Contributions to the Flora of Indiana, No. IV. By Stanley Coulter.

The preceding papers in this series are those entitled *Saxifragaceæ of Indiana* (Proc. Ind. Acad. Sci., 1894, pp. 103–107); *A Preliminary List of Plants Growing in the Vicinity of Washington, Daviess County* (Proc. Ind. Acad. Sci., 1895, pp. 169–182); *Noteworthy Indiana Phanerogams* (Proc. Ind. Acad. Sci., 1895, pp. 183–198). The notes are incidental to the preparation of the catalogue of the flora of the State, and are in a measure supplemental to that work.

Many plants which were originally included in this contribution have been omitted, because of their inclusion in much fuller detail than I could possibly have given in the papers of Messrs. W. S. Blatchley and Robert Hessler, M. D., published in these proceedings. With the exception, therefore, of a few forms to which I desire to call attention, the body of this paper concerns the compositæ of the State, with special reference to their distribution.

Coptis trifolia Salisb. Mr. Van Gorder reports this plant as very abundant in certain localities in both Noble and DeKalb counties. So far as has come to my knowledge, this is the only record of the plant in the State authenticated by herbarium specimens. Its range and habits of growth would indicate its presence in the swamp regions of our northern counties.

Ailanthus glandulosus Desf. This tree, not as yet included in the lists of the forest trees of the State, seems to have become thoroughly naturalized, and is entitled to a place in our flora. In Jefferson county it has escaped from cultivation and covers entire hillsides, notably in the vicinity of Madison and Hanover college. The growth is so dense and rapid as to make it a somewhat doubtful acquisition. A thicket of *Ailanthus* in full foliage gives a very fair idea of the appearance of semi-tropical undergrowth. The tree should be included in the flora of the State.

Sullivantia Ohionis Torr. and Gray. This form, the distribution of which I limited (*Saxifragaceæ of Indiana*, Proc. Ind. Acad. Sci., 1894, p. 104) to a single station at Clifty Falls, Jefferson county, must have an added station in Clark county. The determination of Dr. C. R. Barnes, questioned in that communication, has been verified by abundant specimens found among the duplicates in Purdue university. The Clark county station is of the same general character as that at Clifty Falls, the plant clinging to the vertical sides of moist limestone cliffs, by no chance seeming to leave this apparently barren position for the deeper and richer soils surrounding. The plant in our region may be considered as the most characteristic of the limestone cliffs.

Juniperus Virginiana L. The apparently rapid increase of this cedar throughout southern Indiana is worthy of note. Within ten years the number of well-grown forms has increased at least fourfold. The explanation of this increase is to be found in the almost universal fencing of regions formerly wild, and the consequent restriction of cattle ranges. It is an extremely suggestive example of the almost immediate effect of a modification of the factors entering into the struggle for existence. It is incidentally suggestive of the fact that when reforestration is attempted, the young forest areas must be as carefully guarded as are flower or vegetable gardens.

Tipularia discolor Nutt. This rare orchid is reported by Prof. A. H. Young as having been found at the Clifty Falls station, in Jefferson county, the past season. This is much south of its central range, although in its easterly range it extends as far south as Florida.

The plant affects sandy woods, while the Clifty Falls Station can offer nothing except a thin limestone soil or a heavy, cold clay. The record is verified by herbarium specimens.

The compositæ of Indiana, so far as reported to the survey, number 213 species, distributed through 55 genera. The *Asters* lead with 32 reported species, *Solidago* coming second with 28. The other larger genera are *Helianthus*, 13 species; *Eupatorium*, 7 species; *Erigeron* and *Coreopsis* each with 6 species; *Bidens*, *Silphium* and *Liatris* each with 5 species. Owing to imperfect notes and "scrappy" material the work, especially in the *Asters* and *Solidagos*, was extremely difficult. While doubtless many errors occur, there has been a constant endeavor to eliminate all doubtful references. In some cases specimens have not been seen, but where admitted the original specimens have been passed upon by some well-known expert. Very few of Dr. Schneck's specimens have come into my hands, but all of his doubtful forms were referred at the time of collection to Dr. Gray. It may be assumed that all admitted forms have been inspected or passed upon by some botanist entitled to speak with authority.

