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TAXONOMY TODAY AND TOMORROW[1]

REED C. ROLLINS

THERE has been a strong tendency toward introspection in our subject in recent years. More than once our leaders have felt impelled to examine the tenets we hold, our methods of inquiry, the fabric of the subject matter, and the theories that motivate our activities. The relationships of taxonomy to other branches of botany have been frequently reviewed. All this "self-inquiry" is healthy. It shows a willingness to extend, modify, or change ideas in conformity with new facts and logical conceptions. However, change for its own sake has no place in this; and those who seek to promote change for its novel aspects should be promptly opposed.

The rapid rise of genetics in the past fifty years has been variously received by taxonomists. Some have shown considerable suspicion of it. Others have gone so far as to give up taxonomy entirely to spend their whole time working in genetics. Actually, though not generally recognized in so many words, genetics has provided taxonomy with a very firm underpinning. From genetics has come an explanation for many things previously well known but unexplained in our field. More than any other branch of biology, it has provided a sound philosophical basis for our activities. The implications of the simple truism that "like begets like" is undoubtedly a very ancient observation of man. Today we can still say "like begets like" if we add "within broad limits" and "under most circumstances." The first qualification permits us to properly interpret "like" to mean

[1] Address of the president, American Society of Plant Taxonomists. Delivered before the Society in Minneapolis, September 11, 1951.

"similar," not "identical." Thus we move from the special creationist idea to a modern viewpoint in which variation is recognized as the normal outcome of a reproducing population of plants. The second qualification permits us to take into account such phenomena as interspecific hybridization, alloploidy, and a variety of special genetical and cytological situations. Furthermore, we may allow for the accumulation of gene-changes and the shifts in gene-patterns that inevitably occur in breeding populations, as well as the introgression of genes from one species into another. Genetics has supplied the basis for these important qualifications. As a corollary to these established principles, it is perfectly evident that the variation that does occur, originating from a given reproducing genetic pattern, is not at random, and there is, therefore, a set of limits to this variation as well as a point at which some expressed phenotypic pattern within these limits reaches its highest frequency.

The Role of Intrinsic Factors

It should be stressed for our purposes that the most constant and basic characteristics of a given phenotype are the ultimate products of intrinsic factors consisting largely of the genes. Constant and relatively discrete phenotypic characteristics were first used to delineate the Mendelian principles of heredity. Similarly, it is upon these genetically controlled phenotypic characters that a sound classification must be built. Basically, we as taxonomists are interested in the phenotype as an expression of the genotype, not primarily in the genotype *per se* as some have claimed. It need not concern us so much that the relation between gene action and its ultimate phenotypic expression is exceedingly complex. Our attention is of necessity focused on the end-products rather than upon the way in which genes bring these into being. Taxonomic studies are ultimately concerned with whole individuals, groups of individuals, and finally various taxa. Analyses of the multitudinous parts and organs of an individual as to origin, structure, and function are synthesized into an understanding of the whole. Further, the genetic history of individuals and the populations to which they belong provide the basis for considerable knowledge of the relationships of living taxa. Thus they may be viewed from the depth of time. Finally, we must study the present day and past distributional patterns of species, for in such studies lie the answers to questions as to where they occur on the earth's crust today and where they have occurred in the past. The answers are relevant to an understanding of the species themselves. I am not oblivious to the fact that certain gene-systems are involved in bringing about continuous variation, such as that of size. This type of variation is important in the classification of closely related groups and may be easily taken into account by methods designed to show the total range and greatest frequency of such variation.

The main points I wish to stress are that the major phenotypic characteristics of a living plant are considered to be validated expressions of the genotype, and in using them for taxonomic purposes, we are on the same ground as the geneticists who use them for genetic analyses. We are with good company and the ground would seem to be safe enough. But there are some pitfalls.

In emphasizing the genetic aspects of species differences, some workers have highlighted reproductive incompatibility, even going so far as to make this the sole criterion of species separation. The significance of this type of incompatibility in the evolution of distinct taxa on specific and infraspecific levels is unquestionable in certain groups, but its use as a supercriterion in setting species limits is certainly an untenable procedure. Reproductive incompatibility is not an all-or-none proposition in most instances and it does not arise from a single cause. At one extreme, similar types of incompatibility may exist between different members of the same population, at the other, between different species. Incompatibility is obviously most effective evolutionally when it is associated with other isolating mechanisms. Such isolation is presumably most frequent at the beginning of species differentiation, not an end product of it. The importance of effective reproduction in breeding populations, which in turn make up races and taxa of higher order, is of course fully recognized.

The folly of using reproductive incompatibility as *the* criterion of species distinction has been ably dealt with by Gates (1951). He points out that to insist on infertility (incompatibility) as the sole criterion of species "ignores the aims and methods of taxonomy and seeks to make taxonomy subservient to a condition—sterility in genetics, by raising it to the importance of a universal principle."

The erroneous idea that species throughout the plant kingdom are essentially equivalents has lead to attempts to discover universal criteria for distinguishing them and to construct definitions that will cover all organisms so grouped. To anyone who has worked extensively in taxonomy, it is obvious that species in different large groups are not equivalents. In most instances they are nowhere near equal. For this reason, a single species definition would seem to be an impossibility no matter how long and involved it was. But if the term species has a different connotation in different groups and it is impossible to define for universal application, then of what use is the word *species* and why do we use it so frequently? These are questions I should like to leave for the moment, to be taken up further on.

The Role of Extrinsic Factors

Our intended reliance mainly upon characters whose variation stems from the operation of intrinsic factors makes it necessary to distinguish between these and the characters whose variation is the result of change in the environment. Here lies one of the crucial problems in our subject. For a time, particularly under the leadership of Bonnier (1920) and of Clements (1929), there was a strong environmentalist trend. Environmental factors were held to be of very great importance in molding the ultimate nature of a population and in many cases to outweigh intrinsic genetic factors in maintaining species differences. Today we see the expression of a different form of this notion in Lysenkoism. However, the contentions of Bonnier and of Clements, that one species can be converted into another merely by transplanting it from lowlands to high mountains, or vice versa, has been fully discredited by the brilliant work of Clausen, Keck and Heisey (1940, 1948), who point to the early work of Kerner (1891), with whom they agree. They have demonstrated repeatedly and conclusively that species characteristics, borne of intrinsic factors are relatively stable under radically different environmental conditions. Changes that do occur purely in response to the environment are reversible, giving no indications of permanence. They report that "some of these changes in vegetative characters are quite spectacular, yet they never obscure the individuality of the plant, which is retained irrespective of the conditions of altitude, light, and moisture in which the plant is grown." I am sure you are all familiar with these studies and the conclusions derived from them.

Assuming that all of us will not have available the extensive garden facilities that are needed to determine experimentally the nature of the variation in given populations, we are often required to attack our problems in a different way. When this is necessary, we may fall short of the ideal. However, in all instances we should carry our studies as far as facilities and materials will permit. Students, particularly, should be encouraged to utilize every means at their disposal to make the results of their studies as nearly perfect as possible.

It has long been known that the overall dimensions of the plant-body and its vegetative parts are sensitive to external influences. Because of this, we have the axiom in plant taxonomy that qualitative differences in the vegetative body are more significant for classificatory purposes than are quantitative differences. Furthermore, structures maturing decisively at an early stage in the formation of vegetative parts are less subject to environmental influences than those with a prolonged formative period. For example, most trichomes when present on the leaves of Angiosperms, mature and the cells lose their living contents at a very early stage in leaf development. For this reason, they are far less apt to vary quantitatively due to extrinsic factors than the leaves themselves.

Though dealing with the whole plant, we select for special attention features reflecting most accurately its hereditary constitution. The reproductive parts and associated structures are in general less sensitive to environmental influences than the vegetative portions of the plant (Anderson, 1929; Turrill, 1936). Here, relatively large quantitative differences are more likely to be significant than in the vegetative structures. But again, greatest emphasis for taxonomic purposes is placed upon the qualitative aspects of the structures involved. Polyploidy and the frequently associated size-effects in many plants are too well known to be ignored.

The Role of the Herbarium

We have heard a good deal in taxonomy recently about the study of dynamic populations, of natural hybridization, of introgression, of gene ecology, of apomixis. These modern aspects of some of our problems are popular, and studies involving them carry an implication of *right*. From them we stand to gain a more penetrating understanding of various plant groups and their biological nature. Unfortunately, accompanying increased activities along these lines one finds a tendency to deprecate "specimens," and hence the herbarium and, for that matter, classical taxonomy comes in for its share of punishment. For a moment, I should like to say a little about the role of the herbarium in taxonomy. Actually, we have in it a unique method of documentation. Specimens so placed are relatively permanent and are scarcely subject to manipulation to obscure the facts they reveal. In them, investigators for centuries have available, as nearly as one could hope for, exactly the same basic materials. The specimens should be looked upon as samples. As such, they may be studied in a wide variety of ways. They are samples of the taxonomic groups to which they belong; of a particular flora; of a plant association; of a specific population; of a particular combination of morphological and anatomical characters; and of the product of a particular set of genes. Whether any set of specimens fully represents a given taxon obviously depends upon the circumstances. It is doubtful whether any herbarium has specimens showing the complete variations of more than a few species, if even one. However, one good specimen is concrete evidence that a particular taxon exists or has existed, and considerable information can be obtained from it. It is self evident that the amount of information obtainable does not double when a second specimen of the same taxon is acquired. The amount from each new specimen of a representative series will never equal that obtainable from the first. For this reason, the extent and kind of specimen-representation in a particular herbarium will depend largely upon its objectives and facilities. Perhaps it would be ideal to have the total variation of all taxa represented by specimens in some herbarium, but such a goal is impossible of achievement. Merely to determine the total range of morphological variation of a given taxon, using all the means and methods available, is practically an impossibility, let alone having it represented in an herbarium. Assuming the latter were possible, continuous evolutionary changes would often make such a representation obsolete. This type of natural limitation is not confined to the taxonomic side of things but is equally operative in other branches of botany. The problem of adequate samples is ever present. However, considerable communicable knowledge concerning various taxa can be assembled and a lot can be represented by specimens in the herbarium. It is to the possible that we direct our attention.

The system of arranging specimens in an herbarium is impressive. The availability of any one of the one million three hundred thousand specimens in the Gray Herbarium never ceases to be a marvel to me. Our specimens are far more accessible than the books in a large library. The key to the arrangement is the system of nomenclature which of necessity places the specimens under species names. Our esteemed friend and former president, Dr. Camp (1951), seems to feel that such a procedure leads many taxonomists to regard the *specimens* so placed as the *species.* Perhaps such a tendency exists, but it is hard to imagine a more satisfactory way of doing the job. Personally, I have never met a taxonomist who would argue that a species resided in a museum case. Representatives or samples of a species, yes, but not the species. When I climb to the twelve-thousand-foot level on Hoosier Ridge in Colorado and see individuals of a certain mustard growing among the rocks, I may pick up a plant of it and remark that it is *Draba crassa.* But I do not delude myself into thinking that that particular plant is the species, for I know there are thousands of individuals on Hoosier Ridge, not to mention the tens of thousands on the other high peaks of the Colorado Rockies. Rather, the plant I held in my hand was a sample of *Draba crassa.* One might, in like manner, contemplate a particularly vigorous Jack Pine in northern New England, and suddenly exclaim "Why this is *Pinus Banksiana.*" He would not thereby declare that particular tree to be *the species,* for he would know there are hundreds of thousands of living trees of Jack Pine to be found anywhere from Quebec to Saskatchewan. We work by sampling in the field as surely as we do in the herbarium, and both have the natural limitations inherent in the technique. I doubt whether anyone is capable of a full comprehension of the diversity represented in all the individuals of a single populous species.

The Role of Experiments[2]

There is a popular notion that the real and the only way to get at the true nature of a given taxon is to go at it experimentally. Bring the plants or their offspring into the experimental garden where they can be manipulated in accordance with our best-planned experimental procedures. The results, when properly codified, tell us considerable, but for taxonomic purposes it is often in the nature of additive information to that obtained in other ways, and rarely replaces or negates it. Personally, I believe the more experimentation designed to reveal the nature of species and other taxa the better, but experimental taxonomy is not the whole answer to the problems in our subject. Experimentation is beset with limitations, as are all methods of investigation, and this we must recognize. In the first place, experiments must be carried out by using samples and they are, therefore, subject to the natural limitations of sampling techniques. Secondly, it is next to impossible to sample most taxa adequately. In my own experience, forty acres of experimental plantings were wholly inadequate to provide a proper overall sample of *Parthenium argentatum*, a species comparatively restricted in its geographic range. How many of us have forty acres available for expermental purposes?

It seems almost redundant to say that critical observation and study in the herbarium alone, in the field alone, in the experimental plots alone, or in the laboratory alone, are insufficient for the realization of the primary objectives of taxonomy. A combined attack, using to the fullest the techniques of all these, will scarcely be sufficient to complete the job, but we should get closer to our goal using all of them than we would by using but one. If, in addition, we borrow as much information from other branches of botany as is pertinent and possible, we should proceed a step further toward our ultimate goal. Thus viewed, taxonomy becomes an integrative and synthesizing subject, in a way rising on the shoulders of its sister disciplines.

[2] It is not my purpose to develop this subject in the manner that might be implied from the present heading for, to do so, would occupy my entire time.

What Is a Species?

One of the stumbling blocks upon which the introspective wanderer inevitably barks his shins is the precise definition of terms. Whether we like it or not, the precise meanings of many scientific terms begins to be altered immediately after they have been proposed. After a few generations have been at work, their meaning has often been altered completely. As ideas and ways of looking at subject matter change, the meanings of applicable words are shaded to accommodate the new view. Shifts in meaning are usually so gradual and so closely tied in with the current of contemporary communication, that they frequently go unrecognized until considerable difference from the original has developed. The words we have the most trouble with are those closely associated with changing concepts. For example, to the pre-evolutionists the term species was definite enough. The immutability of its meaning was immediately upset by the concepts of evolution and its preciseness was further devalued by the impact of genetics. Now we are told that no one knows what a species is, and that perhaps there isn't any such thing anyway. Yet anyone who has dealt with whole organisms, whether plant or animal, complex or simple, is fully aware of certain patterns of populations that are reproduced with fidelity over great periods of time. He knows with certainty that at a given time level, the members of neither the plant nor the animal kingdom represent a continuum, no matter what the vantage point from which they may be viewed. Given the facts that organismal diversity exists and that it does not exist in a continuum, the taxonomist's job is to assemble and systematize a body of communicable knowledge about the different kinds of the earth's plants, both of the present and of the past, that will reveal their true nature. In this, the problem of species remains a major one in spite of all that has been said or written upon it. I dare not venture a guess as to the number of times the species problem has been discussed. Certainly it is a perennial of many years standing and it appears to grow more lustily as the years go by. It seems generally agreed among most discussants and writers that a universally applicable species definition is a must and that without it taxonomy lacks the dignity of a science. Some have viewed the problem of defining the term species as a futile one, others lifted the problem to a light vein by suggesting that species are completely subjective and are what a good taxonomist says they are. In taxonomic literature, we even see descriptions of new concepts instead of new species.

Since *species* is one of the key words in our subject, we shall continue to be badgered by questions for an explanation of it. There has often been a certain amount of irrationality in the way of coming to complete grips with the problem. We have sought to satisfy the philosopher-logician type of inquiry by trying to provide a definition of the term. Naturally, others would like to know what we mean when we speak of a species, whether it be of an alga, a conifer, or a mint. But I think none of us have really believed that the curious could find out on his own what a species was in any one of these groups by using our numerous and varied definitions. Even the incompat bility test, which perhaps came as close to being practical as any, brought forth only negative evidence in many instances. If two particular plants of presumably different species would not cross and produce fertile offspring, one could never be sure that two other plants representing different strains of the same two presumed species would behave similarly. In specific groups where authorities supposedly held the secret as to what the species were, there were always intangibles and indefinable somethings that aided in species determination. I do not minimize the necessity of knowing a group nor of diligent attention to every possible detail. The point is, the species definitions we have concocted are not practical. I happen not to agree with most of the attempted dispositions of the problem of determining what species are, and, for this reason, feel somewhat justified in speaking about it. Certainly the problem is very much with us and still needs attention.

In the first place, I should like to state my unqualified belief that there are species in nature quite apart from man's contemplation of them. It is not necessary to call them species, but there are groups of closely interrelated organisms that reproduce themselves with a surprising fidelity over long periods of time—and I am thinking now in terms of millions of years. These species are not equivalents in different large plant groups and, considering the tremendous diversity in the plant kingdom as a whole, it would be surprising if they were. The species in relatively unrelated groups do not have the same attributes, they did not arise in the same way, and they most probably have been subjected to a wholly different combination of environmental influences during their phylogenetic life. Why, then, should we be surprised that a universal species definition for them seems impossible? I do not agree with the notion that because we do not have a satisfactory man-made species definition, the whole fabric of taxonomy comes crashing down around our ears. The species are not man-made. The difficulty arises from trying to pour into a single kind of mold the thousands of almost totally different kinds of plants all will agree are represented in the plant kingdom. The problem is one of interpretation. But why try to produce a universal definition? Why not let the species themselves tell the story? In order to elucidate this latter question I must start with some basic facts.

Genetics has provided us with a valid principle upon which to build. This may be stated as follows. The closer the genetic relationship of individuals or groups of individuals, the greater the number of genes they have in common. Conversely, the more distantly related the fewer common genes. Remembering the specificity of gene-action, it is obvous that similar or identical genes and gene systems produce similar end products. Thus we are justified in using the phenotype as an indicator of relationship. If, as we must assume, similar genes provoke similar organizational patterns, then it follows that genetic variation is controlled in a like manner. Indeed, this has been shown many times. Here is the crucial point, providing the basis for taxonomic use of the organizational pattern of an individual as well as the variation of such a pattern that may be found among all the individuals making up a species. It is in the area of variation that we have learned most in recent years. From the main principle springs the logical basis for the comparative method.

How distant may the relationship be of two groups of plants and there still remain common gene lineages that will operate to produce detectable specific similarities in the phenotype? This we do not know, and there is no organized information on the point. However, parallel variations and changes have been repeatedly observed in species known to be related. It is no stretch at all to suppose that the species of any given genus, or at least subgenus, have numerous common genes and, therefore, we can expect similar characteristics, similar patterns of variation, similar modes of genetic change and even similar responses to external factors. That such is actually the case in many genera can readily be shown. Similarities of this sort permit us to extrapolate from one species to related species. Between certain closely related genera there must also be a community of genes and gene patterns. The species most difficult to distinguish, using all types of criteria, are the most closely related. These have been the source of greatest consternation because of the difficulty of knowing where to draw the line between such species and infraspecific taxa. "Where does the species stop and the subspecies or variety begin?" is the question frequently asked. How many different genes must two populations of plants possess before they are species? How many similar genes may they possess and remain on the species level? These are pertinent questions, but they cannot be answered for the vast majority of cases in which they may be asked. Our present knowledge of most plants is much too fragmentary to provide exact answers. But if we should ask how many and what type of different phenotypic expressions of genes are required before a group of like plants are a species, or only part of a species, there is a way of providing the answer. This way is based upon the expected similarities of related species as mentioned previously and the use of comparative procedures.

The Species-standard Method

For the present, let us focus our attention upon the so called difficult genus *Arabis* of the Cruciferae. It is not an extremely large genus, having roughly 65 species in North America and a few less in the rest of the world. Nor is it small as genera of Angiosperms go. Within it are complexes of species difficult to interpret and separate. Polyploidy is present and interspecific hybridization occurs. At least one species is apomictic (Böcher, 1951), and the rest have not been studied from this point of view. But there are also perfectly distinct, well-characterized species in the genus, too. Often they have distinctive geographic ranges. These distinct species are obviously so, to any discerning taxonomist, and one could obtain complete agreement among botanists willing to study them more than superficially. When I worked on *Arabis* as it occurs in western North America some years ago (Rollins, 1941), I studied these well-defined species in as much detail as possible at that time. They provided the basis for interpreting the more difficult series. They were biological standards of comparison, so to speak, that revealed in themselves what a species is in *Arabis*. There was no need for arbitrary species criteria nor man-made definitions. To have used them would have obscured the facts as revealed by these clearly defined species. In this study, the species used as standards were *Arabis blepharophylla*, *A. cobrensis*, *A. Crandallii*, *A. crucisetosa*, *A. Cusickii*, *A. dispar*, *A. furcata*, *A. glaucovalvula*, *A. Koehleri*, *A. Parishii*, *A. perennans*, *A. platysperma*, *A. rectissima*, *A. Schockleyi* and *A. suffrutescens*. Among them are representatives of all four groups or series of species of *Arabis* occurring in the area. Some of the species are widespread, others are restricted geographically. Some showed less variation than others. In all cases the patterns of variation were of the same general type. Similarly, the same pattern of definitive characteristics ran through the entire group. While the species-standards, individually and collectively, were the real key to species interpretation in the whole genus, certain working hypotheses as to the value of particular characteristics emerged from a study of them. For example, the presence or absence of trichomes on the leaves and stems of *Arabis* was found to be an unreliable criterion of species difference. On the other hand, qualitative differences in the trichomes proved to be of considerable value.

