

SECOND REPORT OF THE COMMITTEE ON FLORAL AREAS.

THIS committee published in October and November, 1918, a report on the New England *Ranunculaceae*. We have now prepared a similar report on *Polypodiaceae*, *Schizaeaceae* and *Osmundaceae*. All our species of these three families are native, none introduced, and they have been extensively collected and reported upon. More material is needed, however, for adequate reports on the lady-fern group. Merely formal varieties and casual hybrids are omitted, as their ranges are not of value here.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,— XXVII.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

POLYPODIACEAE.	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
<i>Adiantum pedatum</i> L.	+	+	+	+	+	+
× <i>Asplenium ebenoides</i> R. R. Scott			+	+		+
<i>Asplenium montanum</i> Willd. . .						+
“ <i>pinnatifidum</i> Nutt.						—
“ <i>platyneuron</i> (L.) Oakes	+	+	+	+	+	+
“ <i>Ruta-muraria</i> L.			+	+		+
“ <i>Trichomanes</i> L.	+	+	+	+	+	+
“ <i>viride</i> Huds.	+		+			
<i>Athyrium acrostichoides</i> (Sw.) Diels	+	+	+	+	+	+
“ <i>angustifolium</i> (Michx.)						
Milde		+	+	+		+
“ <i>angustum</i> (Willd.) Presl . .	+	+	+	+	+	+
“ “ <i>var. elatius</i> (Link)						
Butters	+	+	+	+	+	+
“ “ <i>var. laurentianum</i>						
Butters	+					
“ “ <i>var. rubellum</i> (Gilbert) Butters .	+	+	+	+	+	+
“ <i>asplenioides</i> (Michx.)						
Desv.				+	+	+
<i>Camptosorus rhizophyllus</i> (L.) Link	+	—	+	+	+	+

POLYPODIACEAE	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
<i>Cheilanthes lanosa</i> (Michx.) Watt .						+
<i>Cryptogramma Stelleri</i> (Gmel.) Prantl	+	+	+	+		+
<i>Cystopteris bulbifera</i> (L.) Bernh. .	+	+	+	+		+
“ <i>fragilis</i> (L.) Bernh. . . .	+	+	+	+	+	+
<i>Dennstaedtia punctilobula</i> (Michx.) Moore	+	+	+	+	+	+
<i>Onoclea sensibilis</i> L.	+	+	+	+	+	+
<i>Pellaea atropurpurea</i> (L.) Link. .			+	+	+	+
“ <i>glabella</i> Mett.			+			
<i>Polypodium vulgare</i> L.	+	+	+	+	+	+
<i>Polystichum acrostichoides</i> (Michx.) Schott	+	+	+	+	+	+
“ <i>Braunii</i> (Spenner) Fée	+	+	+	+		
<i>Pteretis nodulosa</i> (Michx.) Nieuwl.	+	+	+	+	+	+
<i>Pteridium latiusculum</i> (Desv.) Max- on	+	+	+	+	+	+
“ “ <i>var. pseudocauda-</i> <i>tum</i> (Clute) Maxon			—	+		
× <i>Thelypteris Boottii</i> (Tuckerm.) Nieuwl.	+	+	+	+		+
<i>Thelypteris cristata</i> (L.) Nieuwl. .	+	+	+	+	+	+
“ “ <i>var. Clintoniana</i> (D. C. Eaton) Weatherby	+	+	+	+		+
“ <i>Dryopteris</i> (L.) Slos- son	+	+	+	+	+	+
“ <i>Filix-mas</i> (L.) Nieuwl.			+			
“ <i>fragrans</i> (L.) Nieuwl.	+	+	+			
“ <i>Goldiana</i> (Hook.) Nieuwl.	+	+	+	+		+
“ <i>hexagonoptera</i> (Michx.) Weatherby	+	+	+	+	+	+
“ <i>marginalis</i> (L.) Nieuwl.	+	+	+	+	+	+
“ <i>noveboracensis</i> (L.) Nieuwl.	+	+	+	+	+	+
“ <i>palustris</i> Schott	+	+	+	+	+	+
“ <i>Phegopteris</i> (L.) Slos- son	+	+	+	+	+	+
“ <i>simulata</i> (Davenp.) Nieuwl.	+	+	+	+	+	+