It may be intimated here that apparently no other family responds so quickly to changed conditions. The response, even to slight changes, is often very marked. Many *Asters* and some *Solidagos* present fairly distinct forms, determined apparently merely by the amount of light or shade. Others indicate clearly the amount of moisture in the soil. Because of this ready response to environmental changes a determination of a form from a single specimen is often an impossibility. I have felt compelled in some cases to omit from the list forms of apparently correct determination until fuller notes or a larger suite of specimens proved them not to be environmental variations.

With but few exceptions, the composites within our bounds do not come into full flower until July and August. As a rule the flowering season is long, many genera blossoming abundantly from July until checked by the frosts. From the middle of August they determine the physiognomy of the vegetation over the entire area of the State. This is especially true in the prairie region and in open fields. Indeed, the great majority of the composites of Indiana are found in their greatest abundance and luxuriance in dry soils and in regions exposed to the full action of the sun. They seem to be xerophytes of the xerophytes.

Some species of *Eupatorium*, *Liatris spicata* and other forms, however, furnish exceptions as regards dryness of soil, while *Polymnia* and a few others give exception as to light. Certainly in no other family in our area can xerophytic adaptations be so satisfactorily studied.

While the flowering season is so extended, and the consequent number of achenes formed enormous, it is probable that but a small proportion of them germinate. The seedlings, also, in all cases in which experiments were tried, were remarkably sensitive to changes in temperature and moisture. Almost every other form used was more hardy in the seedling stage than the compositae. Exceptions to this were the *Ambrosias* and *Lactuca Canadensis* L. In the series of experiments the percentage of seeds germinating was very small in the compositæ, with the exception of *Arctium*, where the per cents, in three experiments were, 87.5, 80, and 87.5. In *Bidens* 20 per cent. was the highest, in *Lactuca* 25 per cent., in *Ambrosia* 20 per cent., while in *Cnicus* out of three plantings of 30 achenes each, only two achenes germinated. Under the same conditions *Abutilon Avicennæ* Gaertn. in two experiments gave 100 per cent., and in a third, 96.7. The seedlings of this plant were extremely hardy, withstanding wide ranges of temperature and moisture. *Solanum nigrum* L., *Datura stramonium* L., and *Scrophularia nodosa* L., *Marilandica* Gray, invariably showed germination per cents. above eighty-five. The plants, other than composites, are introduced simply for purposes of comparison. The data given above are derived from a large number of germination experiments conducted in the Laboratories of Purdue university. In these experiments I have endeavored to eliminate possible error, and to give, so far as could be determined, natural conditions. The experiments cover some 30 composite species distributed among 15 genera, and 50 species representing families other than the compositæ. The material was gathered in almost every instance with extreme care in order that conclusions might be based upon known conditions. So far as the experiments go concerning compositæ, I am convinced that the distribution of this family is largely limited, first, by the small germination percentage of the achenes; second, by the extreme sensitiveness of the seedlings

to heat and moisture changes. A series of pots containing seedlings was subjected to an artificial drought of five days. Of the eleven species of composites all except *Ambrosia* died. Of ten species of other families, only *Scrophularia nodosa Marilandica* died. Repetitions of the experiment showed similar results. Another line of experiments showed that the composite seedlings were unable to withstand any considerable change in temperature, being much more affected by temperature increase than by its decrease. An increase of 5° C., from 25° C. to 30° C, usually proving sufficient to kill them or greatly retard their growth. When it is remembered that the distribution of composites is for the most part in dry soil, in places exposed to the full force of the sun, it is apparent that large numbers of seedlings must perish. It is possible that the danger of a spread of these forms through seed dissemination has been overestimated.

Another fact indicated by the experiments was that the achenes of the earlier and later flowers were rarely viable, this being especially true in *Helianthus.*

It is somewhat surprising that in a family so dominating in species and individuals there is not included a greater number of "worst weeds." Considering the immense size of the family, the number is astonishingly small.

Taraxacum invades the lawns; the *Lactucas, Cnicus, Arctium* and *Erigeron* the fields; but none of them compare in noxious features with forms from other families. *Ambrosia,* which overruns waste fields, I find is considered by the farmers as a positive benefit to the land. *Erigeron,* which a few years ago was a great annoyance, seems to have yielded to cultivation, and to have practically lost its place among bad weeds. Doubtless in some places it is still annoying, but the evidence is that it disappears from carefully cultivated fields. *Chrysanthemum Leucanthemum* L. is certainly bad, but is of restricted range. *Bidens* is annoying to the sheep-raiser, but does not otherwise rise to the rank of a "bad" weed. For the most part the compositæ seem perfectly content to occupy waste places, and readily yield to man the possession of the soil.