The method used to determine "what is a species?" in *Arabis* is one partially used by many monographers, though in most instances it is not done in an organized way. It is my conviction that an extension of the method is highly desirable and would go a long way toward solving the practical aspects of the "species problem." The use of biological standards of comparison is an accepted procedure in other branches of botany. The *Avena* coleoptile test, the *Stapholococcus aureus* test for penicillin concentration, and the growth-rate test of chemical concentration in *Neurospora*, to mention only a few, all depend upon a completely biological standard. Many biological stains and reagents are standardized by purely biological tests. In numerous instances, whole organisms are involved whose complete development is no more controlled nor in fact known than are the wild plants with which we work. The use of living and dead plant samples in formulating species-standards and the use of these in determining the species of a given group, is vastly more complicated than the tests mentioned above. But the method is sufficiently extensible to meet our requirements.

What are the possibilities and ramifications of the species-standard method? Perhaps this can best be shown by assuming that we are setting about to determine "what is a species?" in a hypothetical genus. First we study our materials sufficiently to be able to select for intensive investigations those species that are readily discernible. These materials may be specimens in the herbarium, populations of plants in the field, or plots of them in the experimental garden. In a well-kept herbarium having a reasonable representation of the genus, this step will have been largely done. In many herbaria, the specimens will reflect the cumulative wisdom of a number of workers who have studied them. Study of the geographical ranges of distribution often aids materially in this first stage. I anticipate that someone will say at this point that there are some genera in which there are no clear-cut, easily recognized species. Personally, I do not know of a single genus in which such species may not be found. Certainly the notoriously "difficult" genera *Poa, Salix, Rubus, Crataegus,* and *Hieracium* have readily distinguishable species that might be utilized for our purposes. Naturally, it is necessary to exercise some judgement in the selection of these species and the competence of botanists will vary in this regard. But the critical aspects of the selection are so unrefined as to be within the scope of all who are trained. Furthermore, botanists outside of taxonomy with any acquaintance with its aims and methods will find the selection easy to follow.

The second step in our inquiry involves the detailed study of the selected species. Ideally, this should extend all the way from a careful analysis of the characteristics of a representative series of specimens to transplant work in the experimental garden. Data concerning the range of variation of the species in the field and under manipulated or selected environmental conditions should be gathered and processed. The morphology, anatomy, and cytology should be worked out with a view toward deriving useable information for taxonomic purposes. The reproductive cycle and mode of pollination should be studied. In short, these selected species should be subjected to the most thorough-going study possible. That is the ideal. Actually, most taxonomic studies will fall short of this ideal, except in a limited number of cases. But until such studies are made throughout the plant kingdom, our work is not finished. From this point of view, it is evident that we have scarcely started on the job ahead. The successful application of the method is not dependent upon any particular level of refinement or thoroughness of study of either the species-standards or the other species of a genus under consideration. The most accurate and reliable results will come from complete studies using wholly adequate materials. Where only the minimum of specimens is available and there is no opportunity to carry out experimental or field studies, the method can still be used with considerable probability of arriving at the proper species designations.

The method I have briefly outlined to determine "what is a species?" has several aspects that tend to clear the path of the logical impasse often cited in considering the species question. (1) It is free from arbitrarily selected criteria. Under this scheme, incompatibility or any other characteristic may be significant or insignificant, depending upon the group involved. (2) A universal definition is not required. The species are probably of a different sort in every major group. By recognizing this, we recognize the very great organic diversity existing in nature. Furthermore, we recognize the numerous ways in which species arise and the variety of circumstances under which they survive. (3) Species so defined are not a subjective creation nor a mere concept of man. However, a high percentage of agreement of interpretation should be possible. It should be clear that the species exist, independent of man's ability to define them or to perceive their presence. The fact that many species have reproduced themselves with fidelity for millions of years is ample proof of this (Stebbins, 1950). (4) The method is logical and largely objective, depending not on judgement alone but utilizing the best procedures in scientific research. Naturally, some judgement is required. No matter what is often claimed, there is a certain amount of subjectivity in all kinds of scientific inquiry. If this were not the case, neither ours nor other sciences would have any real meaning to man. (5) The method is extremely flexible, providing the procedure for determining the species in all groups, in such a way that it can be followed by anyone with sufficient training and interest. (6) It permits the assembly of an almost unlimited body of knowledge about determinable and redeterminable kinds of plants. This knowledge thus becomes communicable and the basis for its organization on a large scale is provided. This I consider to be one of the major aims of taxonomy.

How critical is the species-standard method? Simply answered, one might say that the method is as critical as the time and energy of the botanist making the study will permit. The implication is that there are unlimited possibilities for the study of the species providing the standards of comparison within a given genus. This is equally true of the more difficult species that are dependent upon the use of these standards for their detection. The accuracy of the comparative procedures used for the latter purpose is dependent upon the precision and extent of the various comparisons made. Certainly, accuracy cannot be achieved without great care. Complexity stems from the complex nature of the organism itself and perhaps can never be avoided in taxonomy. As stated before, we deal in whole organisms, but the studies employed ordinarily involve analytical procedures in which any part of the plant may be the subject of attack. Such analyses may range from studies of chromosome behavior to the gross morphology of the flower. In the end, the results of analytical studies are synthesized into a body of knowledge that forms the basis for making appropriate comparisons.

As a general observation, it seems to me that taxonomy fails to appeal to some scientists because it does concern itself primarily with whole organisms, which are by their very nature exceedingly complex. Chemistry, Physics, and Astronomy have influenced all of science in the direction of desiring a one to one relationship between cause and effect. The nicety of mathematical precision has been a constant goal in the reduction of observation and experiment. More recently, these sciences have dealt with variable systems and the very complex relationships of various phenomena have been widely recognized. In spite of this reversal, the trend in many branches of biology has continued in the old path. On the whole, the struggle of biologists to simplify the interpretations of phenomena of living organisms has not met with spectacular results, but the directional emphasis has remained. As taxonomists, we find ourselves well outside the main stream of this activity because of the nature of our subject. Simplification cannot logically be carried below the complexity inherent in the living individual and the population of which it is a part. I do not say that analytical methods of all sorts may not be used to delve below this level, for it is extremely important that we utilize them to the utmost, but the information thus obtained, to be relevant, must be applicable to the plants as a whole. We are thus dependent upon information obtained largely by analytical methods but in its ultimate, usable form, it has to be synthesized into a whole. We are dealing largely with variables and the complexity of the ultimate systems reppresented by the living individual, the population, and the taxon considered in time is so much greater than known physical systems that there is no real basis for comparisons between them.

What would be the consequences of the widespread use of the method I have outlined? If the taxonomists who have described hundreds of apomicts in *Hieracium* had used it, certainly they could not logically have named them as species. It would have been absurd for me to have named as species fifty to a hundred apomicts in *Parthenium,* and I am convinced that the wholesale naming of apomicts as species, wherever they are found, is equally absurd. Babcock and Stebbins (1938) using the sexual species of *Crepis* as reference points for the organization of the apomicts in that genus, were certainly on the right track. I believe that the method would even permit agreement as to the numbers of species of *Rubus* or *Crataegus* in eastern North America. Perhaps I am unduly optimistic here, but I should like to see it given a trial.

Using the species-standard method, it would be impossible to recognize socalled cryptic species which show no morphological singularity even though they were incompatible with morphologically similar plants. But I do not believe these are, in reality, species. Difference in chromosome number alone would scarcely be sufficient to set two species apart unless that were the rule throughout the genus. It would not help particularly in dealing taxonomically with species-hybrids and cases of introgression. However, many instances otherwise not easily seen might be detected. It is impossible to foresee the total ramifications of the wide adoption of such a procedure. It does throw emphasis toward the monographic type of study rather than the floristic, for determining what the species are to begin with. Such a procedure has long been recognized as desirable. The taxonomist, working with a particular flora without adequate reference to monographic studies, is indeed handicapped in arriving at natural specific boundaries. The danger of misinterpretations, when a single species or only a few species of a genus are studied independently, should be immediately apparent.

The two novel aspects of the proposed method are (1) the complete abandonment of any attempted species definition that would be of universal application, (2) the definition of species at a relatively low hierarchial level in the plant kingdom, i. e., probably most frequently within the genus. Thus a paradox of long-standing would be resolved. These are fairly radical deviations from the most common present day ideas, so that one may ask how these changes would affect traditional taxonomy as well as the newer approaches to the subject.

In the practice of traditional taxonomy these changes should result in considerable improvement. Definite reference points within genera could be set up that would have real meaning to a wider audience of botanists. Greater agreement in interpreting difficult genera should be achieved and a more systematic determination of the species in generic revisions should result. Nomenclature does not enter, except as new interpretations call for nomenclatural adjustments. Insofar as the newer approaches to taxonomy are concerned, such as those developing in cytogenetics, experimental taxonomy, and the like, these would be as relevant as before and perhaps more so, for the information obtained could be brought more directly to bear on the practical problem of species interpretation. Thus, an integration of the old and the new in taxonomy might be envisaged for the ultimate benefit of us all.

Gray Herbarium, Harvard University

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THE GENUS TOVARA (*POLYGONACEAE*)

Hui-Lin Li[1]

The broad concept of the genus *Polygonum* has been subject to repeated splitting in the past. In most cases, these segregates, maintained by certain authors but generally not accepted by most other taxonomists, have often been based on vegetative characters which are found to vary greatly in this group of plants. *Tovara*, however, is very distinct in having constant differences in the inflorescence and floral parts. Currently it is recognized by most authors as a generic entity distinct from *Polygonum*. The differences are as follows: In *Polygonum*, the calyx is 4–6-, mostly 5-parted, enlarging in fruit, and the segments are often

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petaloid and colored; the styles are 2 or 3, these being deciduous and not hooked; the flowers are either solitary or fascicled in the axils of leaves or bracts and they are arranged in spiciform panicles or in paniculate or corymbose racemes. In *Tovara*, the calyx is always 4-parted, scarcely enlarging in fruit, and the segments are green or reddish; the style is single, 2-parted to base and persistent as 2 deflexed hooked beaks of the achene; the flowers are remotely arranged in spike-like racemes with very elongate slender axes, 1–3 in each fascicle, and they soon become deflexed. The hooked beaks on the achene are very unique and undoubtedly aid in dispersal by animals.

The genus *Tovara* has also a distinct geographical range; like many other genera of this distribution pattern, it occurs disjunctly in eastern North America and eastern Asia only. One species is found in America, with a variety of very local occurrence. The taxonomy of the Asiatic plants is in a confusing state. They are recognized either as one or more varieties of the American species, or as one or several distinct species. However, the Asiatic plants differ from the American species in sufficiently constant morphological characters to be considered specifically distinct. The widespread species in temperate eastern Asia is now known as *T. filiformis*. A distinctly hirsute form is found in the southwesternmost range of the species, in southwestern China and the adjacent parts of Burma. Although it is strikingly distinct in general appearance, intermediate forms render its complete separation from the species impossible and it is here being treated as a variety. Another distinct population, which is of isolated range, being found only in Mindanao of the Philippines, is worthy of being considered a distinct species. A number of species have been proposed from time to time from Japan and the Liukius. When the widespread *T. filiformis* is studied from a large series of specimens from all localities within its range, the variable nature of the different parts of the plant shows that such local segregates are untenable.

The material used for this study is deposited in the U. S. National Herbarium (cited as US) and the Gray Herbarium of Harvard University (GH). The collections in the herbarium of the National Taiwan University, Formosa (NTU), have also been examined.

KEY TO THE SPECIES AND VARIETIES

A. Plants pubescent or rarely glabrous; leaves ovate, acute to rounded and not attenuate at base, the lateral veins 7–9 per side; calyx green, rarely rosy (Eastern North America).

B. Stems pubescent; leaves thin-chartaceous, usually pubescent beneath, strigose or often scabrid above; rhizomes thick, knotty..........1a. *T. virginiana* var. *virginiana*.

BB. Stems glabrous or glabrate; leaves thin-chartaceous to membranaceous, glabrous or glabrate; rhizomes slender, cord-like...............1b. *T. virginiana* var. *glaberrima*.

AA. Plants more or less hirsute-pubescent throughout, especially on pedicels and sheaths; leaves more or less obovate, the base acute to cuneate, attenuate, the lateral veins 7–13 per side; calyx dark red (Eastern Asia).

B. Rhizomes thick, knotty; plants tall, 60 cm. or more high; leaves large, over 9 cm. long, acuminate at apex, broadly cuneate at base, the lateral veins 11–13 per side; flowers more densely arranged, 2 or more fascicles per cm. of the rachis.

C. Pubescence more or less scattered, short; leaves generally broader, about 10–16.5 cm. long and 4–7.5 cm. broad....................2a. *T. filiformis* var. *filiformis*.

CC. Pubescence very dense, long, and coarse; leaves narrower, about 9–16.5 cm. long and 2–5.5 cm. broad 2b. *T. filiformis* var. *kachina*.

BB. Rhizomes slender, not knotty; plants lower, to 60 cm. high; leaves smaller, 5–8 cm. long, obtuse or broadly acute at apex, narrowly cuneate at base, the lateral veins 7–11; flowers more scattered, 0.5–1 per cm. of the rachis...................................3. *T. apoënsis*.

1. **Tovara virginiana** (L.) Raf. Tellur. **3:** 12. 1836.

A slender erect plant, 45–60 cm. or more high, strigose-pubescent or nearly glabrous throughout; rhizomes slender and cord-like or thick and knotty; stems terete, simple or virgately branched especially above; sheaths membranaceous, cylindric, pubescent, the margins ciliate-fringed; leaf-blades thin-chartaceous to membranaceous; ovate to broadly lanceolate, about 5–15.5 cm. long, 2–10 cm. broad, acuminate at apex, acute to rounded at base, not attenuate, usually pubescent beneath and finely and softly strigose and often slightly scabrous above or glabrous or promptly glabrate on both surfaces, the main lateral veins about 7–9 per side; petioles 3–10 mm. long. Inflorescence consisting of 1 or several elongated spicate racemes, the leading ones to 20 cm. or more long, the flowers 1–3-fascicled, these scattered, 1–1.3 per cm. of the rachis, the rachis pubescent, often glabrous above; ocreale funnelform, 2 mm. long, glabrous, the margins ciliolate at top; pedicels scarcely 1 mm. long; calyx greenish or rose-colored, about 3 mm. long, usually 4-parted to the middle or to the base, scarcely enlarging in fruit; stamens 5, included; styles 3 mm. long, 2-parted to the base, long-exserted, the segments reflexed at tip. Achene brown, shining, ovoid, about 3.5 mm. long and 2.5 mm. across, pointed at apex with 2 styles 3 mm. long.

1a. **Tovara virginiana** (L.) Raf., var. **virginiana.**

Tovara virginiana Raf. Tellur. **3:** 12. 1836; Fernald, Gray's Manual ed. 8. 571. 1950. *Polygonum virginianum* L. Sp. Pl. 360. 1753. *Persicaria virginiana* Gaertn. Fruct. **2:** 180. *pl. 119, f. 3.* 1791. *Polygonum muticum* Moench. Meth. Suppl. 266. 1802.

An erect, slender plant, 60 cm. or more high; rhizomes thick, knotty; stems slightly pubescent; leaves chartaceous, firm, usually pubescent beneath, strigose or often scabrid above; calyx green, rose-red in f. *rubra*.

Widely distributed in eastern North America, in rich woodlands and thickets, from southern Quebec and western New Hampshire to southern Ontario and Minnesota, south to Florida, Alabama, Mississippi, Louisiana, and eastern Texas. Flowering July–October. (All cited specimens are from U. S. Nat. Herb.).

Canada:—**Ontario**: *J. Macoun* in 1892. U. S. A.:—**New Hampshire**: *Weatherby & Upham* in 1942. **Massachusetts**: *H. A. Purdie* in 1903, *J. R. Churchill* in 1887. **Connecticut**: *E. H. Eames* in 1894. **Rhode Island**: *P. Spaulding* in 1916. **New York**: *O. P. Phelps 401*, *A. K. Harrison* in 1889, *Standley & Bollman 12321*, **New Jersey**: *W. M. Van Sickle* in 1895. **Pennsylvania**: *T. C. Porter* in 1895, *A. A. Heller* in 1889, *J. K. Small* in 1890, *L. K. Henry 528*. **Ohio**: *C. W. Short s. n.*, *A. E. Ricksecker* in 1894, *E. O. Wooton* in 1896, *E. S. Steele* in 1910, *D. Demaree 11596*. **Illinois**: *H. H. Babcock* in 1871, *L. M. Umbach* in 1896, *M. S. Bebb s. n.*, *E. S. Steele* in 1910, *V. H. Chase 8387*, *C. Gates 1954*. **Indiana**: *W. L. Hahn* in 1906, *B. W. Evermann 992, 1050*, *C. C. Deam 154*. **Michigan**: *A. A. Croizer* in 1886, *G. B. Sudworth* in 1890, *F. J. Hermann 9218*, *W. F. Wight 29*, *O. E. Lansing, Jr., 3329*. **Minnesota**: *C. A. Ballard* in 1892. **Iowa**: *M. P. Somes 3783*, *B. Fink 267*, *J. H. Mills 532*. **Kansas**: *J. B. Norton 462*, *T. T. Crevicoeur 33*. **Missouri**: *P. C. Standley 8342, 9645*, *B. F. Bush 415*, *W. W. Eggleston 12157*. **Kentucky**: *C. W. Short* in 1840, *T. H. Kearney Jr. 515*, *H. W. Lix 471*. **Tennessee**: *A. Ruth 181*, *A. H. Curtis 2413*, *W. B. McDougall 1450*. **West Virginia**: *E. S. Steele* in 1898. **Virginia**: *T. H. Kearney Jr. 2183*, *Fernald & Long 8251*. **Maryland**: *J. D. Smith* in 1878, *E. S. Steele* in 1910. **North Carolina**: *R. K. Godfrey 6311*, *P. C. Standley 5572*, *W. W. Ashe 2379*. **South Carolina**: *Godfrey & Tryon 1516*, *H. D. House 2920*. **Georgia**: *R. M. Harper 305*. **Florida**: *W. A. Murrill 502*, *A. Fredholm 261*. **Alabama**: *C. Mohr* in 1892, *E. A. Smith* in 1874, *G. McCarthy* in 1888, *S. M. Tracy 8034*. **Mississippi**: *S. M. Tracy 8767*. **Louisiana**: *E. J. Palmer 8861*. **Arkansas**: *D. Demaree 8247*. **Oklahoma**: *J. H. Kimmons* in 1895, *G. W. Stevens 2127*. **Texas**: *J. Reverchon 2145*, *V. L. Cory 49842*, *F. W. Thurow 3*, *G. L. Fisher 105*.

A form with bright pink or reddish fruiting calyx, *T. virginiana* f. *rubra* Moldenke in Boissiera **7**: 4. 1943, is recorded from Ohio, near Fresno, in open woodland.

1b. **Tovara virginiana** (L.) Raf. var. **glaberrima** Fernald in Rhodora **39**: 404. 1937.

Slender plant, 45 cm. or more high; rhizomes elongate, slender, cord-like; stems glabrous or glabrate; leaves membranaceous, thin, glabrous or promptly glabrate, usually pubescent along the main veins beneath.

Southeastern United States, rich low woods and flooded bottoms, from southern Virginia to South Carolina.

U. S. A.:—**Virginia**: *Fernald & Long 6201* (GH), *6202* (GH), *6703* (GH, type), *7431* (GH), *7432* (GH), *9319* (GH, US); *Fernald, Griscom & Long 6591* (GH, US); *R. K. Godfrey & R. M. Tryon Jr. 1516* (US). **South Carolina**: *Godfrey 8164* (GH, US), *H. W. Ravenel s. n.* (GH).

2. **Tovara filiformis** (Thunb.) Nakai in Rigakki **29**(4): 8. 1926.

A tall herb, 60 cm. or more high; rhizomes very thick, subligneous, knotty; stems terete, more or less pubescent to hirsute throughout; sheaths membranaceous, cylindric, more or less densely yellowish-brown strigose, the margins ciliate-strigose; leaf-blades membranaceous to chartaceous, obovate to obovate-oblong or obovate-lanceolate, 10–16.5 cm. long, 2–7.5 cm. broad, acuminate at apex, broadly cuneate at base, dark green above, pale beneath, glabrate to densely strigose on both surfaces, the main lateral veins 11–13 per side; petioles 1–1.5 cm. long, canaliculate above, strigose-pubescent to hirsute-strigose throughout. Inflorescence in long slender terminal or axillary racemes, 40–60 cm. long, usually 2–several-branched, the flowers 1–3-fascicled, these scattered, 2 or more per cm. of the rachis; rachis pubescent; ocreale tubular, scabrid-strigose, the margins long-strigose-ciliate; pedicels slender, to 2 mm. long; calyx reddish, 3 mm. long, scarcely enlarging in fruit. Achene brown, shining, ovoid, 2.5–3 mm. long, 1.5–2.5 mm. broad, pointed at apex with 2 styles 2–2.5 mm. long.