POLYPODIACEAE	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
<i>Thelypteris spinulosa</i> (O. F. Mueller) Nieuwl. . .	+	+	+	+	+	+
“ “ var. <i>concordiana</i> (Davenp.) Weatherby				+		
“ <i>spinulosa</i> var. <i>intermedia</i> (Muhl.) Nieuwl.	+	+	+	+	+	+
“ <i>spinulosa</i> var. <i>americana</i> (Fisch.) Weatherby	+	+	+	+		
<i>Woodsia alpina</i> (Bolton) S. F. Gray			+			
“ <i>glabella</i> R. Br.	+	+	+			
“ <i>ilvensis</i> (L.) R. Br. . . .	+	+	+	+	+	+
“ <i>obtusa</i> (Spreng.) Torr. .	+	+	+	+	+	+
<i>Woodwardia areolata</i> (L.) Moore .	—	+		+	+	+
“ <i>virginica</i> (L.) Sm. . . .	+	+	+	+	+	+
SCHIZAEACEAE ¹						
<i>Lygodium palmatum</i> (Bernh.) Sw. .		+		+	+	+
OSMUNDACEAE						
<i>Osmunda cinnamomea</i> L.	+	+	+	+	+	+
“ “ var. <i>glandulosa</i> Waters					+	
“ <i>Claytoniana</i> L.	+	+	+	+	+	+
“ <i>regalis</i> L., var. <i>spectabilis</i> (Willd.) Gray	+	+	+	+	+	+

GENERALLY DISTRIBUTED SPECIES.

<i>Athyrium angustum</i> , var. <i>rubellum</i>	<i>Thelypteris noveboracensis</i>
<i>Cystopteris fragilis</i>	“ <i>palustris</i>
<i>Dennstaedtia punctilobula</i>	“ <i>spinulosa</i>
<i>Onoclea sensibilis</i>	“ “ var. <i>intermedia</i>
<i>Polypodium vulgare</i>	
<i>Pteridium latiusculum</i>	<i>Osmunda cinnamomea</i>
<i>Thelypteris cristata</i>	“ <i>Claytoniana</i>
“ <i>marginalis</i>	“ <i>regalis</i> , var. <i>spectabilis</i>

¹ In the herbarium of the New England Botanical Club there is a specimen of *Schizaea pusilla* Pursh, distributed by Addison Brown and labelled as collected in Rhode Island by J. W. Congdon. When questioned in regard to it in 1907, Mr. Congdon wrote that he had never collected this species in Rhode Island or anywhere else, but that various specimens of it from New Jersey had passed through his hands in the course of exchanges and that one of these had, no doubt, got wrongly labelled.

These species seem, for the most part, to be distributed very evenly, although somewhat dependent on suitable habitats. *Cystopteris fragilis*, for instance, a plant of shaded rocks or rarely of woodland soil, is not known from Cape Cod, where such conditions are lacking. *Dennstaedtia punctilobula*, *Thelypteris marginalis*, *T. palustris* and *T. spinulosa* are apparently less common in northern Maine than elsewhere. Through them, the ranges grade off into those of the following division.

SPECIES OF RICH SOILS.

Adiantum pedatum	Polystichum acrostichoides
Athyrium acrostichoides	Pteretis nodulosa

These ferns are abundant in rich soils, but avoid the spruce forest and sandy regions. The first three are woodland species, the *Polystichum* frequenting drier situations than the others. *Pteretis nodulosa* is by preference a plant of the richest alluvium, where it grows five or six feet tall. It grows also in moist upland country, especially where there is a trace of lime in the soil. Like the other species of this division, it avoids northwestern and extreme northern Maine and the coastal plain areas of Cape Cod; it also avoids the outer Maine coast east of the Kennebec and all of southeastern Massachusetts, and is rare in eastern Connecticut and Rhode Island (two stations, one now eradicated).

NORTHERN SPECIES.

A	B
Thelypteris Dryopteris	Athyrium angustum, var. laurentianum
" Phegopteris	Polystichum Braunii
Woodsia ilvensis	Thelypteris spinulosa, var. americana

The species of group A are northern types of wide range in New England and perhaps as well placed with the generally distributed species, but, unlike them, becoming notably less frequent in southern New England. *Thelypteris Dryopteris*, common northward, is rare in eastern Massachusetts and eastern Connecticut and is not reported from Cape Cod nor the southern islands. It has two Rhode Island stations, both in or near Providence, but is known to have been introduced at one of them; and the other is under suspicion. *T. Phegopteris* has a similar range, but is more frequent southward, has four stations in Rhode Island, and has been found during the past

season in Falmouth at the base of Cape Cod. *Woodsia ilvensis*, a plant of sunny, dry ledges, apparently avoids northwestern Maine and southeastern Massachusetts and is known from only a single station in Rhode Island.