So far as I have been able to discover, none of the species are poisonous, if I except a few reported instances of poisoning by forms of *Cnicus.* Most of these cases, I think, can be referred to personal idiosyncrasy. I have tested all the forms of *Cnicus* upon myself and upon numbers of students without results other than were referable to the mechanical action of the prickles. *Xanthium Canadense* Mill. is said to be poisonous to the touch.[1] If this be true, the forms found in the State, *X. spinosum* L. and *X. strumarium* L., are to be regarded with suspicion by persons susceptible to plant poisoning. It is to be remembered, however, that even the known poisonous plants are only poisonous to a small percent-

[1] White, *Dermatitis venenata.* Boston, 1887.

age of those touching them, and many are only poisonous in certain stages of their growth.

Save for the medicinal value of some few forms, none within the State are of economic value, if Jerusalem artichoke (*Helianthus tuberosus* L.) and the Dandelion (*Taraxacum officinale* Weber), both of which are occasionally used as food, are excepted.

Very few of the compositæ are eaten by animals, except by accident or under pressure of hunger. They are also largely free, at least the Indiana forms, from plant diseases. Their limitation in numbers and distribution I believe to be largely determined by the causes named earlier in this paper.

It is not the purpose of this paper to give a full list of the forms found in the State, but rather to call attention to the more general facts concerning their distribution.

I. LOCAL FORMS.

The species included in this list, so far as has come to my knowledge, are only reported from a single locality. A close examination of the list will show that in many cases this apparently restricted State range is but an indication of territory that has been closely and continuously worked.

Vernonia altissima Nutt. Reported from Tippecanoe county by Messrs. Laben and Conner. The distinction between this form and *V. fasciculata* Michx., turns upon the character of the inflorescence and the surface of the achene. Any one familiar with the varied inflorescence of *V. fasciculata* will see that the ultimate distinction is upon the character of the achene. In *fasciculata* the achene is smooth; in *altissima* hispidulous on the ribs. In the specimens reported the achenes were hispidulous on the ribs and the plant was referred to *altissima* Nutt. Further examination of the genus showed that the achenes of *V. Noveboracensis* Willd., showed the same characters. The character of the involucral scales, however, excludes the form from *Noveboracensis*. *V. altissima* Nutt. is, therefore, added to the State flora. In a general way the plant has the inflorescence and achene of *Noveboracensis*, the involucral scales of *fasciculata*, and leaves intermediate between the two. Its appearance is strongly suggestive of the possibility of its being a hybrid form.

Mikania scandens L. Reported from Gibson and Posey counties by Dr. J. Schneck. "Sandy thickets along streams; rare."[2] There seems to be no reason

[2] 7th Rep. Geol. Surv. Ind., 1875, p. 525.

why this plant should not be found in other localities. It, presumably, from what is known of its distribution, came into the State from the north and east.*

Liatris squarrosa Willd. Gibson and Posey counties, Dr. J. Schneck. "Dry soil; rare."[3] Another form which is probably of much wider range than present reports indicate.

Chrysopsis villosa, Nutt. Reported from Vigo county by W. S. Blatchley. "Frequent; banks of old canal, prairies, etc."[4] This species has evidently entered our territory from the west and may be found in the western tier of counties.

Solidago squarrosa Muhl. Reported from Floyd county in 1837 by Dr. A. Clapp, and not since recorded in the State. A number of species found in the Clapp collection are in similar case. Their disappearance from our flora emphasizes the importance of continuous regional study in order that we may have more accurate knowledge of plant movements.

Solidago petiolaris Ait. Specimens by Baird and Taylor from Clark county have been referred to this species. The specimens are not entirely satisfactory, but there seems no doubt of the accuracy of the reference. The plant entered the State flora from the southwest.

Solidago odora Ait. Gibson and Posey counties, Dr. J. Schneck. "Sandy soils, scarce."[5] Specimens have not been examined, but the species is admitted for reasons indicated earlier in the paper.

Solidago rupestris Raf. Reported from Clark county by Baird and Taylor. The inclusion of Indiana in the range of this species in the 6th edition of the Manual was doubtless based upon this collection.