2a. **Tovara filiformis** (Thunb.) Nakai var. **filiformis.**

Tovara filiformis (Thunb.) Nakai in Rigakki **29** (4): 8. 1926; Maekawa in Bot. Mag. Tokyo **46**: 587. *f. 13, F.* 1932. *Polygonum filiforme* Thunb. Fl. Jap. 163. 1784. *Polygonum virginianum* var. *filiforme* Nakai in Bot. Mag. Tokyo **27**: 380. 1909; Merr. in Journ. Arnold Arb. 21: 367. 1940. *Persicaria filiformis* Nakai, Fl. Quelpart Is. 41. 1914. *Polygonum neofiliforme* Nakai in Bot. Mag. Tokyo **36**: 117. 1922. *Tovara neofiliformis* Nakai in Rigakki 29 (4): 8. 1926; Maekawa in Bot. Mag. Tokyo **46**: 586. *f. 13, N.* 1932. *Persicaria neofiliforme* Ohki in Bot. Mag. Tokyo **40**: 57. 1926. *Tovara virginiana* var. *filiformis* Steward in Contr. Gray Herb. no. 88: 14. *pl. IA.* 1930. *Tovara smaragdina* Nakai ex Maekawa in Bot. Mag. Tokyo **46**: 585. *f. 13, S.* 1932. *Tovara ryukyuensis* Masamune in Trans. Nat. Hist. Soc. Formos. **29**: 60. 1939. *Polygonum virginianum* sensu Hook .f. Fl. Brit. Ind. **5**: 31. 1886; Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26**: 352. 1891; Samuelsson ex Hand.-Mazz. Symb. Sin. **7**: 172. 1929; non L.

A tall herb, 60 cm. or more high, more or less scabrid-pubescent throughout. Leaves membranaceous to thin-chartaceous, broadly obovate to obovate-oblong, 10–16 cm. long, 4–7.5 cm. broad, glabrate to more or less scattered short-strigose; petioles and sheaths hirsute-pubescent.

Eastern Asia from southern Korea, Japan, Liukiu, Formosa to southern and southwestern China and the Himalayas, in thickets and damp places, on mountain slopes, in ravines, or at stream sides, from 600 to 1200 meters.

Korea:—**Quelpart:** *R. K. Smith* in 1934 (US). **Chiisan:** *K. Uno 2598* (GH). Japan:—**Hokkaido:** *Maximowicz* in 1861 (GH, US), *Dr. Albrecht* in 1861 (GH), *S. Arimoto s. n.* (GH); *Dorsett & Morse 1176* (US). **Hondo:** *Tokyo Mus. 393* (US), *J. Matsumura* in 1879 (US), *E. Elliot 12* (GH, US), *D. Savatier 1031* (US), *R. Tomioku 6976* (GH), *R. K. Beatie & Y. Kurihara 10335* (US), *S. Suzuki 9378* (GH), *H. Sasaki 6931* (GH), *K. Shiota 3851, 3881, 3882, 6968, 7874, 8048* (GH), *I. Kato 6911* (GH), *6932* (GH), *T. Kato 9156* (GH). Liukiu:—**Okinawa:** *N. Fukuyama 7196* (NTU, type of *T. ryukyuensis* Masamune). China:—**Shangtung:** *C. Y. Chiao 2863* (GH, US). **Kiangsu:** *Nanking U. Herb. 229* (GH, US), *K. Ling 12532* (GH). **Chekiang:** *R. C. Ching 2322* (GH, US), *9090* (US), *S. Barchet 5817* (US), *Cheo & Wilson 12687* (GH), *K. Ling 2843* (GH). **Hupeh:** *A. Henry 4123* (US), *4784* (GH). **Kiangsi:** *H. C. Cheo 83* (US), *S. K. Lau 4538* (US), *4816* (GH, US). **Hunan:**

H. Handel-Mazzetti 12636 (US), *C. S. Fan & Y. Y. Li 483* (GH). **Szechuan:** *W. P. Fang 2270* (GH), *2471* (GH), *5260* (GH, US), *T. C. Peng 60* (US). **Kweichow:** *Y. Tsiang 8719* (US), *Steward, Chiao & Cheo 310* (US). **Kwangsi:** *W. T. Tsang 28213* (US), *28416* (US). **Kwangtung:** *W. T. Tsang 21491* (GH), *S. K. Lau 2510* (GH). Indo-China:—**Tonkin:** *A. Pételot 2232* (US). Kashmir: *R. R. Stewart 17394* (GH).

Japanese botanists recognize three species of *Tovara* in Japan, namely, *T. filiformis*, *T. neofiliformis*, and *T. smaragdina*. Steward earlier reduced *T. neofiliformis* to the synonymy of *T. filiformis* on the basis of its descriptions, and I fully concur with his judgment. Maekawa (in Bot. Mag. Tokyo **46:** 585– 586. *f. 13.* 1932) distinguishes the three species, aside from the shape and pubescence of the leaves, both of which variable characters are indistinctly defined by him, especially by the shape and size of the achene as follows:

T. filiformis: "Nux late ovata 2.2–2.8 mm. longa 1.8–2.2 mm. lata basi obtusissima."

T. neofiliformis: "Nux major oblonga vel ovato-oblonga 2.8–3.3 mm. longa 1.8–2.2 mm. lata basi subrotunda."

T. smaragdina: "Nux oblongo-ovoidea 2.2–2.5 mm. longa 1.3–1.4 mm. lata basi late cuneata".

In his illustration, however, the bases of the fruits are more or less similarly depicted. It is also impossible in practice to differentiate species on the basis of the narrow ranges of measurements of the achene as given by him. Specimens from different parts of the Chinese mainland show much wider variations in both shape and pubescence of leaves and shape and size of the achene. (The achene is in general smaller than in the American *T. virginiana.*) Furthermore such variations occur in various intergrading forms that make distinctions impossible. If these variations are recognized on the same basis as those proposed as Japanese species, the number of taxonomic entities, whether as species, varieties, or forms, will be multiplied to such an extent as to make them useless. These species are therefore reduced to straight synonyms of *T. filiformis*. *Tovara ryukyuensis* Masamune is reduced on the basis of the type. An attempt to divide this species intraspecifically might be made on a geographical basis, covering the entire range, but only with a much larger series of specimens than is now available.

2b. **Tovara filiformis** (Thunb.) Nakai var. **kachina** (Nieuwland) comb. nov.

Tovara virginiana var. *kachina* Nieuwland in Am. Midl. Nat. **2:** 182. 1912; Steward in Contr. Gray Herb. no. 88: 14. 1930.

A tall herb 45–60 cm. high, more densely strigose throughout than in var. *filiformis;* leaves chartaceous, obovate-lanceolate, 9–16.5 cm. long, 2–2.5 cm. broad, densely long-strigose on both surfaces; petioles and sheaths densely brown hirsute-strigose.

Upper Burma and southwestern China, in thickets and forests at altitudes of 2,000–3,000 meters.

Burma:—**Upper Burma:** *S. Mokin* in 1897 (US, type), *G. Forrest 26374* (US). China:—**Kweichow:** *O. Schoch 409* (GH, US).

3. **Tovara apcënsis** (Elmer) comb. nov.

Polygonum apoënse Elmer, Leafl. Philip. Bot. **8:** 2796. 1915; Merr. Enum. Philip. Fl. Pl. **2:** 121. 1923. *Tovara virginiana* var. *apoënsis* Steward in Contr. Gray Herb. no. 88: 14. *pl. IC.* 1930.

An erect plant, 40–60 cm. high; rhizome slender; stems terete, the young stems yellowish-strigose; sheaths submembranaceous, cylindric, 1–1.5 cm. long, yellowish-brown strigose especially toward the margins, the margins bristly; leaf-blades submembranaceous, obovate to obovate-oblong, 5–8 cm. long, 2.–3.5 cm. broad, bluntly acute at apex, cuneate at base, entire at margins, dark green and glabrate above, much lighter and minutely puberulent or subglabrate beneath, the costa puberulent on both surfaces, the main lateral veins about 7–11 per side; petioles 1.2–2 cm. long, deeply canaliculate above, short-strigose beneath, ciliate upon the upper lateral margins. Inflorescence racemose, usually unbranched, rarely 2- or 3-branched at base, subterminal, erect, ascending, varying greatly in length from 10 to 30 cm. long or even longer, very slender, the flowers usually 1–3-fascicled, scattered, 0.5–1 per cm. of the rachis, the rachis puberulent; ocreale 3 mm. long, glabrous within, yellowish-brown ciliate without and along the upper margin; pedicels stout, 2 mm. long, glabrous; calyx deep purple-red, about 3.5 mm. long, scarcely enlarging in fruit; ovary obovoid, 0.75 mm. long, glabrous, the styles 2, fleshy, glabrous.

Philippine Islands, in Mindanao only, in rich soils of open glens of dense forests at about 1,250 meters.

Philippines:—**Mindanao:** *A. D. E. Elmer 10954* (US, isotype), *R. J. Alverez 25230* (US).

This species is generally a smaller plant than *T. filiformis* and with its smaller leaves more cuneate and attenuate at the base. The inflorescence is also more sparsely branched, and the flowers much more scattered.

Glyceria septentrionalis and G. acutiflora in Lee, New Hampshire.—The Lamprey River which, in its lower course, passes through the townships of Epping, Lee, Durham, and Newmarket has proved to be a good collecting area for the botanist. In Epping one of the best stations that A. A. Eaton knew for *Isoetes* was the broad pond-like part of the stream back of the dam in West Epping. In Lee below Wadleigh's Falls is a turbulent stretch of the Lamprey where the author and some associates in June 1946 collected the first reported *Podostemum* in New Hampshire.[1] In July of that year the same persons collected there among other midsummer maturing species, an assemblage of grasses. Two Glycerias, in particular, growing in shallow water, prove to be of interest. One, *G. acutiflora* Torr., according to all reliable recent literature reaches the northeastern limit of its range in New Hampshire. No specimen of it from that area was to be found in the collections of the New England Botanical Club and the solitary New Hampshire specimen in the Gray Herbarium is that of F. W. Batchelder from Manchester in Hillsborough County. The Lamprey River occurrence then would seem to be the most outlying northeastern station for the species.

Of more real significance is the other *Glyceria* found at the same time, *G. septentrionalis* Hitchcock. It appears that there are no previous authentic records or specimens of it from northeast of Massachusetts in the United States. A single specimen, No. 78 of Louis Arsène collected on August 26, 1901 in the vicinity of Savoyard on the Island of St. Pierre, was originally called *Glyceria borealis* but has been identified recently as *G. septentrionalis* at the Gray Herbarium.

The suite of specimens from Lee, in general, all display the most fundamental taxonomic characteristics of the species as it is described in recent standard treatments and also in most respects match authentic herbarium material. The spikelets, for example, are nearly sessile in the axils of the panicle-branches; the glumes are relatively large and evident (as compared to those of *G. borealis*); the faintly nerved and coriaceous lemmas are finely pubescent all over, not just on the nerves, and the paleas somewhat exceed them. Nonetheless, the Lamprey River specimens are not quite typical. Fernald[2] describes the leaf-blades as obtuse. They seem to be essentially acute in our material. Chase[3] in the Key to Glyceria distinguishes *G. septentrionalis* from *G. fluitans* by the fact that the former has lemmas not tinged with purple while the latter has the lemmas

[1] RHODORA **50**: 209–211. 1948.

[2] Fernald, M. L. Manual of Botany, 8th Edition, 113, 1950.

[3] Chase, Agnes. Manual of the Grasses of the United States, 2nd Ed. Revised U. S. D. A. Misc. Publ. 200, p. 82, 1951.

purple-tinged near their tips. Our specimens are certainly not *G. fluitans* despite the fact that the lemmas have purplish markings toward their tips.

Specimens of both *G. acutiflora* and *G. septentrionalis* from Lee have been deposited in the Herbaria of the New England Botanical Club and of the University of New Hampshire.

It is apparent that more intensive collecting of *Glyceria* § *Fluitantes* should be carried on in southern New Hampshire.—A. R. Hodgdon, Department of Botany, University of New Hampshire, Durham, New Hampshire.

A New Color Form of Polygala paucifolia.—**Polygala paucifolia** Willd., forma **caerulea,** forma nova. A forma typica recedit corolla caerulea. Corolla caerulean blue; otherwise like the species. Mixed oak and pine woods, *R. J. Eaton*, Sudbury, Massachusetts, May 19, 1951. Type deposited in Herbarium, New England Botanical Club. Abundant in a nearly pure colony in an area of about one square rod and well distributed among typical plants of the species over an acre or more.

Although this color form was collected at a station discovered by A. W. Hosmer at least fifty years ago, apparently it has never been described. The color of fresh material is slightly darker than that of *Phlox divaricata* L., but of the same quality of blue. Compared with *Viola papilionacea* Pursh, it is a lighter tint and lacks any trace of purple. Herbarium specimens of typical *P. paucifolia, P. paucifolia* f. *caerulea, Viola papilionacea* and *Phlox divaricata* were pressed and dried in the same folder. The typical red form of the *Polygala* showed little if any change, but f. *caerulea* and the *Phlox* faded to a pale bluish white, in contrast to the *much* darker *Viola*.—R. J. Eaton, Lincoln, Massachusetts.

Persistence of Color Forms of Polygala paucifolia.—The type station in Sudbury, Massachusetts, for *Polygala paucifolia* f. *caerulea* R. J. Eaton was discovered by A. W. Hosmer of Concord. He died in 1903. Therefore, it must be fifty years old and presumably much older still. I first learned of its existence this year from my friend, Joseph P. Richardson, formerly of Concord, who told me where to look for it. He said it had been pointed out to him by Mr. Hosmer in the late 1890's and at that time was abundant in patches in an area of an acre or so.

Another color form of fringed *Polygala*, forma *alba* Wheelock, exists at a relatively large station on the east side of Harrington's Swamp in West Concord, Massachusetts, which I visited in May, 1951. It is the dominant form in a somewhat restricted area in low mixed woods along the margin of an extensive swamp, and scattered through the woods for a distance of 150 yards or more. This station was well known to Mr. Hosmer, according to Mr. Richardson, and in all likelihood the only known locality for the white form in the Concord region. It is cited from Concord in Dame and Collins Flora of Middlesex County, Massachusetts, (Malden 1888), with the statement: "a form with white flowers discovered by Henry M. Pratt at Concord thrives and spreads at the expense of the type." The Concord Public Library possesses a manuscript list of Plants of Concord prepared by Minot Pratt in 1878 shortly before his death at the age of 73. Under the entry, *Polygala paucifolia*, is the statement, "A beautiful pure white variety is found near the Harrington Farm." Hosmer knew most of the Pratt "localities" and visited them regularly throughout his lifetime. Almost certainly he obtained from Pratt his knowledge of the Concord station for the white Polygala. If so, that station has been under observation for at least 73 years.

The appearance and behavior of these two colonies of conspicuous color forms of fringed *Polygala* are that of vigorous clones. Here we have direct evidence of their vigorous persistence for at least fifty and seventy-three years, respectively. In nature, it seems to be the tendency of individual mutants of genetically stable genera to disappear. *Polygala*, as represented by *P. paucifolia*, exhibits marked genetic stability with respect to flower color. Its color forms are rare, or very rare (as in the case of f. *caerulea*). Seldom, if ever, does one encounter in New England a single white or blue-flowered plant in a colony of the typical red form, which suggests that mutation in this species is a rare phenomenon, at least in this portion of its range. Thus in the case of the two old and thriving colonies of mutants under discussion we seem to have encountered an exception to a prevalent belief that mutants in general tend to be ephemeral.—R. J. Eaton, Lincoln, Massachusetts.

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W. Sutulz

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THE NEW ENGLAND BOTANICAL CLUB

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NUTTALL'S GREAT PLAINS SPECIES OF CIRSIUM: C. UNDULATUM AND C. CANESCENS[1]

Gerald B. Ownbey

In the course of his numerous botanical expeditions, Thomas Nuttall discovered several new species of *Cirsium,* two of which were definitely from the Great Plains. These were *Cirsium undulatum* (Nutt.) Spreng. and *C. canescens* Nutt. The type specimen of each of these species is poor, and in the case of *C. canescens* has been largely inaccessible to American botanists.

Asa Gray in his synopsis of North American thistles, published in 1874, gave specific rank to only the earliest proposed of the two species, *Cnicus undulatus,* in which he recognized four varieties, namely, var. *canescens* (Nutt.) Gray, var. *megacephalus* Gray, var. *ochrocentrus* Gray, and var. *Grahami* Gray. The last two varieties will not be considered here.

Gray's disposition of Nuttall's proposed species has not proved satisfactory, and has resulted in further nomenclatorial complexities. The following discussion represents an attempt to resolve some of these difficulties. After reviewing the evidence, the present writer has found it necessary to apply the name *Cirsium undulatum* (Nutt.) Spreng. to Gray's var. *megacephalus* exclusively. *Cirsium canescens* Nutt. appears to him to represent the same entity as *C. plattensis* (Rydb.) Cockerell, and as such is specifically distinct from *C. undulatum.* Evidence supporting this disposition of Nuttall's names is presented under the species concerned.

[1] This investigation was supported in part by a grant from the Graduate School, University of Minnesota. Costs of the engravings for the plates were met from the Hayden bequest to the Dept. of Botany, U. of M. Part of the field work was done while in residence at the U. of M. Forestry and Biological Station, Itasca State Park, Minnesota.

In the preparation of this paper I am indebted to Dr. F. W. Pennell and Dr. F. G. Meyer for supplying me with photographs of types. Curators of the New York Botanical Garden Herbarium, the Gray Herbarium, the Rocky Mountain Herbarium, the Iowa State College Herbarium, and the University of Nebraska Herbarium have been of assistance in supplying additional authentic specimens. I wish to extend my thanks to these botanists.

Cirsium undulatum (Nutt.) Spreng., Syst. Veg. 3: 374. 1826.

Carduus undulatus Nutt., Gen. **2**: 130. 1818. *Cirsium undulatum* Torrey and Gray, Fl. N. Am. **2**: 456. 1843, in part; DC., Prodr. Syst. Nat. **6**: 651. 1838; Rydberg, Fl. Pr. and Plains 882. 1932; W. C. Stevens, Kans. Wild Fl. 426. 1948. Fernald, Gray's Man., ed. 8. 1541. 1950, in part. *Cnicus undulatus* Gray, in Proc. Am. Acad. **10**: 42. 1874, in part; Syn. Fl. N. Am. **1** (2): 403. 1884, in part. *Cnicus undulatus* var. *megacephalus* Gray, l. c. *Carduus undulatus* var. *megacephalus* Porter, in Mem. Torr. Bot. Club **5**: 345. 1894. *Carduus megacephalus* Smythe, in Trans. Kansas Acad. Sci. **16**: 160. 1899; Nutt. ex Daniels, in Univ. Mo. Stud. **2**: 402. 1911 (Daniels, Fl. Boulder, Colo., 254. 1911). *Cirsium undulatum* var. *megacephalum* Fernald, in Rhodora **10**: 94. 1908; O. A. Stevens, N. Dak. Pl. 293. 1950; Fernald, Gray's Man., ed. 8. 1541. 1950. *Cirsium megacephalum* Cockerell ex Daniels, l. c.; Rydberg, l. c.

Perennial from root sprouts, but not strongly so; stems erect, mostly 3–8 dm. tall, simple or sparingly branched above, densely white-tomentose throughout; juvenile leaves elliptical, nearly regular to irregularly toothed at the margins, the later ones becoming successively more deeply cut, each lobe terminated by a stoutish spine and with a few weaker marginal ones; lower cauline leaves usually with a long, winged petiole, the blade often deeply pinnatifid; *middle and upper cauline leaves sessile, the blade broadest at the base, clasping the stem,* irregularly and usually shallowly *cut at the margin into deltoid lobes,* each lobe terminated by a stout spine which is an extension of the conspicuous midrib of the lobe; *upper and lower surfaces of all the leaves densely tomentose,* the upper surface sometimes less so, becoming green in age; inflorescence a single head terminating each main branch; involucre usually large, about 3.0 (2–4) cm. in diameter and about 3.5 (3–4) cm. high; outer involucral bracts narrowly ovate, arachnose, especially at the margins, with a broad dorsal, medial, glandular ridge and a usually stout apical spine which is about 2.5–4.5 mm. long; innermost involucral bracts much elongated, the flat tip linear or lance-linear, not at all expanded marginally, sometimes hispid at the edge; flowers purple, rarely white; achenes straw-colored, sometimes minutely streaked with brown, 6–7 mm. long and 2.5–3 mm. broad at widest point.