Group B is composed of strictly northern plants, confined, except for isolated stations on Mt. Greylock, to comparatively boreal habitats in the northern tier of states. *Athyrium angustum*, var. *laurentianum* was, when first described, known in our region only from extreme eastern Maine in Princeton. It has since been found at three stations in northern Maine. *Polystichum Braunii* grows in ravines and deep woods, usually at an altitude of 1000 feet or more. It has been found on Mt. Greylock, Mass., at many places in the Vermont mountains and in northern New Hampshire, at Grafton, Strong, Temple and New Vineyard in western Maine and at scattered stations on the slopes of mountains in northern Maine. *Thelypteris spinulosa*, var. *americana* has almost the same range, but is much more abundant, as it is a typical plant of the spruce forest at an elevation of 1000 feet or more. It also reaches a splendid development in the spruce woods along the Maine coast from the islands of Penobscot Bay eastward.

SOUTHERN SPECIES.

A

Asplenium platyneuron	Thelypteris cristata, var. Clintoniana
" Trichomanes	
Athyrium angustum, var. elatius	" hexagonoptera
	" simulata

Woodsia obtusa

B

Asplenium montanum	Athyrium asplenoides
" pinnatifidum	Cheilanthes lanosa
Lygodium palmatum	

As in the case of the northern species, the southern divide into two groups. Group A comprises species of rather wide distribution in southern New England, which become rarer and occur mostly at low altitudes northward and, with the exception of *Athyrium angustum*, var. *elatius*, reach in that direction no further than south-central Maine. *Asplenium platyneuron* is well known southward, reaching

north to Burlington and St. Johnsbury, Vt., and North Woodstock, N. H. In Maine it is rare, known only from scattered stations, the northernmost of which is Anson and the most eastern Appleton and Union. *Asplenium Trichomanes* grows on ledges of various kinds of rock in southern New England. Further north it seems to prefer calcareous rocks. It is frequent in Vermont, occasional in southern New Hampshire and in western Maine. It apparently ascends to higher altitudes northward than the other species here placed. *Athyrium angustum*, var. *elatus* is known from scattered stations in other states, and along the Maine coast and on the Kennebec and upper Androscoggin Rivers, but not further north. (This generalization is based on 32 records.) *Thelypteris cristata*, var. *Clintoniana* is frequent west of the Connecticut, especially in the Taconic Mountains. It occurs here and there to the east, except in Rhode Island and on Cape Cod, as far as Mt. Desert. *T. hexagonoptera* is frequent in southern New England, occasional in Vermont, rare in New Hampshire (three stations) and occasional in Maine as far east as Charleston in Penobscot Co. *T. simulata* is known in Vermont only from Brattleboro and Hartland, but is occasional in southeastern New Hampshire north to Merrimac and southern Carroll Counties and in Maine along the coast to Southport and inland to Limington. It is abundant in eastern Massachusetts but apparently is less common in Rhode Island and Connecticut. *Woodsia obtusa* is frequent on ledges and in dry soil in southern New England; occasional in Vermont, reaching Burlington and St. Johnsbury; rare in southern New Hampshire; and in Maine known only from Winthrop (H. Metcalf, RHODORA iii. 236. 1901; specimen in herb. N. E. Botanical Club).

Group B consists of species, rare or local with us, which enter New England from the southwest and are confined, except for one New Hampshire station for *Lygodium*, to the three southernmost states. *Asplenium montanum* is known from six scattered stations on granite ledges in Connecticut. *A. pinnatifidum* is reported from Sharon and Southington, Conn. The specimen from Southington in the Gray Herbarium, however, is not *A. pinnatifidum*, but a state of *A. ebenoides* with obtuse segments; that record may be founded on an error in determination. There seems no reason to doubt the Sharon report. *Athyrium asplenoides* is known from the Boston region and from Sandwich, Mass., and from Rhode Island and Con-

necticut, in no case more than 25 miles from the coast. It may prove to be a coastal plain species when better known, but probably one of the heavier and less acid soils rather than the sand-plains. *Cheilanthes lanosa* occurs at a single station on trap cliffs at New Haven, Conn. (G. Van Ingen). *Lygodium palmatum* is found locally in the Connecticut basin as far north as Winchester, N. H., in the Merrimac Valley in Massachusetts and thence at scattered stations southward to Narragansett Bay. It is not known from Cape Cod.