Brachychæta cordata Torr. and Gray. Jefferson county. For full notes on this form reference is made to *Noteworthy Indiana Phanerogams*, in Proc. Ind. Acad. Sci., 1895, p. 189.

Serriocarpus solidagineus Nees. In the Clapp collections of 1834–37, from Floyd county. It does not seem to have been recorded since that time.

Aster macrophyllus L. This form from the north is reported from Noble county, by Mr. W. B. Van Gorder.

Aster Drummondii Lindl. Reported as "frequent in low, open pastures and prairies"[6] in Vigo county, by W. S. Blatchley. A western form very close to *A. sagittifolius* Willd., and possibly a mere geographical variety.

[3] Ibid, p. 534.

[4] Blatchley, W. S., Compositæ of Vigo County. In ed.

[5] 7th Rep. Geol. Surv. Ind., 1875, p. 536.

[6] Blatchley, W. S. Compositæ Vigo county. In ed.

* Since this was in type, Mr. W. S. Blatchley, under date of September 26, 1897, sends me abundant specimens of this form from Lake county. He reports it as "growing plentifully over bushes on the mucky margin of a stream, four miles east of Hebron."

Aster vimineus Lam., *foliolosus* Gray. This form is reported from Franklin county by O. M. Meyncke. So far as I am able to judge the reference is correct, although the well-known difficulty of separating the group of species in which it is found renders absolute certainty impossible.

Aster junceus Ait. Reported from Clarke county by Baird and Taylor is in all probability *not* a member of the State flora. The very scant specimen I have examined from the Clark county locality is probably *A. Novi-Belgii* L. As the specimens fit the latter as well as they do *junceus*, range probabilities lead to the exclusion of *A. junceus* Ait., from the State flora.

Ambrosia bidentata Michx. Reported as "common, dry prairies"[7] in Gibson and Posey counties by Dr. Schneck. From the west and probably to be found as far north as Vermillion county, although the Gibson and Posey county station the only one reported.

Rudbeckia speciosa Wenderoth. Reported from Jefferson county by J. M. Coulter. The specimen has not been examined, but is admitted upon the authority of the collector.

Rudbeckia fulgida Ait. Reported by Dr. A. J. Phinney from Jay, Delaware, Wayne and Randolph counties. Dr. Phinney states that his specimens were verified by Dr. John M. Coulter. The species is therefore admitted, although so marked a form should not rest upon a single reference.

Helianthus rigidus Desf. Jay, Delaware, Wayne and Randolph counties, Dr. A. J. Phinney. The form is very characteristic and could scarcely be mistaken. It is probably a member of the State flora, although its more natural location would be the western portion of the State.

Helianthus occidentalis Riddell. St. Joseph county. Reported by Dr. Charles R. Barnes and verified by abundant specimens.

Helianthus tomentosus Michx. Reported from Clark county by Baird and Taylor, is probably an incorrect reference. No specimens have been examined and the range probabilities are sharply against its presence in the State.

Coreopsis auriculata L. Clark county, Baird and Taylor.

Coreopsis discoidea Torr. and Gray. A specimen of this species is in the Purdue herbarium labelled Gibson county. No collector's name is given. The plant is not included in Dr. Schneck's *Flora of Lower Wabash Valley*. The identification is correct, the only question which arises is concerning the locality. I know of no collector other than Dr. Schneck in that region. Upon the specimen, the species is admitted to the flora.

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[7] 7th Geol. Rep. Ind., 1875, p. 537.

Bidens Beckii Torr. Reported by W. W. Chipman from a single locality in Kosciusko county. Mr. Chipman secured abundant material of this interesting species which is northern in mass distribution.

Hymenopappus scabiosaeus, L'Her. "Scarce on sandy knolls"[8] in Vigo county Reported by W. S. Blatchley. This is only one of a large number of plants added to our flora by the careful investigations of Mr. Blatchley. The plant entered the State from the southwest. Verifying specimens in De Pauw university herbarium.

Artemisia Canadensis Michx. Lake county, E. J. Hill. For full report see *Noteworthy Indiana Phanerogams*, Proc. Ind. Acad. Sci., 1895, p. 191.

Artemisia annua L. A Gibson county specimen with no further data. Investigation indicates that it is probably not uncommon in the State, although not definitely reported from other localities.