Distribution: plains and foothills, western North Dakota, South Dakota, Nebraska, Oklahoma and Texas westward at low elevations to the Pacific coast states, but commonest in the Great Plains. Reports of this species east of the Great Plains doubtless are a result either of chance introductions or misidentifications.

The type of *Cirsium undulatum* is on deposit at the Philadelphia Academy. A photograph of the type is reproduced in

Plate 1182. It consists of a single basal leaf bearing Nuttall's original tab. Another label added by A. Gray reads "The authentic original representative (and all of it) of *Cnicus undulatus.*" It appears that this statement is probably correct since Dr. F. G. Meyer, in 1950, found no more type material in Nuttall's herbarium. A specimen collected by Culbertson in 1850 mounted with the type is also *C. undulatum.*

An examination of the type provides sufficient evidence that it represents the taxon known as *Cirsium undulatum* (Nutt.) Spreng. var. *megacephalum* (Gray) Fernald or *Cirsium megacephalum* (Gray) Cockerell. This combination of shape and pubescence of the basal leaves is found in no other species of *Cirsium* of this region.

The habitat of *C. undulatum* is given in the original description as "On the calcareous islands of lake Huron, and on the plains of Upper Louisiana." Reference to its occurrence on the islands of Lake Huron is in error, and is possibly resultant from confusion with some other species of *Cirsium* in literature. Nor to the best of my knowledge does the species occur in what is now Louisiana though this is certainly within the limits of possibility. It is, of course, abundant in what was formerly the Louisiana Territory.

C. undulatum is recognizable even in seedling stages by its broad, entire or toothed juvenile leaves and reproduction by root shoots. At maturity the species is marked by its stout habit, large cauline leaves, the middle and upper ones sessile and distinctly clasping the stem, its very large involucres, and its overall densely tomentose nature. It is sometimes confused with *C. flodmanii* in herbaria, but this is principally a result of placing too much reliance on size of involucres. The leaves provide more reliable characters. Although the species sometimes grows with *C. flodmanii*, it, on the whole, occupies drier situations. The species overlap only at the extremes of their tolerance ranges, at the more moist end for *C. undulatum*, and at the drier end for *C. flodmanii.* I have seen no evidence of natural hybridization between them.

A considerable amount of geographical variation exists in this species. A number of variants have been given varietal or specific names. It is not within the scope of the present paper to discuss more than the midwestern aspect of the species to which Nuttall's type belongs, but a further study of its broader aspects in contemplated.

Cirsium canescens Nutt., in Trans. Am. Phil. Soc. 7: 420. 1841.

Cnicus undulatus var. *canescens* Gray, in Proc. Am. Acad. Arts and Sci. **10**: 42. 1874, in part; Syn. Fl. N. Am. **1** (2): 403. 1884, in part. *Carduus plattensis* Rydb., in Contr. U. S. Nat. Herb. **3**: 167, pl. 2. 1895; Britton and Brown, Ill. Fl. n. U. S. and Canada, **3**: 487. 1898. *Carduus plattensis* var. *spinosior* Rydb., l. c. *Carduus Nebraskensis* Britton, l. c. *Cnicus plattensis* Pammel, in Proc. Iowa Acad. Sci. **8**: Plate XXX. 1901. *Cnicus plattensis* var. *spinosior* Pammel, l. c. *Cirsium plattense* Cockerell ex Daniels, in Univ. Mo. Stud. Sci. **2**: 402. 1911 (Daniels, Fl. Boulder, Colorado, 254. 1911); Fernald ex Robinson, in RHODORA **13**: 240. 1911; Britton, Britton and Brown, Ill. Fl. n. U. S. and Canada, ed. 2, **3**: 551. 1913; Petrak, in Beih. Bot. Centralbl. 35 (2): 430. 1917; Rydberg, Fl. Rocky Mts. 1012. 1917; Fl. Pr. and Plains, 881. 1932. *Cirsium nebraskense* Britton, l. c. 552; Rydberg, Fl. Rocky Mts. 1012. 1917; Fl. Pr. and Pl. 881. 1932. Not *C. nebraskense* Lunell. *Cirsium Lettermanii* Petrak, l. c. 432, nomen nudum in syn.

Biennial from a deep tap root; stems usually 4–8 dm. tall, simple or branched upward, tomentose throughout; first basal leaves narrow, tapering to both ends, entire or undulate-margined, later ones successively more and more deeply lobed, the lobes oblong, all weakly spinose marginally; *cauline leaves decurrent on the stem, the wing usually provided with long, stout spines; blades of the lower cauline leaves mostly deeply pinnatifid into narrowly oblong segments which are 3–6 times longer than broad*, each lobe tipped with a weak spine and armed with still weaker spines marginally; middle cauline leaves less deeply pinnatifid than the lower, the segments ovate or deltoid; *uppermost cauline leaves linear or oblong-linear*, with undulate or dentate weakly spinose margins; lower surfaces of the leaves uniformly white tomentose; upper surfaces of the leaves more sparsely tomentose, usually greener than the lower; inflorescence of a few large, terminal heads at first, and occasionally few to numerous other nearly sessile heads on axillary shoots produced later in the season; first involucres large, usually 2.5–4 cm. broad, 3–4 cm. high, the later ones much smaller; involucral bracts sparingly arachnose to glabrate, minutely puberulent, the outermost ones lanceolate, having a distinct, glandular, medial ridge, and tipped by more or less well developed spines which usually are 2.5–6 mm. long; innermost involucral bracts somewhat elongated, the apical processes spreading, lanceolate, more or less expanded laterally, often erose-margined, translucent; flowers ochroleucous, very rarely pale or dark lavender; achenes straw-colored, often minutely streaked with brown, 6–7 mm. long and about 2.5 mm. broad at point of greatest width.

Distribution: Occurring on the semi-arid hills, plains and roadways of central and western Nebraska, northeastern Colorado, eastern Wyoming and southwestern South Dakota; possibly also in northern Kansas and southeastern Montana; often in sandy soil.

Photographs of Nuttall's type, collected on the "Arid plains of the upper Platte" and now on deposit at the British Museum are

PLATE 1182

Cirsium undulatum (Nutt.) Spreng. Fig. 1, Type, consisting of a single basal leaf. Fig. 2, a Culbertson specimen mounted with the type, consisting of one young plant. Fig. 3, an enlargement of Fig. 2, showing nature of pubescence on stem and foliage.

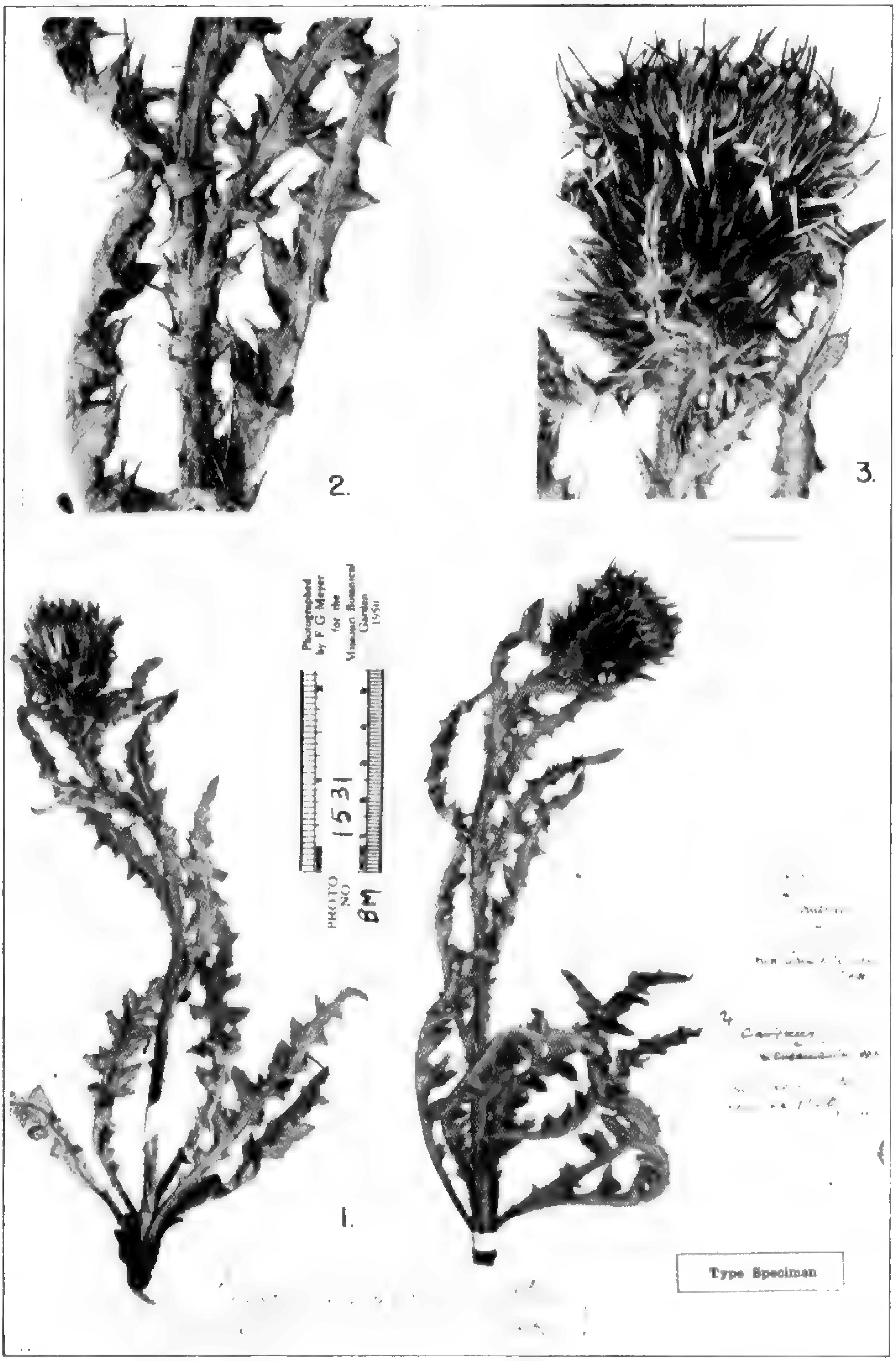

PLATE 1183

Cirsium canescens Nutt. Fig. 1, Type, consisting of two depauperate plants broken off at ground level. Fig. 2, enlargement of stem showing decurrent leaf bases. Fig. 3, head, showing nature of involucral bracts.

reproduced in Plate 1183.[2] It consists of two depauperate plants broken off at the surface of the ground. A comparison of the type photographs of *C. canescens* Nutt. with the type of *C. plattense* (Rydb.) Cockerell provides substantial evidence that both belong to the same species. Rydberg's species was described from several Nebraska specimens, the type designated being *Rydberg 1356* from "Near Plummer Ford, Dismal River, Thomas County, on sandhills," July 5, 1893, and now deposited in the herbarium of the New York Botanical Garden. The two proposed species share the following features: the pinnatifid basal and lower cauline leaves, the lobes usually narrowly oblong in outline (more narrowly oblong in the type of *C. plattensis*); leaves progressively less pinnatifid up the stem, the uppermost lanceolate to linear, dentate or undulate margined; bases of the cauline leaves strongly decurrent; involucral spines comparatively short. This seems to the writer sufficiently strong evidence to warrant combining of the two proposed species. Further, field studies to date have provided no evidence that there is more than one species in which these features are combined in the region in question.

Nuttall described *C. canescens* as having "Florets pale rose,—" This could have been true although the predominating color of the corollas in this species is ochroleucous. The corollas often are tinted with lavender in the western part of the species range, and occasionally are even deep lavender. I can explain Nuttall's statement "The roots creeping as in *C. arvense*" only by hypothesizing that in this respect it was confused with *C. flodmanii*. The type specimen offers no support to Nuttall's statement.

[2] Nuttall crossed the continent with a party led by Nathaniel J. Wyeth on Wyeth's second expedition to Oregon. The following information taken from Wyeth's Journals, published as Vol. I, Parts 3 to 6 of "Sources of the History of Oregon," University of Oregon Press, 1899, is pertinent. The party traveled along and near the North Platte River from near its junction with the South Platte westward through Nebraska, crossing into what is now Wyoming on May 31, 1834 and leaving the Platte at the Red Buttes, Natrona Co., on June 8. Nuttall's "Arid plains of the upper Platte" probably, therefore, are correctly located in eastern Wyoming somewhere within a few miles of the river. One can safely assume that the latest possible date for collecting the type was June 8. The elevation of the plains in this region increases from about 4,000 feet at the state line to just over 5,000 feet at Casper, Wyoming, which is only a few miles northeast of the Buttes. In view of the early date, elevation and aridity of the region, it is not surprising that Nuttall brought back very immature, dwarfed specimens. I have collected this species in bud, flower and early fruit at Douglas, Wyoming, on July 21, or approximately six weeks later in the season. The plants were of normal size.

C. canescens Nutt. was combined with *C. brevifolium* Nutt.[3] by Gray and reduced to *Cnicus undulatus* var. *canescens.* The name was then applied to another species which was at that date still unrecognized as distinct from *Cirsium undulatum*, namely, *C. flodmanii* (Rydb.) Arthur. Later authors who took up the name either as a variety or species usually followed Gray in applying it to *C. flodmanii.* That this practice was incorrect is confirmed by inspection of the types. This usage, however, necessitated the proposal of another name for the predominantly ochroleucous flowered species of the central plains. The first such name proposed was *Carduus plattensis* Rydb. discussed above.

Carduus plattensis var. *spinosior* Rydb. appears to me to be no more than the most spinescent extreme of *C. canescens* Nutt. and hardly deserving of nomenclatorial recognition. Rydberg designated no type for the variety but cited several Nebraska collections, namely, *Fendler 73* from near Ft. Kearney, *Hayden s. n.* from the sand hills of the upper Platte, both at the Gray Herbarium; *Smith and Pound 64* (in part) from Boxbutte Co., and *Clements 2964* from Paddock, Holt Co,. the latter two said by Rydberg to be at the University of Nebraska. Of the cited specimens I have seen only *Smith and Pound 64* sent by both the New York Botanical Garden and the University of Nebraska. The New York specimen is marked Type, and I see no reason for denying it this status. One of the two stems is very spinescent as is also part of the Nebraska material. This number was, however, cited as both species and variety by Rydberg.

The type of *Carduus Nebraskensis* Britton, *Rydberg 110,* from "Scotts Bluff, Nebraska, July 24, 1891," is deposited at the New York Botanical Garden (Columbia College Herbarium). It is fragmentary, consisting of the upper portion of one stem. However, the linear uppermost leaves and decurrent leaf bases are readily discernible, and the combination of these two characters is sufficient to establish its identity with *C. canescens* Nutt. The basal leaves which are equally diagnostic were not preserved.

[3] I am in doubt as to the identity of *C. brevifolium* Nutt., but it is certainly not conspecific with *C. canescens* Nutt, or *C. undulatum* (Nutt.) Spreng. I thought for some time that it possibly was conspecific with *Cirsium flodmanii* (Rydb.) Arthur. Dr. Arthur Cronquist who has recently viewed the type of *C. brevifolium* at the British Museum is, however, of the opinion that it is referable to the Pacific northwest *C. palousense* Piper. There is considerable evidence supporting this view.

Curiously, in the original description of *C. plattense*, Rydberg cited his July 24, 1891 collection from Scotts Bluff, Nebraska. Petrak in his study of *Cirsium* in North America placed *Carduus nebraskensis* Britton in synonymy under *C. canescens*, but then misapplied this name to what is at present known as *C. flodmanii*.—UNIVERSITY OF MINNESOTA, MINNEAPOLIS.

SOME NEW ENTITIES IN THE FLORA OF THE BROOKS RANGE REGION, ALASKA

CONTRIBUTIONS TO THE FLORA OF ALASKA, NO. 2

LOUIS H. JORDAL[1]

IN the course of two seasons' botanical explorations in the Brooks Range region of Alaska a number of plants were discovered which could not be fitted into any known systematic categories and which after careful review of literature and collections must be regarded as being new to science.[2]

In the report on the Brooks Range investigations which I prepared as a dissertation to the Graduate School of the University of Michigan under the title (1951) "A Floristic and Phytogeographic Survey of the Southern Slopes of the Brooks Range, Alaska" these new entities are described and discussed at some length. But because of inevitable delays associated with the publication of such a lengthy account it seems expedient to publish here briefly the formal diagnoses of these new entities.

Altogether five undescribed species were found in the flora of the Brooks Range region. Two of these are members of the genus *Oxytropis* which have been recently proposed as new by Mr. A. E. Porsild in Can. Field Nat. 64 (2). A third species is a *Poa* related to *Poa abbreviata* R. Br. This taxon, as yet undescribed, is in the hands of Mr. J. R. Swallen of the Smithsonian Institution.

The remaining species and forms are described and briefly discussed as follows:

[1] We regret to report that Louis H. Jordal was killed in an airplane crash in December, 1951. Eds.

[2] The author is indebted to the Arctic Institute of North America for research support which made these botanical activities possible and also to the Director of the Botanical Gardens Univ. of Michigan, for aid and support.

Festuca altaica Trin., f. **pallida** f. nov. Paniculae angustiores quam in forma speciei typica; spiculae pallide flavescenti-virides; lemmata dorsaliter paene glabra. Specimen typicum in Herbario, Univ. Michiganensis conservatum, *Jordal 1862* prope "Wiseman" in montibus "Brooks Range," Alaskanis, denominatis.

No. *1862* has conspicuously pale yellowish-green spikelets with nearly glabrous lemmas. These plants are shorter (up to 45 cm. tall) than the typical form of the species and the inflorescences are less ample. This conspicuous form appears not to have been recognized before.

Festuca altaica Trin., f. **vivipara** f. nov. Plantae robustae; floribus viviparis. Specimen typicum in Herbario, Univ. Michiganensis conservatum, *Jordal 2471* ad locum "Wild Lake" in montibus "Brooks Range," Alaskanis, denominatis.

This collection is comprised of a tall (90 cm.) viviparous form of very robust appearance with broader leaves and coarser stems etc., than the typical form of the species. Although it appears to be only of sporadic occurrence it deserves a name.

Braya Bartlettiana sp. nov. Perennis, gracilis, 3–10 cm. alta; caudice plus minusve elongato plerumque multicipiti sed interdum simplici; ramis caudicis folia dense aggregata et scapum singulum ferentibus; folia 5–20, basalia, lineari-lanceolata, 5–25 mm. longa, minus quam 2 mm. lata, apice acuta vel obtiuscula, ad basim versus late et pellucide marginata usque ad insertionem semi-amplexicaulem latam, marginibus subintegris vel denticulis duobus (raro 4) praeditis, sparse ciliatis, pilis vel denticuliformibus vel bifurcatis, ad basem marginibus hyalinis longe ciliatis pilis simplicibus, ad superficiem utrinque glabra, plus minusve purpurea, praecipue versus basem et secus costam; nervis, costa conspicua excepta, invisibilibus; caules 1, 2 vel 3, sine foliis supra partem infimam, erecta ca. 10 cm. alti, graciles, ca. 0.5–0.75 mm. crassi, sparse puberuli, pilis subappressis, inaequaliter bifurcatis, plus minusve (praecipus deorsum) purpureitinctus; inflorescentia vel simplex, racemosa, vel saepe ramo uno unifloro unibracteato distanter infra floram infimam praedita (ramo 3–25 mm. longo, flore graciliter pedicellato; bractea ca. 7 mm. longa vel minus, textura foliis simili); floribus superioribus aggregatis, ascendentibus in pedicellis brevibus minus quam 3 mm. longis, inferioribus gradatim distantioribus, infimis saepe in pedicellis 10 mm. longis gracillimis; flores 3–3.5 mm. longi; sepalis oblongis, subcanaliculatis, apice obtuse cucullatis, 1.5–2.5 mm. longis, 0.8–0.9 mm. latis, 3-nervis, anguste hyaline marginatis, valde purpureis, glabris; petalis parvis, 1.8–3.5 mm. longis, unguiculatis, unguis longitudine triplo breviore quam limbo, usque ad sesquipliciter longiore, ungui anguste ligulato, sine constrictione, sursum gradatim expanso, limbo abrupte expanso, late ovato, emarginato, glabro, pallidiuscule purpureo; stamina curvata, quam sepala paullo breviora vel paullulo longiora; filamentis anguste ligulatis; antheris basi cordatis, late ovatis, 0.4–0.5 mm. longis; siliqua quam 7 mm. brevior, stylo includente, ca. 1.4 mm. lata infra basem rotundatam vel cuneatam, sursum ad stylum attenuata; valvis obscure 1-

nerviis, pallide vel intense purpureis, glabris; septo hyalino, albo, enervio, persistenti, completo; semina bifariam ordinata in ambobus lateribus, ovulis 3–5 per singulam lineam; stylo demum ca. 1 mm. longo, ex medio constricto usque ad stigma gradatim incrassato; stigma capitato ca. 0.5 mm. lato, obscure bifido.