COASTAL PLAIN SPECIES.

<i>Osmunda cinnamomea</i> , var. <i>glandulosa</i>	<i>Woodwardia areolata</i>
	“ <i>virginica</i>
<i>Pteridium latiusculum</i> , var. <i>pseudocaudatum</i>	

These plants are coastal plain types which, however, for the most part intrude into acid areas further inland than the actual geologic coastal plain. The *Osmunda* has been found only at Barrington, R. I. *Pteridium latiusculum*, var. *pseudocaudatum* has been collected at Needham, Mass., on Cape Cod at Barnstable, Dennis, Brewster and Harwich, and on Nantucket. It has also been reported from the sand-plains in Colchester, Vt. All the New England specimens seen are somewhat transitional and by no means as clearly distinguishable as the material from further south (where the variety entirely replaces the typical form), and often appear like a mere ecological state. *Woodwardia areolata* occurs near the coast from Brownfield and Acton in southwestern Maine southward, penetrating inland in Connecticut to East Hartford, Newington and Middlebury, and occurring also on Nantucket, Martha's Vineyard and Block Island. *W. virginica*, a plant of sphagnous swamps, extends further inland. It appears at scattered localities in western Maine as far north as Chesterville and Belgrade and in the Penobscot valley at Oldtown. It is frequent throughout eastern Massachusetts and occurs in the sandy Springfield region, also at several places in the interior of Connecticut. It is also known at Rutland, Colchester and Franklin in the Champlain valley.

CALCIPHILE SPECIES.

Northern

<i>Asplenium viride</i>	<i>Thelypteris Filix-mas</i>
<i>Cryptogramma Stelleri</i>	“ <i>fragrans</i>

*Cystopteris bulbifera**Pellaea glabella**Woodsia alpina*" *glabella**Southern**Asplenium ebenoides*" *Ruta-muraria**Athyrium angustifolium**Camptosorus rhizophyllus**Pellaea atropurpurea**Thelypteris Goldiana*

The term calciphile is here used in a somewhat general sense to cover all species whose ranges are, for the most part, identical with areas of calcareous rock. The actual lime requirements of the different species placed here probably differ considerably. *Asplenium Ruta-muraria*, for instance, is strictly confined to ledges of calcareous rock. *Camptosorus* and *Thelypteris fragrans* occur not uncommonly on other rocks. As shown by tests made by Dr. Edgar T. Wherry, of the Dept. of Agriculture, the former will grow in a weakly acid soil. *Thelypteris Goldiana* and *Athyrium angustifolium* are plants of rich woods, not always visibly associated with any source of lime other than leaf-mold. But it is probable that none of these species live in soils which do not contain soluble calcium compounds.

Since the calcareous areas of New England are chiefly west of the Connecticut River, these species are most abundant there. The valley between the Green Mts. and the Taconics is a rich area for them, and so are Mt. Toby in Massachusetts and Smugglers' Notch and the Willoughby Lake region in Vermont. *Cystopteris bulbifera* is the most widely distributed of these ferns east of the Connecticut, being known from Mt. Toby, from northern Coos Co., N. H., and from most of the calcareous areas in Maine. *Cryptogramma Stelleri* is probably next in abundance among the northern calciphiles, though in dry seasons it is likely to wither away early. It is very rare in western Connecticut, local in Franklin Co., Mass., and in eastern Vermont, and occasional in western Vermont. It has been found at Colebrook, N. H., by Dr. A. S. Pease and at West Paris, Maine, by W. L. Bacon (RHODORA x. 35. 1908).

Asplenium viride has been found at five stations in the Green Mts. of Vermont and in 1917 at Green Mt. on the north branch of the Penobscot in Somerset Co., Maine, by Dr. Harold St. John. *Woodsia glabella* has six Vermont stations and two on ledges along the Androscoggin at Berlin and Gorham, N. H. It also occurs at Moxie Falls, Somerset Co., and Chain of Ponds, Franklin Co., Maine. *W. alpina*

is found only at Queechee Gulf, Smugglers' Notch and Mt. Willoughby in Vermont, though it closely approaches the Maine border in the Aroostook valley, New Brunswick. *Thelypteris Filix-mas* has been found at eight stations in central Vermont, where it thrives best in high pastures and thickets (see E. J. Winslow, The Male Fern in Vermont, Am. Fern Journ. vii. 87-90. 1917). *T. fragrans* is a fern of drier ledges (sometimes hardly calcareous) which occurs locally in the Green Mts. south to central Vermont, at Lake Sunapee and in gorges of streams north of the White mountains in New Hampshire and at scattered stations in Oxford, Franklin, Kennebec, Piscataquis and Aroostook Counties, Maine.