Artemisia Absinthium L. Escaped and well established in Gibson and Posey counties. Not reported from any other locality.

Senecio palustris Hook. This species, reported from Clay county by D. T. MacDougal, is represented by specimens in the DePauw herbarium. I have examined the forms and believe the determination accurate. Range probabilities would suggest the form to be *S. lobatus* Pers., but the "*20 or more rays*" seem sufficient grounds for holding to the original reference. It is probable that the range as indicated in the manual should be somewhat extended southward.

Cacalia tuberosa Nutt. Reported from LaPorte, LaPorte county, by Dr. C. R. Barnes. I have also found this species in fair abundance in the low ground to the south and west of Pine Lake, near LaPorte. Abundant herbarium specimens verify the reference. The form has probably a much more general distribution through the northern portion of the State in wet lands.

Cnicus horridulus Pursh. Reported from Putnam county by D. T. MacDougal, with verifying specimen in herbarium of DePauw university. The reference is incorrect. The specimen is *Cnicus lanceolatus* Hoffm., in which the leaf prickles have a yellowish caste. With this exception the form is the typical *lanceolatus*. *Cnicus horridulus* is a coast plant, and should be excluded from the State flora.

Cnicus Pitcheri Torr. Lake county, E. J. Hill.[9]

Cnicus pumilus Torr. Lake county, E. J. Hill.[10]

Cnicus Hillii, W. M. Canby. Lake county. E. J. Hill.[11]

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[8]Blatchley, W. S.: Compositæ of Vigo county. In ed.

[9]Coulter, Stanley: Noteworthy Indiana Phanerogams, Proc. Ind. Acad. Sci., 1895, p. 193.

[10]Ibid., p. 193.

[11]Ibid., p. 193.

Cichorium Intybus L. Reported from Noble county by W. B. Van Gorder. This form escapes readily from cultivation, and to my personal knowledge has made a foothold for itself in several localities in the State. This is notably true in Jefferson county. The only specimens, however, are from Noble county.

Hieracium Canadense Michx. Reported from Lake county by E. J. Hill. The form will probably be found to be confined to the northern counties in favorable localities, its mass distribution being northerly.

Hieracium longipilum Torr. "Prairies and open woods, common,"[12] Gibson and Posey counties, Dr. J. Schneck. From the north.

Prenanthes serpentaria Pursh. Listed from Clark county by Baird and Taylor. No specimens have been examined. The species is eastern in its distribution, and the reference is probably incorrect. Excluded from the State flora in absence of verifying specimens.

The following forms seem to be limited within the State to the northern counties:

Solidago stricta Ait. Reported from St. Joseph county by Dr. C. R. Barnes, and from Noble county by W. B. Van Gorder. From the north, and probably to be found in favoring localities in low, damp ground in the northern tier of counties.

Solidago uliginosa Nutt. Lake, St. Joseph and Noble counties.

Solidago Riddellii Frank. Reported from Noble county by W. B. Van Gorder; from Tippecanoe county by Prof. Hussey; from Jay, Delaware, Randolph and Wayne by Dr. Phinney. The Noble county reference is well authenticated and sufficient to admit form to State flora. The Tippecanoe county specimen is unsatisfactory, being both scant and incomplete. No special feature excludes it from the reference, nor, on the other hand, does any marked character require the reference. I am inclined to think the Tippecanoe county specimen, *S. Ohioensis*, Riddell, a species of known occurrence in the county. Dr. Phinney's specimens are not accessible. As it stands, Noble county is the only authenticated station for the species.

Solidago tenuifolia Pursh. Reported from Jasper county by Dr. C. R. Barnes, and authenticated by abundant specimens in the Purdue herbarium. Also included by Dr. Phinney in his list of Jay, Delaware, Wayne and Randolph counties.

Coreopsis palmata, Nutt. Laporte and St. Joseph counties, reported by Dr. Barnes. Specimens in Purdue herbarium. Probably from the northwest.

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[12] 7th Geol. Surv. Ind. 1875, p. 541.

Artemisia caudata Michx. This species, which has heretofore had its sole station in Lake county, but which I intimated should be found more widely distributed,[13] has an additional station reported in Fulton county by Dr. Robert Hessler. The specimens were examined and are unquestionable.