In "tundra" declivitatibus muscosis montium calcareorum, alt. 3500 ped., supra flumen "Bettles River" in montibus "Brooks Range," Alaskanis, July 13, 1949, denominatum. Specimen typicum in Herbario, Univ. Michiganensis, *Jordal 2291*, conservatum.

I must agree with Mr. A. E. Porsild (in correspondence) that the species here proposed "comes dangerously close to *Braya americana* (Hook.) Fern." It is, however, set apart from that species by the nerveless septum. This may be a minor feature but judging from the characters that have been previously used in separating species within the very critical genuus *Braya* it is valid enough.

Recently E. C. Abbe in Rhodora **50**: 1–15 (1948) has published on the members of this genus in boreal eastern America. He concludes that the specimens from Alberta and Newfoundland which Fernald in Rhodora **28**: 203–204 (1926) referred to *B. americana* (Hook.) Fern. are distinct within their respective areas and that the Newfoundland material must be considered as belonging to a separate species which he establishes as *B. Fernaldii* Abbe. This species is characterized by having lance-subulate siliques, the seeds crowded into one row, valves hirtellous and petals uniformly lilac to pink, fading to white. It is clear from my description that in none of these features does it agree with my material.

The question now remains whether the proposed new species is identical with *B. alpina* Sternb. & Hoppe var. *americana* Hook., to which Fernald (op. cit.) gives specific status and which Hooker in Flor. Bor. Am. I, p. 65 diagnoses as follows: "stylo longiusculo gracili," adding further in his annotations (loc. cit.) that Drummond's material from the Rocky Mountains between lat. 52–57 "differ in no respect from the European plant in my possession from the Carinthian Alps, except in the greater length of the style, which, indeed, is very striking."

Drummond's material had not been seen by Fernald when he gave the var. *americana* Hook. specific status. I have not seen it either, but my material differs from *B. americana* according to Fernald's expanded diagnosis in having completely glabrous valves and in the fact that the septum only has the faintest trace of a nerve toward the very base and is not "manifeste uninervo," in agreement with the expression which applies to the latter species.

B. americana, *B. Fernaldii*, *B. alpina*, *B. aenea*, *B. Henryae* and *B. Bartlettiana* are all very closely related and considered together phytogeographically they form a logical Arctic-Montane group of vicarious entities in which the components may perhaps be only varietally related to *Braya alpina* Sternb. & Hoppe. *Braya Bartlettiana*, which is named in honor of Professor H. H. Bartlett, Director of the Botanical Gardens at the Univ. of Michigan, seems to be the particular type which survived in the unglaciated mountain regions of northern Alaska.

Empetrum nigrum L., var. **hermaphroditum** (Lange) Soerensen, f. **ciliatum** f. nov. A forma typica foliis margine valde villoso-ciliato differt. Specimen typicum in Herbario Inst. Smithson. "U. S. National Herbarium," Washington, D. C. conservatum, *Jordal 3742* prope "Old John Lake" in montibus "Brooks Range," Alaskanis, denominatis.

This curious form with strongly villous-ciliate leaves was discovered at Old John Lake. It is undoubtedly only a sporadic occurrence but deserves formal recognition.

Gentiana glauca Pall., f. **chlorantha** f. nov. Corolla 15–18 mm. longa, omnino pallide flavescenti-viridis. Specimen typicum in Herbario, Univ. Michiganensis conservatum, Jordal no. *2415* prope "Wiseman" in montibus "Brooks Range," Alaskanis, denominatis.

This is a curious color form in which the corolla is greenish-yellow instead of greenish-blue. It occurs occasionally in the populations of the species within our area.

Phlox alaskensis sp. nov. Planta perennis, adpressa-caespitosa; folia anguste oblanceolata, vix plus quam 1 cm. longa et 2 mm. lata (mediana 7 × 1.5 mm.), apice valde apiculata, 1-nervia, nervo sub apice evanescenti, glabrata vel untrinque parce glanduloso-pubescentia etiamque valde villoso-ciliata, pilis aliis longis, albis, multiseptatis, aliis brevioribus glanduloso-capitatis; flores in apice ramulorum solitarii, sessiles vel breviter pedicellati, pedicellis valde pubescentibus pilis albis vel flavis, glanduloso-capitatis; calyx anguste conicus, tubo ca. 4 mm. longo, pubescenti pilis eis foliorum similibus, conspicue 5-nervato, lobis linearibus, usque ad 5 mm. longis, viridibus, similiter pubescentibus, adscendentibus, sinulis acutis; corolla pallida caerulea vel incarnato-caerulea, tubo ca. 10 mm. longo, glabro, limbo vix 2 cm. lato, lobis obovatis, usque ad 9 mm. longis et 6 mm. latis, apice rotundatis; stylus ca. 5 mm. longus; antherae flavae, ovales ca. 1 mm. longae; capsulae ca. 4 mm. longae, 3 mm. latae, valvulis venulo mediano praeditis, stramineis, coriaceis, minute reticulato-foveolatis; semina in loculo singulo, ca. 1 mm. longa, testa atrobrunnea.

Specimen typicum in Herbario, Univ. Michiganensis conservatum, Jordal no. *2198* prope "Wiseman" in montibus "Brooks Range," Alaskanis, denominatis.

This species is closely related to *P. variabilis* Brand from which it differs, *inter alia*, in its strongly glandular foliage, stems and calyces. From *P. caespitosa* Nutt. it differs chiefly in its shorter, shortly exerted or included corolla tubes. From *P. Richardsonii* Hook. it differs mainly in its broader leaves and shorter corolla tubes and from *P. sibirica* L. conspicuously in its smaller size, much more prostrate habit and one-seeded locules.

The caespitose Phloxes in Alaska form a very complicated group of closely related plants. The plants here described as a new species, *P. alaskensis*, appear to have been referred to *P. sibirica* by most workers. Hultén recognizes only two species of *Phlox* in his Flora of Alaska and Yukon and according to his treatment my material would be referred to *P. sibirica*. His treatment is extremely conservative, however, and his concept of *P. sibirica* unduly broad. If Brand's treatment of the genus *Phlox* in Das Pflanzenreich has any authority then it is obvious that the plants we are here discussing cannot even be assigned to the subgenus *Macrophlox* where *P. sibirica* L. belongs. The relatively small size of the seeds of my material and the constantly one-ovuled locules would necessitate placing it in the subgenus *Microphlox* sect. *Chortobolon.*

Erigeron alaskanus Cronq., f. **albiflorus** f. nov. A forma typica differt ligulis albis.

Albino forms, differing only in having white rather than blue ligules, occur sporadically within the populations of this endemic species. They are sufficiently conspicuous to deserve some formal recognition.—Botanical Gardens, University of Michigan.

COCHLEARIA OFFICINALIS ARCTICA IN THE VICINITY OF POINT BARROW, ALASKA

John H. Thomas

Cochlearia officinalis ssp. *arctica* (Schlecht.) Hultén is generally considered to be a strand and coastal marsh plant. In the vicinity of Point Barrow it shows a wide range of habitats. The primary factor in its local distribution appears to be the disturbance of the vegetation cover either by erosion or by human activity.

Cochlearia grows along the Arctic Coast and along the banks of brackish lakes and lagoons above the high water mark and behind the coarst pebbly beach in sandy or muddy areas. No localities were observed where it grew subject to submersion at high tide or during a storm as does *C. sessifolia* Rollins (Rollins 1941, p. 182) on Kodiak Island. It is commonly associated with *Arenaria peploides* L., *Mertensia maritima* (L.) S. F. Gray, *Phippsia algida* (Soland.) R. Br., *Puccinellia paupercula* (Holm) Fern. & Weath., *Sagina intermedia* Fenzl., *Saxifraga rivularis* L., and *Stellaria humifusa* Rottb. Less frequently *Elymus mollis* Trin., *Papaver radicatum* Rottb., and *Potentilla emarginata* Pursh are found growing with it. The strand association forms a sparse vegetation cover allowing *Cochlearia* to assume a prostrate caespitose rosette-like form, often to 15 cm. in diameter. Young seedlings are often observed which have germinated beneath the mature plants.

There are two types of topography immediately behind the ocean beach: 1, gently sloping tundra, and 2, steep bluffs and cliffs some of which are 50 feet high. On the first type, the tundra and strand meet and gradually intergrade. *Cochlearia* is found in decreasing regularity as one goes back from the beach. On the tundra, characterized by *Cassiope tetragona* (L.) D. Don, *Dryas integrifolia* Vahl., *Dupontia fisheri* R. Br., *Eriophorum* spp., *Luzula* spp., *Poa arctica* R. Br., *Petasites frigidus* (L.) Fries, *Potentilla emarginata* Pursh, *Salix* spp., and *Vaccinium vitis-idaea* ssp. *minus* (Lodd.) Hult., *Cochlearia* is almost always lacking. On steep coastal bluffs and on hummocks bordering fresh water lakes where erosion and slumping is constantly taking place due to wave action and thawing of permanently frozen ground, *Cochlearia* often grows to the exclusion of other species. The general shape of the plants is to some extent dictated by the microtopography. On flat ground surfaces, whether horizontal or sloping, the more typical rosette form dominates. Plants growing in depressions have an elongation of the main axis and the lateral branches. The fact that *Cochleari* can grow removed from the ocean is seen by its occurrence on the inland hummocks. In one particular instance it grew profusely on barren lake banks ten miles from the ocean. Another inland habitat is the bare tops of peat hummocks often resulting in pure stands. Associated inland species are primarily *Potentilla emarginata* Pursh, *Draba* spp., *Phippsia algida* (Soland.) R. Br., and *Saxifraga rivularis* L.

Wherever man dwells he alters natural conditions and permits certain species to assume a weed status. This is true in the Arctic as it is in more temperate climates. There are several abandoned Eskimo villages in the vicinity of Point Barrow. These sites have been altered by trampling of the original vegetation cover, by the enrichment of the soil by human and canine excreta, and by the formation of numerous kitchen middens. In the black heavy nitrogenous soil *Cochlearia* has spread rapidly. At the old village site, Nuwuk, at Point Barrow much of the ground is covered by pure stands of *Cochlearia.* The stands are often several meters in diameter and the surface coverage is complete. Elsewhere it grows intermingled with *Cerastium beeringianum* C. & S., *Dupontia fisheri* R. Br., *Poa arctica* R. Br., *Phippsia algida* (Soland.) R. Br., *Saxifraga rivularis* L., and *Stellaria humifusa* Rottb., both on the ground and on the ancient Eskimo sod huts. The typical form of the plants growing in close physical contact with other species is a spindly one with a much elongated central axis and lateral basal branches, up to 15–20 cm. long. Polunin (1948, p. 126) notes a similar occurrence of *Cochlearia officinalis* subspecies around inhabited areas on the Cumberland Peninsula across Davis Strait from Greenland.

Along Elson Lagoon, in the vicinity of Point Barrow, the shore line is constantly being eroded by wave action and the melting of subsurface ice masses, causing large pieces of sod and earth to slump into the Lagoon. *Cochlearia* is often abundant on the newly exposed bare faces and tends to invade the mature tundra above.

Cochlearia is probably a biennial plant. The large number of dead plants among the living ones suggests this. Flowering may be delayed until the second year. The season begins shortly after the snow has melted along the coast, usually about the 15th of June and lasts until about the end of September.

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SUGGESTION FOR THE ASSIGNMENT OF TORREYOCHLOA TO PUCCINELLIA

Robert T. Clausen

On the basis of cytological and morphological data, Church (1949) removed from *Glyceria* the "pauciflora group" of species and proposed for them the new genus *Torreyochloa*. The purpose of the present discussion is to indicate first that the valuable data supplied by Church demonstrate that the species of the "pauciflora group" of *Glyceria* should be transferred to *Puccinellia* and second to validate for use the binomial which is necessary for the eastern North American species which is involved in this consideration.

The separation of *Glyceria* from *Puccinellia* in current manuals and floras is unsatisfactory. In the new eighth edition of Gray's Manual, for example, Fernald (1950), in his key, described the sheaths of *Glyceria* as closed and the lodicules as united. Yet, as species no. 13 under *Glyceria*, he listed *G. pallida* with the lower sheaths free (= open) at the summit, but did not mention the lodicules which are free. Mrs. Chase (1951), in the useful second edition of Hitchcock's Manual, separated *Puccinellia* on a basis of the faint nerves of the flowering glumes and the habitat in saline soil, but ignored discrepancies pointed out by Church between the "pauciflora group" and the rest of *Glyceria.*

Older authors similarly had trouble in differentiating *Glyceria* and *Puccinellia.* Hackel (1887) separated *Glyceria* from *Puccinellia* (as *Atropis*) on the basis of the evident awns ("Gr. deutlich") and connate lodicules as opposed to the absence of awns and free lodicules in *Puccinellia.* Belk (1939) has shown, however, that the lodicules are free in *Glyceria canadensis* and in some populations of *G. striata,* both species which clearly belong in *Glyceria* on a basis of many other characteristics. Hackel's statement about awns on the flowering glumes of *Glyceria* is perplexing and untrue. Since "Granne" appears elsewhere in his text with the usual meaning, namely awns, the reference to awns in *Glyceria* appears to be a mistake.

Church (1949) reported that *Glyceria pauciflora, G. erecta, G. pallida* and *G. fernaldii* all have sporophytic numbers of 14 chromosomes, whereas species of *Glyceria* have numbers which are multiples of 10. Because of this cytological difference and certain differences in morphology which are well indicated in his table 2, he rightly concluded that these and four related species should be removed from *Glyceria.* Accordingly, he proposed the new genus *Torreyochloa* for this group of species. Although Fernald (1950) and Chase (1951) had the chance to review the evidence for *Torreyochloa,* both rejected it and continued to include in *Glyceria* the species assigned to it by Church.

The species placed in *Torreyochloa* by Church differ from *Glyceria* in having the leaf—sheaths open, not closed and the second empty glumes with three nerves instead of one. These both are characteristics by which *Puccinellia* likewise differs from *Glyceria.* On the other hand, *Torreyochloa* has in common with *Glyceria* the prominent nerves of the flowering glumes and usually the adjustment to freshwater conditions, although in the Montezuma Marshes of New York *Glyceria pallida* occurs in brackish situations and *Puccinellia distans* grows in this same area. Other morphological characteristics, such as compression of the spikelets, vary too much to be useful for separating genera. On a basis of the morphological differences and similarities of *Glyceria, Torreyochloa* and *Puccinellia,* a decision as to relationships might be difficult, since the condition of the sheaths and nervation of the second empty glumes need to be weighed in importance against the prominence of the nerves of the flowering glumes and the adjustment to habitat. Fortunately, the cytological data of Church indicate how these morphological data should be evaluated. For *Glyceria* he reported sporophytic numbers of 20, 40 and 60; for *Torreyochloa* 14; and for *Puccinellia* 14, 28, 42, 56 and 63. The alignment of *Torreyochloa*, on a basis of number of chromosomes, is with *Puccinellia*. Further, the chromosomes are similar in size, being larger and longer than those of *Glyceria*. The condition of the sheaths, the nervation of the second empty glumes, the branching of the stigmas, the apices of the grains and the chromosome all indicate such a close similarity between *Torreyochloa* and *Puccinellia* that they should not be separated as genera. Instead, *Torreyochloa* should be included in *Puccinellia* as a section, distinguished primarily by the prominent nerves of the flowering glumes. This conclusion requires the following formal changes of nomenclature:

Sectio **Torreyochloa** (Church) stat. nov., fundata super *Torreyochloa* Church, Am. Jour. Bot. **36**: 163 (1949).

Puccinellia pallida (Torrey) comb. nov., fundata super *Windsoria pallida* Torrey, Cat. Pl. City N. Y., p. 19, 91 (1819).

Since the taxonomic status of other species assigned by Church to *Torreyochloa* is uncertain, their transfer is best postponed until clear specific differences are established between them and *Puccinellia pallida*. The North American species of this relationship comprise a series and essentially replace each other geographically and altitudinally. They may all belong to a single polytypic species. The names involved include *Glyceria fernaldii* St. John, the doubtful status of which as a species already has been discussed by Fassett (1946); *Glyceria pauciflora* Presl, only slightly different morphologically from *Puccinellia pallida; G. erecta* Hitch., possibly a subalpine and alpine subspecies of *G. pauciflora; G. californica* Beetle and *G. otisii* Hitch., which may be respectively a high altitude dwarf and a lax shade form; and *G. natans* Kom. and *G. viridis* Honda, both of which require further study before their status can be evaluated.

The inclusion of *Torreyochloa* as a section of *Puccinellia* requires redefinition of both *Glyceria* and *Puccinellia*. As reconstituted, the two genera may be separated as follows:

A. Sheathes of leaves usually connate; nerves of upper empty glumes single; styles present; chromosomes small or medium in sets of 10 .... *Glyceria.*

AA. Sheaths of leaves open; nerves of upper empty glumes 3; styles absent; chromosomes large, in sets of 7 .... *Puccinellia.*

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PERLUSTRATIONES PLANTARUM ARCTICARUM II:

'Parry Plants' in the Manchester Museum

Nicholas Polunin

Among the most interesting of the many botanical collections given by the late James Cosmo Melvill (1845–1929) to the Manchester Museum were three small sets of Parry plants totalling about 130 specimens which were kindly sent to me for identification at Oxford some years ago by the then Curator of the Museum's herbaria, Miss Grace Wigglesworth, as indicated in 'The Manchester Museum . . . Report for the Year 1941–42,' pp. 6–7. The specimens were mounted on small pieces of drawing paper, generally about 16 cm. long by 9 cm. wide, which had subsequently been stuck on to large herbarium sheets stamped nearby with a letter (A, B or C) to indicate the set to which each specimen belonged. To distinguish the small, original sheets from the large herbarium ones, the former will hereafter be called "sheetlets." Although these sheetlets were of varying texture and color within each set, and usually more than one of them was stuck on each herbarium sheet, the stamped letters or other considerations enabled the specimens to be dealt with in what it seemed reasonable to presume were their three original sets.

Certainly one or two and probably all three of the sets were given to Mr. Melvill in 1927 by the late Sir Sydney Parry, grandson of the navigator and father of the present Admiral Sir W. E. Parry. As a boy Melvill had evidently met the great arctic navigator; and I have seen a letter, dated March 4, 1927 when Melvill was some years past the *four*-score, in which he thanked Sir Sydney for the gift of plants "collected by your grandfather Sir Edward Parry from Port Bowen chiefly." This must be borne in mind firstly because on a sheet of paper accompanying these collections there are written in Mr. Melvill's hand the following confused and misleading notes " . . . given me by Sir Sydney Parry son of the collector Admiral Sir W. E. Parry . . . contains a few of his Arctic Plants collected on the Franklin Expedn. (search for Sir John Franklin)," and secondly because in "A brief account of the Cosmo Melvill Herbarium" (*Manchester Museum Publication* 54, pp. 5 and 12, 1904) there is mention of "Arctic plants, collected during the Franklin expedition" and "Arctic Europe and America . . . Rutherford (Franklin Expedition)." Some of these notes have been repeated in printed and other records but if there is truth in them they must belong to collections other than the present three sets. These sets will now be described in detail, the order and nomenclature followed in each list of component plants being that of my "Botany of the Canadian Eastern Arctic. Part I,"[1] except that the few mosses are named according to Prof. W. C. Steere's contribution to Part II of the same series.[2] Synonyms will in general be given only where they are necessary for direct reference to a cited paper.

Set A. This first set is labelled, on a sheetlet of the size and texture most used for mounting in all the sets, "Plants Port Bowen 1825 lat. 75° long. 115." Below this is written on the same sheetlet "Elizth. Gurney from Capn. Parry." The latter label is in a hand much resembling Parry's but the former was

[1] Canada: Department of Mines and Resources, *National Museum Bulletin* No. 92, pp. vi + 408, 1940.

[2] Polunin *et al.*: 'Botany of the Canadian Eastern Arctic, Part II, Thallophyta and Bryophyta'; Canada: Department of Mines and Resources, *National Museum Bulletin* No. 97, pp. v + 573, 1947.

evidently written by somebody else—not only because of the very different calligraphy but because the figures given for latitude and longitude are so far out as to suggest that the writer had never been to Port Bowen, or even, probably, on the expedition on which the plants were gathered! This expedition, the first label indicates, was Parry's 'Third Voyage for the Discovery of a North-West Passage,' as is upheld by a further label on a separate piece of paper which reads "Dried Plants brought by Sir Edward Parry from Port Bowen 1825. Presented to Elisabeth Gurney" (*sic*). Port Bowen was the wintering place of the expedition and lies in about lat. 73° N. and long. 89° W. on the west coast of the Brodeur Peninsula, Baffin Island. That the collection was lent by one Samuel Gurney for some months in 1876 to a "Scientific Apparatus Exhibition" in the "South Kensington Museum" is to be gathered from formal correspondence in which it is described as "A collection of 30 specimens of dried plants from the Arctic Regions made by Sir Edward Parry mounted on paper—and title page."