The ranges of the two species of *Pellaea* overlap in Vermont, where *P. glabella* is known from six stations from Willoughby Lake to Pownal. *P. atropurpurea* crosses the Connecticut eastward to Mt. Toby and Berlin, Mass. (RHODORA ii. 14. 1900), and occurs at Lincoln, R. I., and Bolton, Conn., while occasional westward.

Asplenium ebenoides is a rare hybrid reported from six places in Vermont, Sheffield, Mass., and Canaan, Berlin and Southington, Conn. *A. Ruta-muraria* is "scarce" on Mt. Toby and local in western Berkshire Co. in Massachusetts, and occasional in western Vermont (with a single station at Willoughby) and western Connecticut, and occurs rarely on the trap ridges of central Connecticut. East of the Connecticut, *Camptosorus* was once found in Winthrop, Maine, by Haven Metcalf (RHODORA iii. 236. 1901). It has been collected at Hudson and Windham, N. H., at Weston and Natick (eradicated) and Needham near Boston, at Brookfield, Amherst and Mt. Toby, Mass., and at Lincoln, R. I., and at a few scattered stations in eastern Connecticut. West of the Connecticut it occurs at numerous stations from New Haven, Conn., to the Canadian border, becoming locally common in the calcareous areas west of the Green Mts.

Athyrium angustifolium is a rich woods calciphile, running north in Vermont to St. Albans and Danville and known east of the Connecticut only at Alstead, N. H., and in the Mt. Toby region. *Thelypteris Goldiana* is a plant of similar habitats, but rather more common and with a wider range east of the Connecticut. It has scattered stations at Mt. Toby and in Worcester Co., Mass., at Alstead and in northern Coos Co., N. H., and in Franklin Co. and at Winthrop and Fairfield farther east in Maine.

MISCELLANEOUS SPECIES.

*Athyrium angustum**Thelypteris Boottii**Thelypteris spinulosa*, var. *concordiana*

Athyrium angustum, the dimorphic sun form of the lady-fern group, seems to be absent from large areas, for no obvious reason, unless that it has not been collected in sufficient quantity as yet.

Thelypteris Boottii, now generally regarded as a hybrid between *T. cristata* and *T. spinulosa*, var. *intermedia*, is well distributed but seldom abundant. It seems to prefer swampy places in rich woods areas, but is not reported from northern Maine and northern New Hampshire, nor from Rhode Island. *T. spinulosa*, var. *concordiana* was discovered by Henry A. Purdie and William Brewster at Concord, Mass., in 1902 (RHODORA vi. 313. 1904), and is as yet known certainly only from the type locality.

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INTERNAL GLANDULAR HAIRS IN DRYOPTERIS.

THEO. HOLM.

ANATOMICAL studies of the ferns reveal many points of interest, and especially with regard to the arrangement of the various tissues in the stem and stipe. Moreover it is in the ferns that internal, glandular hairs have been observed, and such are described by De Bary¹ as characteristic of *Dryopteris Filix-mas*, and *D. spinulosa*. These hairs were found in the ducts of the rhizome and the base of the petiole. Another type of internal hairs is known from *Pilularia*, *Nymphaeaceae*, *Araceae*, *Rhizophora* and *Limnanthemum*, but these hairs are not glandular.

Concerning the presence of these hairs in the ferns it does not seem that they have been found in the leaf except in the petiole, nor have they been recorded from any of the other species of *Dryopteris*, nor from other genera. Some few years ago, when engaged in studying the anatomy of some of our ferns from living specimens, I found these hairs in the intercellular spaces of the leaf-parenchyma in *Dryopteris*

¹ Vergleichende Anatomie der Vegetationsorgane der Phanerogamen und Farne. Leipzig, 1877, p. 230.



Knowlton, Clarence Hinckley, Ripley, Winfield Scott, and Weatherby, Charles Alfred. 1920. "SECOND REPORT OF THE COMMITTEE ON FLORAL AREAS." *Rhodora* 22, 80–89.

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