Artemisia Canadensis Michx.[15]

Prenanthes racemosa Michx.[14] Formerly reported only from Lake and Noble counties, has been reported from Cass county by Dr. Hessler. Abundant specimens were submitted to the survey.

The following species, so far as can be determined, seem to be restricted in range to the southern portion of the state. It is probable, however, that more extended study will extend many of these ranges.

Elephantopus Carolinianus Willd. Reported only from Gibson, Posey, Jefferson, Clark, Daviess and Vigo counties.

Eupatorium cœlestinum L. Reported from Gibson, Posey, Jefferson, Franklin, Monroe and Daviess counties. There seems to be no reason why it should not be found throughout the State, as the mass distribution of the form is northward.

Solidago neglecta Torr. and Gray. Reported from Jefferson county by John M. Coulter, and from Clark county by Baird and Taylor. The Clark county specimen has not been examined. The Jefferson county specimen in the Purdue herbarium is *S. arguta* Ait. In absence of further data, the form is excluded from State flora, the range probabilities being against its occurrence in the localities cited. If found in the State it will probably be in the swamps of the northern counties.

Solidago Shortii Torr. and Gray. Floyd county, 1837, Dr. A. Clapp. Reported also from Clark county by Baird and Taylor. Indiana probably represents the eastern limit of this species.

Boltonia asteroides L' Her. Reported from Gibson, Posey and Jefferson counties. Also included in Dr. A. J. Phinney's list of the central-eastern counties.

Aster ericoides L., *villosus* Torr. and Gray. This variety should be, and probably is, fairly abundant in the State. It is, however, only definitely reported from Jefferson, Franklin and Vigo counties.

Erigeron divaricatus Michx. In the Sixth Edition, Gray's Manual, the range given is "Indiana to Minnesota, and southward." The species, however, is only reported from Jefferson, Gibson and Posey counties. In both localities it is said to be "not abundant."

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[13] Coulter, Stanley: Noteworthy Indiana Phanerogams. Proc. Ind. Acad. Sci., 1895, p. 191.

[14] Ibid., p., 192.

[15] Ibid., p. 191.

Pluchea camphorata DC. In Jefferson county, on river banks. In Gibson and Posey counties, "common in rich clearings and moist glades."

Polymnia Uvedalia L. A species found in moist and miry places. Reported only from Gibson, Posey, Jefferson, Franklin and Clark counties.

Eclipta alba, Hassk. Probably occurring throughout State, but, so far as reports go, not found north of Johnson county. Very abundant and variable in the more southern counties.

Heliopsis laevis Pers. Reported stations of this species indicate that it is not found farther north than Johnson county. As in the preceding species, its mass distribution in the State is evidently southern.

Heliopsis scabra Dunal. Reports indicate this species to be southern in its distribution. Putnam county represents the northern station in the State.

Helianthus parviflorus Bernh. This form is reported from Gibson, Posey, Jefferson and Franklin counties, and in the list of Dr Phinney.

Helianthus doronicoides Lam. Is reported from the same localities as the preceding species, with Putnam county as an added station. There is no apparent reason why both forms should not be of more general distribution.

Anthemis arvensis L. Reported from Monroe and Clark counties. The occurrence of the species within our boundary is exceptional, and it is a question as to whether it has maintained its place in the localities in which it was found.

Chrysanthemum Parthenium Pers. Reported from Gibson, Posey and Clark counties. The position of these "escapes" in a local flora is very questionable. I am inclined to exclude such forms from the State list unless the form generally escapes from cultivation and successfully maintains itself for a series of years.

Onopordon Acanthium L. Doubtfully admitted on reports from Jefferson county by Dr. John M. Coulter, and from Clark county by Baird and Taylor.

Centaurea Cyanus L. This species undoubtedly escapes at times from cultivation. It is so reported from Gibson, Posey, Clark and Monroe counties. Its admission to the State flora will depend upon proof that it has maintained itself in the localities in which it has escaped.

Hieracium paniculatum L. Reported from Clark, Monroe, Jefferson and Harrison counties. While no range improbabilities intervene the somewhat scant specimens examined are perilously close to *H. scabrum* Michx. The well known variability of the latter species in our range leads to a slight degree of uncertainty in the reference. The number of flowers in the head, 12–20, however, determined the reference.