This set indeed appears to consist of 30 specimens, viz. the 28 marked "A" and two others marked "B" but almost certainly by mistake (*see* annotated list of the specimens given below). That the present specimens were not considered by W. J. Hooker when preparing his "Botanical Appendix"[3] to Parry's account of the voyage seems evident from almost such a series of considerations as led to a similar conclusion with regard to another set collected on the same expedition and described in the first paper in this series (hereafter cited as "Perl. I").[4] Nevertheless most, and probably all, of the vascular plant taxa represented in either of these sets are mentioned or at least "covered" by Hooker in his appendix.[3] The plants comprising the set described in Perl. I were satisfactorily localized, having been collected at Port Bowen, or on Somerset Island, or on the Whale-fish Islands off the west coast of Greenland. The plants of the present set are

[3] Pp. 121–131 of the appendix to W. E. Parry, 'Journal of a Third Voyage for the Discovery of a North-West Passage from the Atlantic to the Pacific; performed in the years 1824–25, in His Majesty's Ships Hecla and Fury.' *London:* pp. xxviii + 186, and appendix, pp. 1–151, 1826.

[4] Published in the *Journal of Botany* (vol. 80, pp. 81–94, "May, 1942"), the cessation of publication of which is the reason for the time-lag in the appearance of this and some further papers in the series. In Perl. I the plants described were unfortunately referred to as "the University of Durham set"; they have since been generously presented to me personally by the actual owner, Professor J. W. Heslop Harrison, F.R.S.

given no localities except the general one of Port Bowen which can scarcely be correct in all instances; it seems more likely that of these specimens, again, some (e. g. *Saxifraga flagellaris*) came from Somerset Island and others (e. g. *Loiseleuria procumbens*) from the Whale-fish Islands. In any case there are prevailing doubts which must prevent any additional records from being founded on this set.

The only words written on the sheetlets of set A (with the exception of the one moss, which lacks any note) are attempted binominal identifications. These are mostly, but not all, in the same, apparently contemporary hand which though not characteristic may perhaps be Parry's. The specific names are almost invariably capitalized, and spelling mistakes are common and of a type (e. g. "Oppositafolia" and "Flagellaria" in both the present set A and the one from the same expedition described in Perl. I) which suggests that many at least of the identifications were made, if not by the same person, then either from the same (other?) set or at the same time before distribution. Unlike the earlier described set which is watermarked "1825," consideration of the various papers comprising sheetlets in the present set lends weight to the likelihood of the mounting having been done during periods of inactivity on board ship. This mounting and subsequently the identifying were probably, and the distributing after landing most likely, carried out before Hooker took over the (main?) collections for the preparation of his "Botanical Appendix"; for it seems that from these expeditions it was the custom to bring back collections of "dried flowers" for presentation to one's friends.

There follows an annotated list of all the different plants represented in this set A in which, when a specimen is noted as "Correctly named on sheetlet," errors of spelling or undesirable capitals are ignored:

Pohlia cruda (Hedw.) Lindb. No note on sheetlet. Not included among the three mosses mentioned by Hooker,[3] but earlier recorded from the same general region and now known to occur practically throughout the Canadian Eastern Arctic—cf. Steere.[2]

Cystopteris fragilis (L.) Bernh. Sub nom. *Woodsia*. This species was reported with some doubt from Port Bowen by Hooker[3] (sub syn. *Aspidium fragile*).

Alopecurus alpinus Sm. Correctly named on sheetlet.

Pleuropogon sabinii R. Br. Correctly named on sheetlet. Only very doubtfully reported from Port Bowen—*see* Bot. Can. E. Arctic, I, p. 64—though probably occurring there, even if this specimen may well have come from elsewhere. Concerning the use of this specific name, see Polunin in Bull. Torr. Bot. Club **71**: 248, 1944.

SALIX ARCTICA Pall., *s. l.* Labelled "Salix Arctica 'The largest tree near the North Pole'." This specimen has peculiarly light-colored, long and narrow bracts rather reminiscent of *S. glauca* var. *stenolepis* (Flod.) Polunin.

POLYGONUM VIVIPARUM L. Correctly named on sheetlet.

LYCHNIS APETALA L. Correctly named on sheetlet.

CERASTIUM ALPINUM L., *s. l.* One of the eight sheetlets of this, although marked "B," is labelled "Cerastium Alpinum" in the same characteristic calligraphy as almost all of set A, to which it presumably belongs.

ARENARIA RUBELLA (Wahlenb.) Sm. Correctly named on sheetlet.

?RANUNCULUS SULPHUREUS Soland. in Phipps. Labelled "Ranunculus Sulphureus" on sheetlet but the determination somewhat uncertain owing to the incompleteness and state of the specimen. *R. sulphureus*, which was included by Hooker[3] in *R. nivalis*, has not yet been authoritatively recorded from Port Bowen but probably occurs there.

PAPAVER RADICATUM Rottb. Labelled on sheetlet "Papaver Nudicaule."

COCHLEARIA OFFICINALIS var. GROENLANDICA (L.) Gelert in Anderss. & Hesselm. Labelled on sheetlet "Cochlearia Fenestrata."

EUTREMA EDWARDSII R. Br. Correctly named on sheetlet.

DRABA ALPINA L. [approaching var. *nana* Hook., emend. Fernald]. Labelled on sheetlet "Draba Alpina."

DRABA FLADNIZENSIS Wulfen, *s. l.* Labelled on sheetlet "Draba Androsacea." Also probably belonging to the present species is an indeterminable scrap labelled on sheetlet "Diapensia Lapponica."

BRAYA PURPURASCENS (R. Br.) Bunge in Ledeb. Labelled on sheetlet "Platypetalum purpurascens" (synonym).

SAXIFRAGA CERNUA L. Correctly named on sheetlet.

SAXIFRAGA CAESPITOSA f. UNIFLORA (R. Br.) Engler & Irmscher. Labelled on sheetlet "Saxifraga Caespitosa"—cf. Hooker.[3]

SAXIFRAGA FOLIOLOSA R. Br. (*S. stellaris* var. *comosa* Retz.) Labelled on sheetlet, but perhaps fairly recently, "Saxifraga congesta?"

SAXIFRAGA NIVALIS L. Correctly named on sheetlet.

SAXIFRAGA FLAGELLARIS Willd. ex Sternb. Correctly named on sheetlet. Not known from Port Bowen or anywhere in Baffin Island but plentiful on Somerset Island ("North Somerset") whence, therefore, the present specimen probably originated (cf. distribution given in Bot. Can. E. Arctic, I, p. 265).

SAXIFRAGA HIRCULUS var. PROPINQUA (R. Br.) Simmons. Labelled on sheetlet "Saxifraga Propinqua" (synonym).

SAXIFRAGA OPPOSITIFOLIA L. Correctly named on sheetlet.

POTENTILLA PULCHELLA R. Br. Correctly named on sheetlet. Not known from Port Bowen, where, however, it seems likely to occur.

DRYAS INTEGRIFOLIA M. Vahl. Originally correctly named on sheetlet.

?PYROLA GRANDIFLORA Rad. Although marked "B," this sheetlet is labelled "Pyrola Rotundifolia" in the same calligraphy as almost all of set A, to which it presumably belongs. The specimen is an indeterminable scrap, probably belonging to *P. grandiflora*, which is not yet known from Port Bowen although quite likely to occur there.

LOISELEURIA PROCUMBENS (L.) Desv. Labelled on sheetlet "Azalea Procumbens" (synonym). Not yet recorded from Port Bowen or anywhere else so far north in the Canadian Eastern Arctic.

PEDICULARIS HIRSUTA L. Labelled on sheetlet "Pedicularis Arctica."

Taraxacum phymatocarpum J. Vahl in Hornem., *s. l.* (*Leontodon palustre* of some early authors). Not yet known from Port Bowen, but its general (and local) distribution suggests that it is very likely to occur there.

Set B. This second set is much the largest of the three. Some of its sheetlets are unmarked, but the majority are clearly labelled in Parry's neat and characteristic hand with both the locality and the year of collection. Other notes on the sheetlets, such as attempted identifications, are entirely lacking, but apparently belonging to this set are two separate sheetlets of the size and texture most often used for mounting throughout. One of these is labelled in the same hand as (and similarly to) the first mentioned under A, except that the latitude and longitude are omitted; the other is labelled in Parry's own hand and reads "Plants from Port Bowen the last wintering place of H. M. Ships Hecla and Fury in the Arctic Regions. 1824–5." But even if the plants were all "brought" (e. g. as "souvenirs") from Port Bowen or the nearby but "far superior" Neill's Harbour, to which the expedition returned before sailing for home, they were not by any means all gathered there; so much is clear from the individual labels on the mounting sheetlets and supported by the identity of some of the specimens themselves. Experience has shown that such individual labels can normally be relied upon, whereas the more general ones of those days often cannot; accordingly it would be unsafe to assume that the unlabelled specimens were collected at Port Bowen, or, once again, to found any records on them.

This set of plants appears to have been retained by Parry and kept in his family until it was given to Mr. Melvill in 1927. Moreover I am inclined to the opinion that, for once, either these specimens or a set of duplicates was seen by Hooker when preparing his "Botanical Appendix"; thus with a very few exceptions the records are all, and correctly, included in this appendix,[3] and the chief of these exceptions, *Papaver* from Port Bowen, is not only easily explained but its omission is rather to be expected (*see* below). The few mosses may well have been ignored by Hooker because they were entirely unlocalized; he was careful in this appendix to give precise localities for all the plants which he included.

?Pohlia cruda (Hedw.) Lindb. Scrap only, without label. Cf. above.

Tomenthypnum nitens (Schreb.) Loeske. Minor portion of a tuft mostly composed of the next species. The sheetlet lacks a label apart from the "B" stamped nearby. Neither this nor the next moss is among the three reported by Hooker in his appendix,[3] but the present species had earlier been recorded from the same general region and is now known to occur practically throughout the Canadian Eastern Arctic—cf. Steere.[2]

Ctenidium procerrimum (Mol.) Broth. No label—*see* above. Although circumboreal, this plant has rarely been collected in the Canadian Eastern Arctic whence it was hitherto known only from rather farther north than Parry reached.

Alopecurus alpinus Sm. Two sheetlets, one labelled "Port Bowen 1825" and the other "Whale-fish Islands[5] 1824"; also a third sheetlet without note or designation which seems most likely to belong here.

Arctagrostis latifolia (R. Br.) Griseb. (*Colpodium latifolium* R. Br.). Port Bowen 1825.

Deschampsia brevifolia R. Br. Port Bowen 1825.

Poa abbreviata R. Br. Lacking locality or date, but superficially resembling the last and so placed with it as to suggest that they had been considered duplicates—perhaps from the time of collection. Already reported by Hooker[3] from "Port Bowen, very abundant."

Poa arctica R. Br. North Somerset[6] 1825.

Salix arctica Pall., *s. l.* Two sheetlets, one labelled "Port Bowen[7] 1825."

Salix glauca L., *s. l.* (cf. *S. cordifolia* Pursh). Whale-fish Islands 1824. Not reported by Hooker (*l. c.*), but probably included by him under some other species. According to M. P. Porsild (*Medd. om. Grønl.*, vol. 58, p. 66, 1920), both *S. glauca* and phases of *S. arctica* are plentiful in this region.

Oxyria digyna (L.) Hill (*O. reniformis* W. J. Hooker). Two sheetlets, one labelled "North Somerset[6] 1825."

Polygonum viviparum L. Two sheetlets, one labelled "Port Bowen 1825."

Lychnis apetala L. Three sheetlets, two being labelled "Port Bowen 1825."

Cerastium alpinum L., *s. l.* Five sheetlets, including two labelled "Port Bowen 1825" and two labelled "Whale-fish Islands 1824."

Stellaria longipes Goldie (*S. edwardsii* of authors). North Somerset 1825.

Arenaria rubella (Wahlenb.) Sm. Two sheetlets, one labelled "North Somerset 1825."

Ranunculus nivalis L. Cape Warrender[8] 1824. There is a duplicate specimen in Herb. Edinburgh (*see* Bot. Can. E. Arctic, I, p. 216, footnote 1).

Ranunculus sulphureus Soland. in Phipps. North Somerset 1825. Included by Hooker[3] in *R. nivalis*, which is noted as "North Somerset, very abundant" (but *see* Perl. I).

Papaver radicatum Rottb. (*P. nudicaule* of some authors, not L.). Two sheetlets, both labelled "Port Bowen 1825." Recorded by Hooker[3] only from "North Somerset," but this does not necessarily mean that he did not see the

[5] C. 69° N. off the coast of West Greenland. Visited on the outward voyage.

[6] Now called Somerset Island.

[7] Any residual sheetlet which is not mentioned as labelled may be understood to be unlabelled.

[8] Lat. 74° 26′ N. and long. 81° 44′ W. on Devon Island (previously called "North Devon").

present specimens, as (1) there are similarly labelled duplicates of the present specimens in both the British Museum and Kew herbaria, and (2) this very common plant is the only one implied specifically—as only one species of "poppy" is known from the region—by Parry in his narrative of his 'first' voyage[9] as having been seen not far from Port Bowen already in 1819—cf. also Hooker's introductory remarks to his appendix[3] in which he explains that "this list has been reduced to as small a compass as possible, there being but few plants which had not been found during the previous voyages."

Cochlearia officinalis L., *s. l.*, vars. (*C. fenestrata* of authors). Two rather doubtful sheetlets belonging to this difficult polymorph: one, labelled "North Somerset 1825," is referable to var. *oblongifolia* (DC.) Gelert in Anderss. & Hesselm., which has not hitherto been reported from Somerset Island but may be a mere *forma crassa* of the better marked var. *groenlandica* (L.) Gelert in Anderss. & Hesselm., to which the other specimen, that is unlabelled, probably belongs. However, it is atypical in being upright and leafy, though small, and in having subspherical siliques.

Eutrema edwardsii R. Br. Three sheetlets, two of them labelled "Port Bowen 1825."

Cardamine bellidifolia L. Mere scrap without label.

Draba alpina L. [approaching var. *nana* Hook., emend. Fernald]. Two sheetlets, one labelled "Port Bowen" (without date).

Draba fladnizensis Wulfen, *s. l.* (*D. hirta* var. of some authors). Two sheetlets, both labelled "Port Bowen 1825."

Braya purpurascens (R. Br.) Bunge in Ledeb. (*Platypetalum purpurascens* R. Br., *Braya arctica* Hook.). Two sheetlets: the one labelled "Port Bowen 1825" is a mere scrap insufficient for certain determination but appears to belong to var. *dubia* (R. Br.) O. E. Schulz, as the only silique remaining is short and pilose. This scrap would seem to have been too small for Hooker, if indeed he saw the present specimens before publishing his 'Botanical Appendix', as he says,[3] "Of my supposed *Braya arctica*, there were only specimens in flower in the collection, and these flowers were scarcely fully developed."

Saxifraga rivularis L. Whale-fish Islands 1824.

Saxifraga cernua L. Three sheetlets, two of them labelled "Port Bowen 1825."

Saxifraga caespitosa f. uniflora (R. Br.) Engler & Irmscher. Three sheetlets, one atypical and the others labelled "Port Bowen 1825"—cf. Hooker.[3]

Saxifraga foliolosa R. Br. (*S. stellaris* var. *comosa* Retz.). No locality or other note.

Saxifraga nivalis L. Two sheetlets, one labelled "Port Bowen 1825."

Saxifraga flagellaris Willd. ex Sternb. Two sheetlets, one labelled "North Somerset 1825."

Saxifraga hirculus var. propinqua (R. Br.) Simmons. Three sheetlets, including one labelled "Port Bowen 1825" and another labelled "North Somerset 1825"—cf. Hooker.[3]

Saxifraga oppositifolia L. Three sheetlets, two of them labelled "Port Bowen 1825."

Potentilla pulchella R. Br. Two sheetlets, one without any note and the other labelled "North Somerset 1825," whence the species was already

[9] W. E. Parry, "Journal of a Voyage for the Discovery of a North-West Passage from the Atlantic to the Pacific; performed in the years 1819–20, in His Majesty's Ships Hecla and Griper." *London:* pp. xxix + 310, and appendix, 1821.

reported by Hooker.[3] This latter is rather a doubtful specimen which has unusually large cauline leaves and relatively sparse indumentum but is insufficient for description if new.

DRYAS INTEGRIFOLIA M. Vahl. Three sheetlets, two being labelled "Port Bowen 1825" and one of these approaching f. *intermedia* (Nathorst) Polunin.

EMPETRUM NIGRUM var. HERMAPHRODITUM (Lange) Soerensen. Whale-fish Islands 1824—cf. Hooker.[3]

LOISELEURIA PROCUMBENS (L.) Desv. (*Azalea procumbens* L.). Whale-fish Islands 1824.

VACCINIUM ULIGINOSUM var. ALPINUM Bigel. Whale-fish Islands 1824—cf. Hooker, *l. c.* p. 126.

PEDICULARIS HIRSUTA L. Three sheetlets, two of them labelled "Port Bowen 1825."

?ANTENNARIA ANGUSTATA Greene (*A. alpina* of authors, not L.). Whale-fish Islands 1824. Not quite typical.

CHRYSANTHEMUM INTEGRIFOLIUM Richardson. North Somerset 1825.

SET C This is the last and smallest of the sets under consideration here. It consists of 27 sheetlets, representing 20 species of angiosperms (*see* list below), and seems to be something of a 'rubbish heap.' Thus on a small paper label stuck to a wooden board which accompanied the specimens when they reached Manchester is written—apparently by Parry, and ending with his signature—"Specimens of Plants collected in the Polar Regions A. D. 1819–20 by W. Parry." According to this the specimens should have been collected during Parry's 'first' voyage, probably (but not necessarily—*see* Perl. I) on Melville Island. This is indeed upheld by three of the four labels occurring on the individual sheetlets (the majority are unmarked), but significantly enough not by the fourth such label, which reads "Luzula Hyperborea Igloolik" and indicates that this and perhaps some of the other specimens were collected during Parry's "second" voyage (1821–23). In this connection it is significant to note that four of the species in this set are unrepresented in Robert Brown's "Chloris Melvilliana,"[10] although two of these are now known to grow on Melville Island and the other two seem not unlikely to occur there. Thus, once again, it is evident that we must not allow any new records to be founded on the unlabelled specimens in this collection, while the four specimens that are labelled and localized (*see* below) merely substantiate old reports:

[10] 'A list of plants, collected in Melville Island, by the officers of the expedition; with characters and descriptions of the new species': pp. cclxi–cccx of the 'Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-West Passage, in the years 1819–20'. *London:* pp. clxxxi–cccx, 1824.

Poa arctica R. Br. Two sheetlets.

Luzula nivalis (Laest.) Beurl. (*L. hyperborea* R. Br., in part). Labelled "Luzula Hyperborea Igloolik": there is a similar specimen in Herb. Copenhagen.

?Salix polaris Wahlenb. An interesting but problematical specimen: leaves entire to subentire, somewhat hairy like the young twigs; bracts dark brown and rounded, broad, hairy; capsule densely white-tomentose—characters that, although they strongly suggest the variable *S. polaris*, of which I have collected similar forms in Spitzbergen and on mountains in the extreme north of Scandinavia, still do not exclude phases of the even more variable *S. arctica* (cf. H. G. Simmons, 'A Survey of the Phytogeography of the Arctic American Archipelago,' p. 73, 1913) or some hybrids of *S. herbacea*. It would not be altogether inaccordant with the known range of *Salix polaris* that it should occur on Melville Island, which has distinct "western" relationships phytogeographically and lies only a few hundred miles east of areas whence plants that have been authoritatively referred to it have been reported (e. g. by Simmons, *l. c.*); again, a few hundred miles to the east in the Lancaster Sound region *Salix herbacea* is not rare (*see* Bot. Can. E. Arctic, I, p. 156), though I have searched in vain for its hybrids hereabouts. But in any case the locality of the present specimen is doubtful and no new record can be founded on it, although both *S. polaris* and *S. herbacea* should be searched for on Melville Island. Actually, the representative of *S. polaris* to be expected on Melville Island should any occur there, is subsp. *pseudopolaris* (Flod.) Hultén, Fl. Alaska and Yukon, III, p. 510, 1943, which is stated by Hultén (*l. c.*) to constitute "a not too distinct geographical race of *S. polaris*, characterized by light-coloured bracts with wavy hairs."

Polygonum viviparum L.

Cerastium alpinum L., *s. l.* Two sheetlets, one labelled "Cerastium Alpinum Melville Island North Georgia."

