtus elevatae, supra conspicuae, planae; venulae immersae, areolatae; areolae costales trapezoidales, latere inferiore venulam soriferam gerentes; areolae alterae inter areolas costales dispositae, subtriangulares, latere inferiore venulam soriferam gerentes. Sori plerumque biseriati versus apicem venulae soriferae dispositi. Venulae soriferae apice incrassatae.

ARGENTINA: Siambon, Sierra de Tucuman, Lorentz & Hieronymus 948 (type, BM).

Readily distinguished from the other species of this group by its dull brown shining scales. The rhizome is more wide-creeping than in *P. angustifolium*, the scales more persistent, with laxer reticulation, darker and more shining. All the Argentine specimens commonly referred to *P. angustifolium* seen belong to this species, except those from Misiones, in the north-eastern part of the country.

Polypodium (Campyloneurum) angustipaleatum Alston, sp. nov.

Rhizoma repens, usque ad 2.5 cm. longum, 4 mm. crassum, pruinatum, simplex, paleaceum, paleis subpersistentibus; paleae patentes, parte maiore nigro-fuscescentes, basi pallidiores, leviter nitentes, anguste lineari-lanceolatae, basi expansae, basi 0.75 mm. latae, medio 0.30 mm. latae, 7 mm. longae, apice quasi-capilliformes, reticulatae, reticulis apicem versus anguste oblongis, basin versus minoribus subrotundatis. Frondes pendentes, circiter 65 cm. longae, 2.5 mm. latae; stipites rufo-straminei vel straminei; lamina linearis, basin versus gradatim decurrens, coriacea, marginibus leviter revolutis, integris; costae plerumque obscure virides subtus elevatae, supra conspicuae; venulae obscurae, immersae, areolatae; areolae costales trapezoidales,

classibus dualibus alternantibus, illae latere maiore costale, alterae latere maiore externa, areolae nonnullae subtriangulares secundae ordinis adsunt; venulae soriferae angulo basali orientes, apice leviter incrassatae, apicem versus soriferae.

BOLIVIA: *Bang* 2461 (BM); near Cochabamba, *Bang* 1288 (BM, type).

Separated from the other species in this group by its dark linear scales.

Polypodium (Campyloneurum) austrobrasillianum Alston, sp. nov.

Rhizoma late-repens, usque ad 8 cm. longum, 2 mm. crassum, pruinatum, plerumque simplex, dense paleaceum, paleis plus minusve caducis; paleae laxae imbricatae, brunneae, vix nitentes, subuniforme clathrato-reticulatae, lanceolatae, 0.60 mm. latae, 2.5-3.0 mm. longae, apice attenuatae. Frondes numerosi, pendentes, circa 35 cm. longae, 5-9 mm. latae; stipites straminei, 5-10 mm. longi, dorso applanati; lamina linearis, basi et apice attenuata, basi decurrens, subcoriacea, marginibus leviter revolutis, integris; costae virides, subtus elevatae, supra conspicuae, subelevatae; venulae immersae, areolatae; areolae costales subtrapezoidales, latere exteriore leviter rotundata, latere inferiore venulam soriferam gerentes. Sori uni- vel biseriati, apicem versus venulae soriferae dispositi. Venulae soriferae apice incrassatae.

S. BRAZIL; PARANA: Curitiba, *Hoehne* 24365 (BM, type).

Readily distinguished from *P. angustifolium* by its slender, wide-creeping rhizome.

REVIEW.

The General Aspects of the Vegetation of Europe. By MARIETTA PALLIS. 8vo, pp. 66, 1 chart. London: Taylor & Francis Ltd. Price 3s. 6d.

It is over twenty years since Miss Pallis wrote on the vegetation of the Fens and on the structure and history of the Flax. Afterwards she devoted herself to art, but apparently without losing her ability to regard vegetation with a certain amount of freedom from the trammels of the various schools.

In this essay she has stated a case which needs more consideration than it has had in the past. The fact that she has probably overstated it does not necessarily detract from the value of her presentation.

Her general thesis is that a forest climate must have antedated the appearance of Dicotyledonous trees in the Upper Cretaceous. Since then there has been almost unbroken forest in Europe

with the exception of the Ice Age of the Pleistocene. There is no European natural grassland except above the altitudinal tree limit, and perhaps in certain estuaries and steep places. The presence of grassland and other forms of degraded vegetation is the result of interference by man; the animal kingdom dominates the vegetable kingdom.

Where extremes of climate and ancient settlement by man coincide, the result was probably a vast derangement. The migration and trade routes pass through the most devastated regions and it is suggested that the great deserts possibly may be interference-induced and not original or climatic. Interference with the forest-covering brings instability and a rise or fall of the water level with the setting in motion of the flora according to the plants convenient at hand. Interference brings not only elimination and rarefaction but also concentration of the quicker growing, scattered, subsidiary forms.

The suggestion is made that the poverty of the British flora is due to the formation of a biological barrier—the temperate forest which was early reconstituted after the glacial epoch and held the ground completely: this prevented the establishment (or re-establishment) of many outlying and scattered species.

The author gives many facts from her observations in Great Britain, Roumania, and her native Greece. From her manner of presentation she has been free to wander a little from her main theme—but this is chiefly in the form of footnotes, many of which, particularly those relating to Greek customs, add much to the general interest of her pamphlet.

BOOK-NOTES, NEWS, ETC.

ASSOCIATION FOR THE STUDY OF SYSTEMATICS IN RELATION TO GENERAL BIOLOGY.—Hitherto the organization of the Association has been deliberately kept as loose as possible and there has been no subscription for membership. But it is now apparent that the Association cannot fulfil its function unless a regular income is assured and, at a general meeting held a short time ago, it was decided to fix the subscription at a minimum of 5s. per annum for three years, when the position can be reviewed in the light of new conditions. At the same meeting an agreement with the Linnean Society was ratified by which, among other things, the Association may use the Society's rooms for meetings; joint meetings between the two bodies are to be held for the discussion of matters of common interest; and the Annual Report of the Association will be published in the Proceedings of the Society.

The Council has decided to carry on the work of the Association so far as possible during hostilities.

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