Hieracium venosum L. This species is reported from the "Knobs" by Dr. Barnes and from Monroe county by Mr. Blatchley. Its mass range is decidedly

to the north of these localities, and it may be looked for with confidence in the northern portions of the State.

Prenanthes aspera Michx. As reported, this species is confined to Jefferson and Clark counties. There is reason to believe it of more general distribution.

Lactuca hirsuta Muhl., *L. Floridana* Gaertn. and *L. cucophœa* Gray, are all confined to the southern counties, Monroe being the extreme northern reference in any case.

Only one form appears to be strictly western in its State distribution.

Solidago Missouriensis Nutt. This species is reported from Jasper county by Prof. Barnes, but with this exception is confined to counties bordering the Wabash River as far south as Gibson and Posey.

It is thus seen that 36 species have a *single* reported station; that 8 species are strictly northern, 24 species southern and 1 species western in distribution within our territory. The range of many of these 69 species will doubtless be extended as the result of further study. The remaining 144 species of the family are so generally reported, or are reported from such widely separate stations as to make it probable that they are found throughout the State in greater or less abundance. In many cases the distribution of these general forms is so thoroughly worked out as to give with a fair degree of certainty the determining factors in the distribution. It is impossible in this paper to give in detail illustrative cases. In a general way, water courses may be said to be an important determining factor. In the case of *Liatris pycnostachya* Michx., a prairie form, the southward extension of the species from the prairie region is found to follow closely the course of the Wabash River as far south as Gibson and Posey counties. The same thing is true in a less marked degree of *Eupatorium sessilifolium* L., which nowhere wanders far from water ways.

The prevailing winds play a large part in the direction of movement of composite species. After lodgment has once been obtained, the direction in which any given form spreads seems in many cases to be absolutely conditioned by the direction of the prevailing winds at the season of the dissemination of the achenes. A number of lines of distribution are easily attributable to this conditioning factor.

The great trunk lines of railway may serve to introduce new forms, many may find lodgment because of impure seed supplies furnished the agriculturists, but the after distribution, with but few exceptions, is determined by water courses and prevailing winds.

To a slight degree within our area the elevation seems to determine distribution. Thus our extreme southwestern counties are but 300 feet above sea level,

while the remainder of the State ranges from 700–1,100 feet above sea level. A single instance illustrates the point. *Solidago latifolia* L. is found abundantly throughout the State, with the exception of the extreme southwestern counties. It is found, however, in the higher land a little to the west in Illinois, and a little to the south. Other forms occur which indicate that even a slight change of elevation may at times enter as a very positive factor in distribution.

I ask the botanists of the State in their future study of composite forms to devote more time and care to ecologic observations, since by this means only can our State flora be made of such nature as to be readily correlated with work done in other parts of the country. Many lists are a weariness to the flesh, but ecologic facts do good as a medicine.

Additions to the Published Lists of Indiana Cryptogams. By Lucien M. Underwood.

The following plants, mostly collected during my connection with the State Biological Survey, have not been reported as growing in Indiana, and may properly be noted in this connection. All are represented by specimens in my herbarium:

UNREDINEÆ.

Aecidium Cyparissiæ DC. On *Euphorbia commutata*, Montgomery, 5, 1895 (Olive).

Coleosporium ipomoeæ. On *Ipomoea pandurata*, Tippecanoe, 9 1895 (Arthur).

THELEPHORACEÆ.

Corticium alutarium B. & C. Putnam, 10, 1892.

Corticium calceum Fr. Putnam, 5, 10, 1893; 12, 1894.

Corticium cinereum Pers. Putnam, 12, 1891.

Corticium filamentosum B. & C. Putnam, 10, 1892; 12, 1894.

Corticium lacteum Fr. Putnam, 6, 9, 1893.

Corticium lividum Pers. Putnam, 5. 10. 1893.

Corticium ochraceum Pers. Putnam, 10, 1891.

Corticium portentosum B. & C. Putnam, 10, 1892.

Corticium rubropallens Schw. Putnam, 10, 1893.

Hymenochæte fuliginosa (Pers.) Lev. Putnam, 12, 1894.

Hymenochæte purpurea Cke. & Morg. Putnam, 9, 1893.

Peniophora cinerescens (Schw.) Sacc. Should stand in place of *Hymenochæte cinerescens* previously reported. Putnam, 10, 1891; 12, 1894.

Stereum coffeatum B. & C. Putnam, 12, 1891.