Stellaria humifusa Rottb. Two sheetlets, unfortunately unlabelled. Not yet recorded from Melville Island but probably occurring there; circumpolar but of diminutive stature and restricted (saline) habitat, hence generally overlooked.

Ranunculus sulphureus Soland. in Phipps (*Ranunculus nivalis* var. of some authors). Two sheetlets.

Papaver radicatum Rottb. (*P. nudicaule* of some authors, not L.). Labelled "Papaver Nudicaule Melville Island North Georgia."

?Draba alpina L., *s. l.* Atypical but inadequate scrap.

Braya purpurascens (R. Br.) Bunge in Ledeb. (*Platypetalum purpurascens* R. Br.).

Saxifraga rivularis L. (*S. hyperborea* R. Br.).

Saxifraga cernua L.

Saxifraga caespitosa f. uniflora (R. Br.) Engler & Irmscher (*S. uniflora* R. Br.).

Saxifraga foliolosa R. Br. Two sheetlets.

Saxifraga nivalis L. Two sheetlets, of which one is apparently normal and the other represents a peculiar form rather reminiscent of, and possibly resulting from hybridization with, *S. hieracifolia* Waldst. & Kit.

Saxifraga tenuis (Wahlenb.) H. Smith (*S. nivalis* var. *tenuis* Wahlenb., *S. nivalis* var. "β. corymbus simplicissimus pauciflorus" R. Br.).

Saxifraga flagellaris Willd. ex Sternb.

Potentilla hyparctica Malte (*P. emarginata* var. *typica* Abrom.). Not mentioned by Brown,[10] but the species is now known to occur on Melville Island—*see* Simmons, *op. cit.* p. 108.

Cassiope tetragona (L.) D. Don (*Andromeda tetragona* L.). Two sheetlets, one labelled "Andromeda Tetragona Melville Island North Georgia."

Pedicularis hirsuta L. Not reported by Brown[10], but now known to occur on Melville Island—*see* Simmons, *op. cit.* p. 124.

In conclusion it is a pleasure to acknowledge indebtedness to Mr. Strickland Gibson, lately Keeper of the University Archives, Oxford, for advice and assistance with the identification of handwriting, and to thank my colleague Dr. A. R. Clapham for so kindly determining the mosses mentioned in this contribution. Grateful acknowledgment is also due to the John Simon Guggenheim Memorial Foundation for their generosity in granting a research fellowship and to Harvard University for once again affording facilities and an honorary appointment for the continuation of my multifarious works in arctic botany.—Gray Herbarium.

The Propagation of the Camperdown Elm.—My recent encounter with Fernald's[1] rather irritated comment on carelessness in books on trees leads me to recount an instance of a statement in an otherwise useful and dependable book on trees. In this book the statement is made that the common Camperdown Elm is propagated by a reverse graft. I do not know what a *reverse* graft may be but suppose it to be one in which the top of the scion points downward.

I have never grafted any Camperdown elms, but I have seen such grafts shortly after they had been made and found the scions were upright. I have been assured by plant propagators, superintendents of arboreta and foremen of extensive nurseries that the Camperdown elm is always grafted with the scion in the normal upright position. The Camperdown elm, like the weeping mulberry, is so strongly recumbent that it must be "worked" on a standard to prevent its creeping on the ground. In fact, I have one which was grafted near the ground level that is being used as a ground cover.

I had long ago heard the folk tale of the upside-down grafting to propagate weeping trees but supposed it had passed out of

[1] Fernald, M. L. "Why so many careless books on trees and other plants?" *Rhodora*: 52: 272 279, 1950.

circulation with increased knowledge of the development of cultivated types of trees. But, not long since I heard one of our teaching fellows telling a class in elementary botany this strange tale of *reverse* grafting. When I undertook to correct him, he said they were all told this story by the professor in charge of the course. The professor, when challenged, said he believed he had read it in a book by L. H. Bailey. Unwilling to believe such a thing of a man so eminent as a plant propagator[2] I searched all the works of Bailey which I thought might possibly contain such a statement without finding any incriminatory evidence. After I had alternately searched and fumed for some time, one of my students discovered for me the true source of the statement. I shall not cite the title of the tree book in question since the book is useful and generally dependable and the offending statement is made only in a revision, and may not have been from the hand of the author himself.

I now await the appearance of that other strange idea of weeping trees; that they are produced by planting normal trees of certain species upside down with the roots in the air.—Carl D. LaRue, Department of Botany, University of Michigan, Ann Arbor, Michigan.

[2] Bailey, L. H. *The Nursery Book*, xi + 395, 20th ed., MacMillan, New York, 1915.

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PHYTOGEOGRAPHIC STUDIES IN ONTARIO

1. The Genus Uvularia in Southern Ontario

James H. Soper[1]

When the preliminary check list of the flora of southern Ontario was being compiled (12), it was found necessary to verify the occurrence in that area of a number of species which had been known earlier but not collected nor reported within recent years. Among these was one of the Bellworts, *Uvularia perfoliata* L., a species frequently confused with *Uvularia grandiflora* J. E. Smith, the more common plant in our region.

According to Anderson and Whitaker (1), *Uvularia grandiflora* is the more widespread and the more western of these two species, occurring from Quebec and New England to Wisconsin and south to Missouri, whereas *U. perfoliata* shows a distribution along the Alleghany mountains and the coastal plain from New England to Georgia, with an extension westward to western New York and Pennsylvania in the Lake Erie region. On their map (loc. cit., p. 38, fig. 5) are shown six stations for *U. grandiflora* in Canada (southern Quebec and eastern Ontario, but none in southwestern Ontario) and only one for *U. perfoliata* on the Niagara peninsula of southwestern Ontario.

A study was therefore undertaken to determine more fully the distribution of these species in Ontario. An examination was made of herbarium specimens and living plants were studied in the field during the past summers' field work on the flora of southern Ontario. In May, 1950, an unreported station for the rare *U. perfoliata* was located in the Niagara district, and in

[1] Assistant Professor of Botany and Curator of the Herbarium of Vascular Plants, Department of Botany, University of Toronto, Toronto, Ontario.

May, 1951, a second station was discovered in the vicinity of Hamilton. The scope of the study was broadened to include the related species, *U. sessilifolia,* and its distribution will also be discussed.

Description and Discussion of Species

Uvularia is represented in Ontario by three species, viz. *U. grandiflora* J. E. Smith, *U. perfoliata* L., and *U. sessilifolia* L. The last of these, *U. sessilifolia,* is quite distinct and easily recognized by its elongate rhizome, its sessile (but not perfoliate) leaves, and its ellipsoid capsule. By some authors it has been placed in a separate genus (*Oakesia* S. Watson; *Oakesiella* Small), but in view of the cytological evidence presented by Anderson and Whitaker (1) such a treatment seems artificial.

The other two species, *U. grandiflora* and *U. perfoliata,* are more alike, both of them having a short rhizome, perfoliate leaves, and a truncate capsule. They have been confused by many collectors and, unless it is possible to locate verifying specimens, most reports of these species in the early literature must be considered with some doubt. The morphological differences between *U. grandiflora* and *U. perfoliata* have been studied in great detail by Anderson and Whitaker, who applied a statistical analysis. They have also been pointed out by C. C. Deam (2), by M. L. Fernald (4), and by Wiegand and Eames (13). The main differences are summarized below.

Uvularia grandiflora.—This species is usually larger and somewhat more branched and more leafy than the second. The plant is not glaucous but the leaves are whitish-pubescent beneath. The inner surface of the perianth-segments is smooth, not granular-roughened, and the stamens exceed the style.

Uvularia perfoliata.—This species is generally smaller than the first, with a somewhat less branched and less leafy habit. The leaves are glaucous and glabrous. It can be distinguished readily by the presence on the inner surface of the perianth-segments of a number of small, but clearly visible, granular or papillate projections. The stamens are shorter than the style.

It will be seen from the summary given above that some of the differences between these two species are of a qualitative nature. The character of the inner surface of the perianth, however, is usually definitive. On the basis of measurements of the size and shape of leaves and of other characters, Anderson and Whitaker concluded that the two species could always be separated by a combination of characters if a single character did not suffice. It was also pointed out that the two species occupy largely distinct natural areas in North America and that where overlapping does occur, they are found in different habitats within the same general area. This was also found to be true in the present study with respect to the habitats occupied in southern Ontario.

Wiegand and Eames (13) called attention to the difference in the flowering dates of the two species in question. This difference is also apparent in Ontario, although the data are few for *U. perfoliata* because of its rarity. The average date of flowering for *Uvularia grandiflora* in Ontario is May 15th (based on 81 collections); for *Uvularia perfoliata* it is May 30th (based on 7 collections). Thus, in spite of the fact that *U. perfoliata* is found only in the extreme southern part of the province where the growing season opens earliest, its flowering date is about two weeks later than that of *U. grandiflora.*

Key to the Species of Uvularia in Ontario

A. Leaves perfoliate; rhizome short; capsule obovoid, truncate, three-lobed or angled, but not winged. . . . . B.

B. Plant not glaucous, leaves usually whitish-pubescent or puberulent beneath; inner surface of perianth-segments smooth, not granular-roughened; stamens exceeding the style. . . . . 1. *U. grandiflora.*

B. Plant glaucous and glabrous; inner surface of perianth-segments bearing some small, but clearly visible, granular or papillate projections; stamens shorter than the style. . . . . 2. *U. perfoliata.*

A. Leaves sessile but not perfoliate; rhizome elongate; capsule ellipsoid, tapering at each end, with three winged angles . . . . 3. *U. sessilifolia.*

Distribution of Species

The distribution of the three species of *Uvularia* has been plotted on outline maps of southern Ontario (see figs. 1, 2, 3) on the basis of the specimens examined in the field and in the herbaria, together with any published or unpublished reports that were considered authentic. Specimens have been cited under each species to give records for the counties and districts of Ontario, but many which are nearly duplicates or merely additional records from the same county have been omitted.

Symbols and Abbreviations.—Four types of symbols have been used to distinguish the different kinds of records on the maps. The locations of collection of specimens examined in the herbarium are shown as black dots; those for plants examined by the author in the field but not collected—as open circles; published reports considered authentic—as solid triangles; and "other records" such as personal communications, both oral and written, from other collectors, when the information seemed credible on the basis of the known distribution—as open triangles.

The following are the abbreviations used to designate the herbaria from which specimens[2] were examined: BUF—Buffalo Museum of Science, Buffalo, New York; CAN—National Museum of Canada, Ottawa, Ontario; DAO—Division of Botany, Department of Agriculture, Ottawa, Ontario; FFT—Faculty of Forestry, University of Toronto, Toronto, Ontario; MT—Montreal Botanical Garden, Montreal, Quebec; McM—McMaster University, Hamilton, Ontario; OAC—Ontario Agricultural College, Guelph, Ontario; QU—Queen's University, Kingston, Ontario; TRT—Department of Botany, University of Toronto, Toronto, Ontario; WO—University of Western Ontatio, London, Ontario.

1. **Uvularia grandiflora** J. E. Smith—In Canada known from southwestern Quebec, southern Ontario (see fig. 1), [probably in western Ontario near the borders of Manitoba and Minnesota (but no specimens seen)], and southeastern Manitoba. It grows in deciduous woods, mixed deciduous and coniferous woods, along wooded banks of streams and slopes of wooded ravines, or occasionally in open rocky woodland. The following, from 163 sheets examined, are cited as county and district records:

ONTARIO: Brant: New Durham, May 4, 1927, *R. F. Cain* (TRT). Bruce: rich woods, Dyer's Bay, June 29, 1936, *P. V. Krotkov 10412* (TRT). Carleton: open rocky woodland, vicinity of Ottawa, May 8, 1946, *A. J. Breitung 2127* (DAO). Dufferin: Shelbourne, May 21, 1898, *Wm. Scott* (TRT). Dundas: Williamsburg, June 20, 1903, *E. J. Wells* (QU). Durham: low wet woods about one mile n. of Courtice, June 13, 1950, *Soper & Shields 4621* (TRT). Elgin: rich woods, Aylmer, May 10, 1898, *R. T. Anderson* (TRT). Essex: woods, Sandwich, June 5, 1901, *J. Macoun* (CAN). Fron-

[2] Most of the abbreviations used are from the list compiled by J. Lanjouw (7). In the case of the Department of Agriculture, Ottawa, the abbreviation DAO is preferred to OTB, since the former is the one more generally used in publications by phanerogamic taxonomists of that Department. For the herbaria not listed by Lanjouw, tentative abbreviations have been assigned, some of which are in general use.

TENAC: Kingston, 1907, *F. J. Pound* (QU). GRENVILLE: Mirwin's woods, w. of Prescott, May 14, 1859, [*B. Billings*?] (QU). GREY: edge of wooded hillside about one mile s.e. of Meaford, June 7, 1950, *Soper & Shields 4608* (TRT). HALDIMAND: highland, two miles e. of Dunnville, May 17, 1951, *Bert Miller* (McM). HALIBURTON: Carnarvon, May 18, 1935, *R. C. Hosie* (FFT). HASTINGS: woods near Stoco, May 22, 1948, *A. J. C. Barry* (TRT). HURON: rich woods, Wingham, May & July, 1890, *J. A. Morton* (CAN). LAMBTON: oak-hickory woods, the Public Bush, Walpole Island, Aug. 4, 1950, *Soper &*

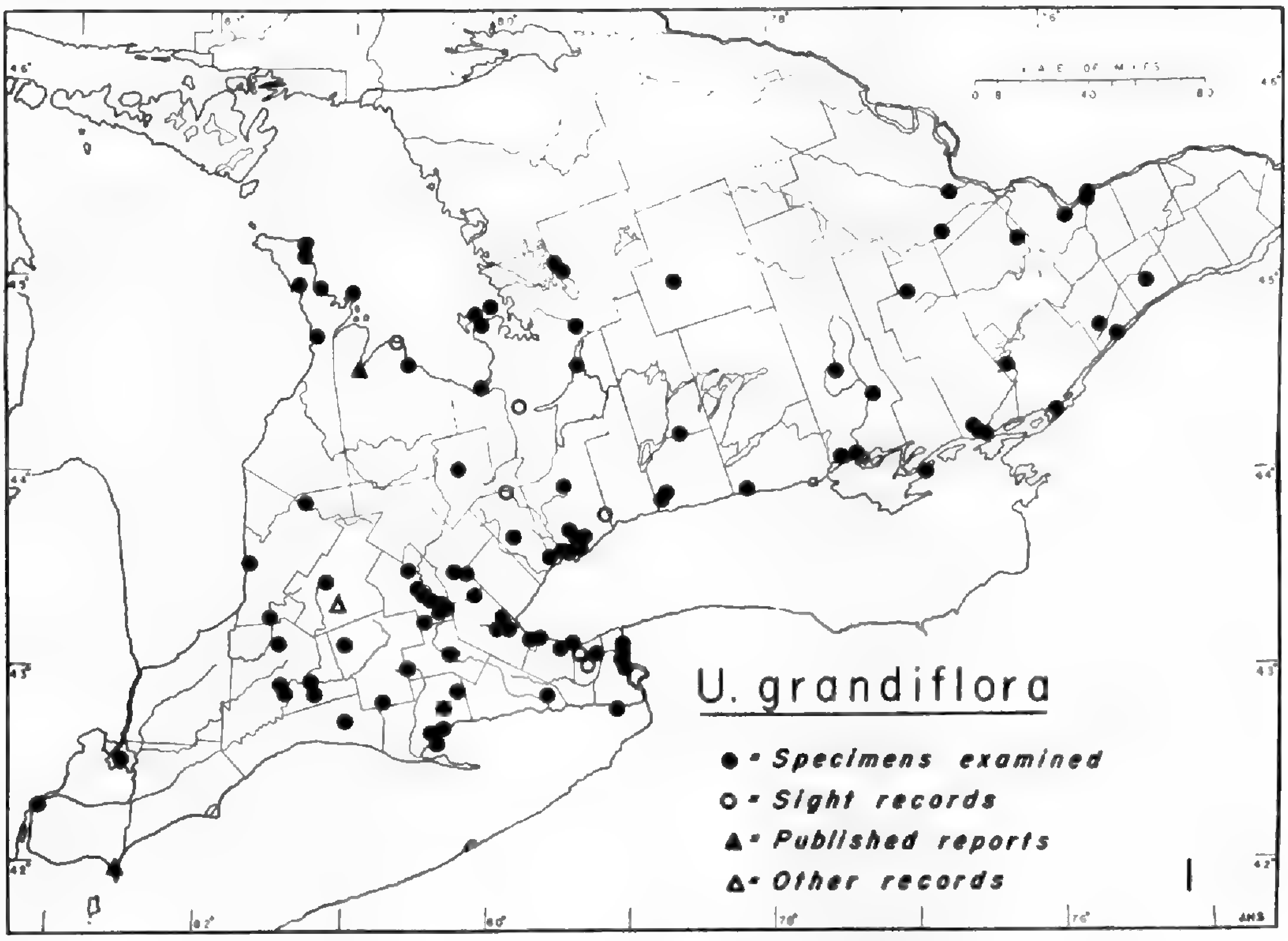


FIG. 1. UVULARIA GRANDIFLORA IN ONTARIO

Shields 5103 (TRT); open woods, [without exact locality], Moore Tp., May 1892, *Mrs. A. E. Gurd* (WO). LANARK: moist stream bank, Wolves Grove, lot 16, conc. VII, Ramsay Tp., May 23, 1939, *Senn & Minshall 1243* (DAO, MT). LEEDS: Jones' Falls, June 8, 1895, *ex herb. J. Fowler* (QU). LINCOLN: in woods along south side of Queen Elizabeth highway, lot 5, conc. I, Clinton Tp., May 17, 1950, *Soper & Shields 4358* (TRT); wooded ravine slope, near Beamsville, July 4, 1950, *Soper & Shields 4877* (TRT); woods along slope below escarpment about two miles s. of St. Catherines, June 18, 1950, *Soper & Shields 4717* (TRT). MIDDLESEX: beech-maple woods about three miles s.w. of Komoka, July 18, 1941, *J. H. Soper 2735* (TRT). MUSKOKA: Urquhart's Farm, Port Carling, May 17, 1940, *L. C. Coleman* (TRT). NORFOLK: ravine hillside, Turkey Point, June 3, 1938, *J. H. Soper 137* (McM). NORTHUMBERLAND: Cobourg, May 22, 1890, [collector not stated] (TRT). ONTARIO: between limestone blocks, open field, Atherley, May 24, 1949, *A. G. Edmund* (TRT). OXFORD: deciduous woods, about five miles n. of Thamesford, May 30, 1950, *Soper & Shields 4512* (TRT); in woods about one mile w. of Tillsonburg, June 26, 1950, *Soper & Shields 4815* (TRT). PEEL: Snelgrove, May 5, 1891, *Jas. White* (TRT). PERTH: damp maple-beech woods, lot 6, conc. IV, Logan Tp., two miles n.e. of Mitchell, July 25, 1950, *J. K. Shields 212* (TRT). Prince Edward: rich open woods, Cressy, June 3, 1928, *J. Oughton* (TRT). Renfrew: Calabogie Lake, May 28, 1884, *ex herb. J. Fowler* (QU). Simcoe: low wet woods, Thunder Beach, Georgian Bay, May 24, 1949, *Bruce Falls* (TRT); woods along bank of Nottawasaga River near its mouth, June 29, 1950, *Soper & Shields 4849* (TRT). Victoria: rich shady woods, Mt. Horeb, May 26, 1913, *N. C. Hart* (WO). Waterloo: dry woods, Cressman's Wood, German Mills, May 6, 1939, *F. H. Montgomery 109* (McM, OAC). Welland: rocky woods, Niagara Glen, May 20, 1950, *Soper & Shields 4391* (TRT). Wellington: woods, Arkell, May 15, 1933, *S. A. Simmons* (OAC). Wentworth: damp alluvial soil in wooded stream bed, between Waterdown and Aldershot (near Hamilton), May 22, 1951, *J. H. Soper 5164* (TRT). York: ravine slope at edge of woods, about one mile n. of Donlands Station, May 15, 1950, *Soper & Shields 4303* (TRT).

2. **Uvularia perfoliata** L.—This species is apparently restricted in Canada to the extreme southern part of Ontario, between the Niagara River and the western end of Lake Ontario (see fig. 2); it may possibly occur also in the southwestern part of Quebec. It is to be looked for in the Ottawa district and the eastern counties of southern Ontario. It grows in woods and thickets on upland sites, or on the slopes of wooded hillsides. The following sheets are cited from the twelve specimens examined from Ontario.

ONTARIO: Lincoln: St. Davids, May 24, 1904, *Wm. Scott* (TRT); rich woods, Jordan Station, May 27, 1892, *J. Macoun* (CAN); south of St. Catherines, July 8, 1901, *J. Macoun* (TRT); thicket, Lincoln County [but without exact locality], June 3, 1906, *Wm. L. Putnam* (OAC). Welland: wooded ravine, between Fonthill and Ridgeville, May 22 & June 18, 1950, *Soper & Shields 4408 & 4712* (TRT); woods, Niagara, May 11, 1901, *J. Macoun* (CAN). Wentworth: dry upland woods, between Waterdown and Aldershot (near Hamilton), May 22, 1951, *J. H. Soper 5163* (TRT).

In addition to the above, a specimen was examined from the herbarium of Queen's University labelled "vicinity of Ottawa, May 1879, *M. Fletcher*" which is undoubtedly this species, but no other collections nor reports have been seen from that region. It may be assumed that the species once grew in the Ottawa district and is now either extinct there or so rare that it has escaped detection. An alternative possibility is that the information concerning the locality as given on the label is incomplete or inaccurate. J. M. Macoun reported in 1879 (9) that this species was known only from near Niagara and Jordan Station and stated that it was "very rare and not collected for many years." No mention was made of the occurrence of *U. perfoliata* in the Ottawa district.

J. Fletcher, in his first check list for the Ottawa district published in 1879 (5, p. 58), listed all three species of *Uvularia* without specific localities. Later, in preparing the annotated edition of the Flora Ottawaensis, Fletcher (6, pp. 90–91) gave *Uvularia grandiflora* and *Oakesia sessilifolia* as common in the Ottawa district, but dropped *Uvularia perfoliata* from the list without comment.

Uvularia perfoliata was not known definitely to occur in Quebec by Louis-Marie (8), although it was later included in the Flore Laurentienne by Victorin (10) with the statement: "bois riches de l'ouest du Québec; rare." In a more recent paper by Raymond (11), in which many rare and southern species are listed for southern Quebec, *U. perfoliata* is not mentioned. If this species were abundant in the southwestern part of Quebec, the record for the Ottawa district or reports for eastern Ontario would seem more acceptable. Since such is not the case, it seems better to exclude the Ottawa record at least until verification or a more recent collection appears.

The restricted distribution of *U. perfoliata* in Ontario is difficult to explain in terms of the soil-preferences of this species. Accurate descriptions of habitat and associated species are lacking for all of the stations known to the author only through herbarium specimens. Only two stations for this species have been discovered and studied in Ontario by the author. Several writers have indicated that *U. perfoliata* is a plant of "acid to circumneutral soils" (4, p. 429) or "sterile gravelly or sandy, acid or subcalcareous soils" (13, p. 143). Likewise, *U. grandiflora* is said to occur in "rich woods and thickets, chiefly calcareous" (4, p. 429) or "in gravelly or alluvial calcarous rich soils" (13, p. 144). It seems probable that the same general statements can be applied to these two species in Ontario, but with only two stations for *U. perfoliata* which could be studied, no significant comparison could be made. For both stations, however, the general appearance was of a well-drained soil, the one a sandy kame moraine and the other an upland or sloping shale plain. A comparison of the associations of plants found where *U. perfoliata* was discovered by the author yields the following list of species common to the two sites:

Trees and Shrubs:	*Populus grandidentata*	*Hamamelis virginiana*
	Fagus grandifolia	*Prunus serotina*
	Castanea dentata[3]	*Rhus radicans* var. *Rydbergii*
	Quercus alba	*Acer saccharum*
	Quercus rubra	*Viburnum acerifolium*
	Sassafras albidum	
Herbaceous Species:	*Botrychium virginianum*	*Hepatica americana*
	Pteridium aquilinum var. *latiusculum*	*Ranunculus abortivus*
		Thalictrum dioicum
	Maianthemum canadense	*Geranium maculatum*
	Trillium grandiflorum	*Aralia nudicaulis*

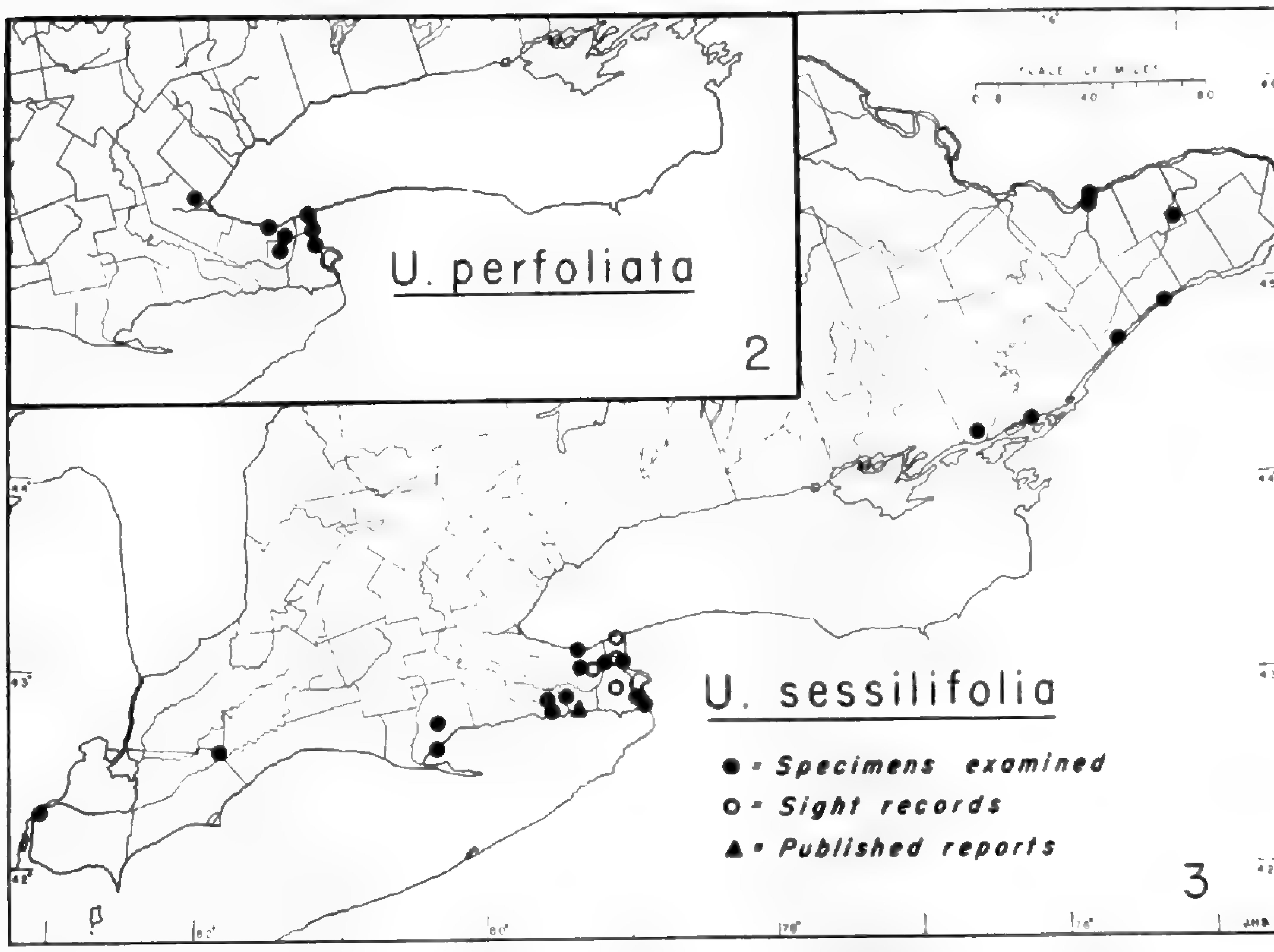
Among the species listed above are several which are at or near their northern limit in Ontario at the Niagara and Hamilton regions, such as *Castanea dentata* and *Sassafras albidum.* To these may be added the following, found at one or other of the two stations in Ontario for *U. perfoliata: Liriodendron Tulipifera, Cornus florida,* and *Swertia caroliniensis.* These southern species are restricted in Ontario to the so-called Carolinian Zone, the extreme southern portion of the peninsula of Ontario which lies between lakes Ontario and Huron. The stations for *U. perfoliata* shown on the map (fig. 2) represent the northwestern extension of the natural area of this species into a region of Ontario which contains a considerable number of southern species there reaching their northern limit in the province.

Finally, it may be noted that at neither of the two stations for *U. perfoliata* discovered in southern Ontario was *U. grandiflora* found in the same type of habitat. The latter species is common, however, throughout the same region. At the station between Waterdown and Aldershot the two species were growing in the same general area within three hundred yards of each other, but *U. perfoliata* was on well-drained wooded upland and *U. grandiflora* was in rich damp alluvial soil in the wooded stream-bed of a neighbouring ravine.

3. **Uvularia sessilifolia** L.—In Canada known from Nova Scotia, New Brunswick, Quebec, southern Ontario (see fig. 3), western Ontario (near the borders of Manitoba and Minnesota), and southern Manitoba. It is usually found in deciduous woods, frequently in rather dry, sandy, or grassy situations in open woods or clearings. The following are cited from the 45 sheets examined from the province:

[3] Represented only by stump-sprouts.

ONTARIO: CARLETON: rich woods, Ottawa, June 9, 1878, *J. Fletcher* (TRT); open woods, Rideau River, lot 19, Junction Gore, Gloucester Tp., May 10, 1939, *W. H. Minshall 9* (DAO). DUNDAS: dry island, Morrisburg, May 12, 1894, *A. H. D. Ross* (QU). ESSEX: Sandwich, June 5, 1901, [probably *J. Macoun*][4] (CAN, *no. 13315*). FRONTENAC: Cataraqui, May 27, 1896, *W. Nicol* (QU). GRENVILLE: Mirwin's woods, w. of Prescott, May 14, 1860, [probably *B. Billings*] (QU). HALDIMAND: edge of woods, near Port Maitland



FIGS. 2 AND 3. UVULARIA PERFOLIATA AND U. SESSILIFOLIA IN ONTARIO.

in Sherbrooke Tp., June 17, 1950, *Soper & Shields 4709* (TRT). KENT: Bothwell, July 18, 1917, *M. Y. Williams* (CAN). LEEDS: Gananoque, 1939, *I. O'Driscoll* (DAO). LINCOLN: open woods, Vineland, May 18, 1940, *H. M. Harrison* (OAC). NORFOLK: lot 17, conc. VI, Charlotteville Tp., June 9, 1948, *M. Landon* (McM). RUSSELL: Casselman, May 16, 1891, *Wm. Scott* (TRT). WELLAND: Whirlpool, Niagara, May 24, 1898, *Wm. Scott* (TRT); woods near Crescent Beach, Bertie Tp., June 14, 1930, *C. A. Zenkert* (BUF); open woods near Wainfleet (Marshville), June 1, 1930, *C. A. Zenkert* (BUF); open grassy woods about three miles w. of Fort Erie North, May 20 & July 5, 1950, *Soper & Shields 4398 & 4887* (TRT); Thorold, May 15, 1911, *M. O. Malte* (CAN).

This species was said to be common in Lambton County by C. K. Dodge (3), although no specimens have been seen from that area during the course of the present study.[5]

[4] Deduced by a comparison of handwriting with that on labels of other specimens. *U. grandiflora* was collected at Sandwich by Macoun on the same day.

[5] C. K. Dodge's herbarium at the University of Michigan does not contain a specimen of this species from Lambton County, Ontario, according to Dr. Rogers McVaugh (*in litt.*), although there is one there which was collected at Port Huron, Michigan, opposite Sarnia.

Acknowledgements

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Summary

The identity and geographical distribution of *Uvularia grandiflora*, *U. perfoliata*, and *U. sessilifolia* have been discussed. Distribution maps show locations in southern Ontario from which these species are known and selected groups of specimens have been cited to give a record of sources of material for the counties and districts. The finding of one hitherto unreported station for the rare *U. perfoliata* in the Niagara district and of a second in the vicinity of Hamilton establishes the existence of this species, which apparently has not been collected in Ontario for nearly fifty years.

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[6] This work (101 pp., not completed) is usually cited as having been published from 1888–1893, but the last section, pp. 78–101, containing the references to *Uvularia* and *Oakesia* was published on March 1, 1894, according to the date given on the paper cover of parts 11 and 12 (issued together) of volume 7 in the bound copy at the Legislative Library of the Parliament Buildings in Toronto.

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SOME NOTES ON UNITED STATES TREE NAMES

William A. Dayton

Herewith are some observations on the scientific names of the pines in Walter's "Flora Caroliniana" and in the so-called "Walter Herbarium" in London, as well as of knobcone pine, bristlecone fir, two oaks, and the Florida doveplum; also, on the significance of the name "loblolly pine."

Thomas Walter's Pines

Thomas Walter, in his "Flora Caroliniana" (1788), briefly describes (p. 237) five species of pines, as follows:

"*glabra* 1.	foliis geminatis, strobilo oblongo-ovato brevi, cortice glabro.
squarrosa 2.	foliis geminatis glabris brevibus, strobilo ovato brevi, squamis *subretrorsum mucronatis*, cortice scabro.
palustris 3.	foliis trinis sesquipedalibus, strobilo subulato, spinis adscendentibus.
lutea 4.	foliis trinis pedalibus, strobilo ovato-subulato, *spinis rectis*.
Cedrus? 5.	foliis, strobilo subgloboso squamis apice, *spinis retrorsum imbricatis*."

Walter's italic and roman type in the specific names above are not explained by his prefatory note: "Notam dubietatis ad nomen genericum ponere, et differentias typis italicis indicare, saepe contentus fuit"—which appears to be his only interpretation of his italicization.

In the above catalog *Pinus glabra, lutea,* and *squarrosa* appear to be new species and original publications by Walter. No. 3 undoubtedly is longleaf pine (*P. palustris* Mill.). His fifth species, "*Pinus Cedrus?*" is indeed a puzzle. The blank space after "foliis" appears to indicate that Walter himself was not sure of the leaf characters and perhaps had only the cone. It seems unlikely that he had in mind the cedar of Lebanon (*Cedrus libanensis* Juss. ex Mirb., syn. *P. Cedrus* L.). Nor could it have been the Italian stone pine [*P. pinea* L., syn. *P. Cedrus* Uspenski (1834)]. Dr. Little has informally suggested that, because of the phrase "strobilo subgloboso," Walter may have had a pond pine (*P. serotina* Michx.) cone.

Pinus glabra Walt. is generally agreed to be the spruce pine of our southeastern coastal plain.

Pinus squarrosa Walt. is listed by Sargent (Silva of North America, Vol. **11**. 1897), by Shaw (The genus Pinus. Arnold Arbor. Pub. 5. 1914), and by Rehder (Bibliography of cultivated trees and shrubs hardy in the cooler temperate regions of the northern hemisphere. 1949) as a synonym of shortleaf pine (*P. echinata* Mill.) and that is, with little question, the proper disposition of it.

Pinus lutea Walt. is listed in Index Kewensis (1894) and by Sudworth (Nomenclature of the arborescent flora of the United States. U. S. Dept. Agr. Bul. **14**. 1897) as a synonym of longleaf pine (*P. palustris* Mill.). But Sargent, Shaw, and Rehder (*opp. cit.*) hold it to be a synonym of *P. taeda* L., loblolly pine. The latter treatment, despite Walter's use of "pedalibus" in describing the leaves, seems much the more plausible.

It may not be inappropriate at this point to comment on the common name "loblolly pine." Prof. Fernald[1] has published this etymology: "Loblolly Pine, from *loblolly*, a loutish, foolish or useless person." On August 18, 1948, I wrote Prof. Fernald (in part) as follows:

> "With all proper and due respect permit me to question your etymology of the name 'loblolly' in American plant names—such as loblolly bay, loblolly pine, etc. I gravely doubt that the name has any connection whatever with 'a loutish, foolish or useless person.' The first definition of this word in the Oxford Dictionary is as follows: 'Thick gruel or spoon-meat, frequently referred to as a rustic or nautical dish or simple medicinal remedy; burgoo. Hence, a ship-doctor's medicines.' Whence such old nautical expressions as 'loblolly boy' (who would correspond roughly with

[1] Fernald, M. L., and Schubert, Bernice G. Studies of American types in British herbaria. Part III. A few of Philip Miller's species. Rhodora, **50**: (596) 181–190. Aug., 1948.

a present-day pharmacist's mate of the U. S. Navy) and 'loblolly doctor' (a ship surgeon and physician). In the Craigie-Hulbert 'A dictionary of American English on historical principles' (published by the University of Chicago) loblolly is defined thus: '(1) A thick, gruel-like food. . . .(2) A miry puddle or mud-hole.' This dictionary cites (*inter alia*) from the Georgia General Assembly Acts: 219 (1760) this expression: 'Squared timber. . . .made of swamp or loblolly pine.' There we have it, I think, a vernacular expression (based on loblolly, gruel, etc.) for a thick-mucky or swampy place. Forest Service Circular 183, 'Forest Planting Leaflet. Loblolly Pine (*Pinus taeda*),' published 1910, says: 'Loblolly pine is a name which originated in Mississippi and Louisiana, and which designates the place of growth, loblolly being the local name for a thicket swamp.'"

On September 27, 1948, Prof. Fernald replied at length to my letter of August 18, and referred to my remarks on the name "loblolly pine" as follows: "I was very glad to have your detailed notes on the significance of the name 'loblolly.' I had depended too much on Sargent's statement." Fernald's reference to Sargent is, I assume: "Loblolly, a loutish or foolish person, nautically loblolly-boy or surgeon's assistant, is a nautical name for water gruel or spoon meat, and is applied to medicines collectively. It was early used in the West Indies as a plant name, and appears in Plukenet's *Almagestum Botanicum*, published in London in 1696 . . ." (Sargent, Silva of North America **1:** 42. 1892).

As I was to be in London for a brief period in 1950, Dr. Elbert L. Little, Jr. of the U. S. Forest Service asked me to see if there is a specimen of longleaf pine (*P. palustris* Mill. or *P. australis* Michx. f.) in the Fraser volume of Thomas Walter's plants, upon which Walter's Flora Caroliniana was based in part; also if there is a specimen there which could be accepted as the type of *P. lutea* Walt. There are numerous references[2] in the literature to this Fraser folio 117-p. volume of Walter's plants in the British Museum of Natural History at South Kensington, London, and

[2] See, for example:

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Blake, S. F. Some neglected names in Walter's Flora Caroliana. Rhodora **17** (199): 129–137. July, 1915.

Britten, James. Thomas Walter (1740?–88) and his grass. Jour. Bot. **59** (699): 69–74. Mar., 1921.

Fernald, M. L., and Schubert, Bernice G. Studies of American types in British Herbaria. Part IV. Some species of Thomas Walter. Rhodora **50:** 190–208, pl. 1103–1115. Aug., 1948.

a brief quotation from Gray[3] (Vol. **1**, p. 136) will serve as a sample:

> "Saturday evening, February 9 (1839).—I have been engaged nearly the whole day upon the herbarium you [Torrey?] so much wished to examine, viz., that of Walter. I have not yet finished it, and find the examination very tedious, as the specimens are very often not labeled, except with the genus in his 'Flora,' so that I have first to make out his own species, and then what they are of succeeding authors.
>
> "The specimens are mostly mere bits, pasted down in a huge folio volume. I suspect this was done by Fraser, and the labels have sometimes been exchanged, so that it requires no little patience. Some of the things I most wished to see are not in the collection, and there are several in the collection which are not mentioned in the 'Flora.' You [Torrey?] would laugh to see what some of the things are that have puzzled us: thus, for instance, his 'Cucubalus polypetalus' is Saponaria officinalis! His 'Dianthus Carolinianus' is Frasera! in fruit. I will soon send you my notes on the collection, or a copy of them. Bentham looked over the Leguminosæ, Labiatæ, etc., with me....."

In his paper "The confused bases of the name Pinus palustris" (Rhodora **50:** 241–249. Oct., 1948) Prof. Fernald alluded (p. 247) to the desirability of a further study of Walter's pine material. On July 4, 1950, it was my good fortune to be able to visit the British Museum of Natural History and there Dr. George Taylor and Mr. Groves received me very courteously and were most helpful. I was permitted to look over the "Walter Herbarium." The pine material consists of four small mounts on p. 83, three at the bottom of the page and one above and to the left. Dr. Taylor has very kindly provided me with photographs of this pine material and these are shown (assembled) in Plate 1184. For convenience of reproduction here, the position of the left-hand specimen in Plate 1184 has been moved from its original one (immediately above the second specimen from the left, "P30") into aligment with it.

The left-hand specimen is about 15 cm. long; the rather slender leaves are in 2's and about 50–65 mm. long. The second specimen from the left ("P30") is about 18 cm. long; the twigs are slender and glabrous; the slender leaves are in 2's, about 50 mm. long, and more or less glaucous beneath. These two specimens are almost certainly *Pinus glabra* Walt., and perhaps should be considered the type material of that species.

[3] Gray, Jane Loring. Letters of Asa Gray. 2 vols., 838 p., illus. Houghton Mifflin & Co., Boston and N. Y. 1893.

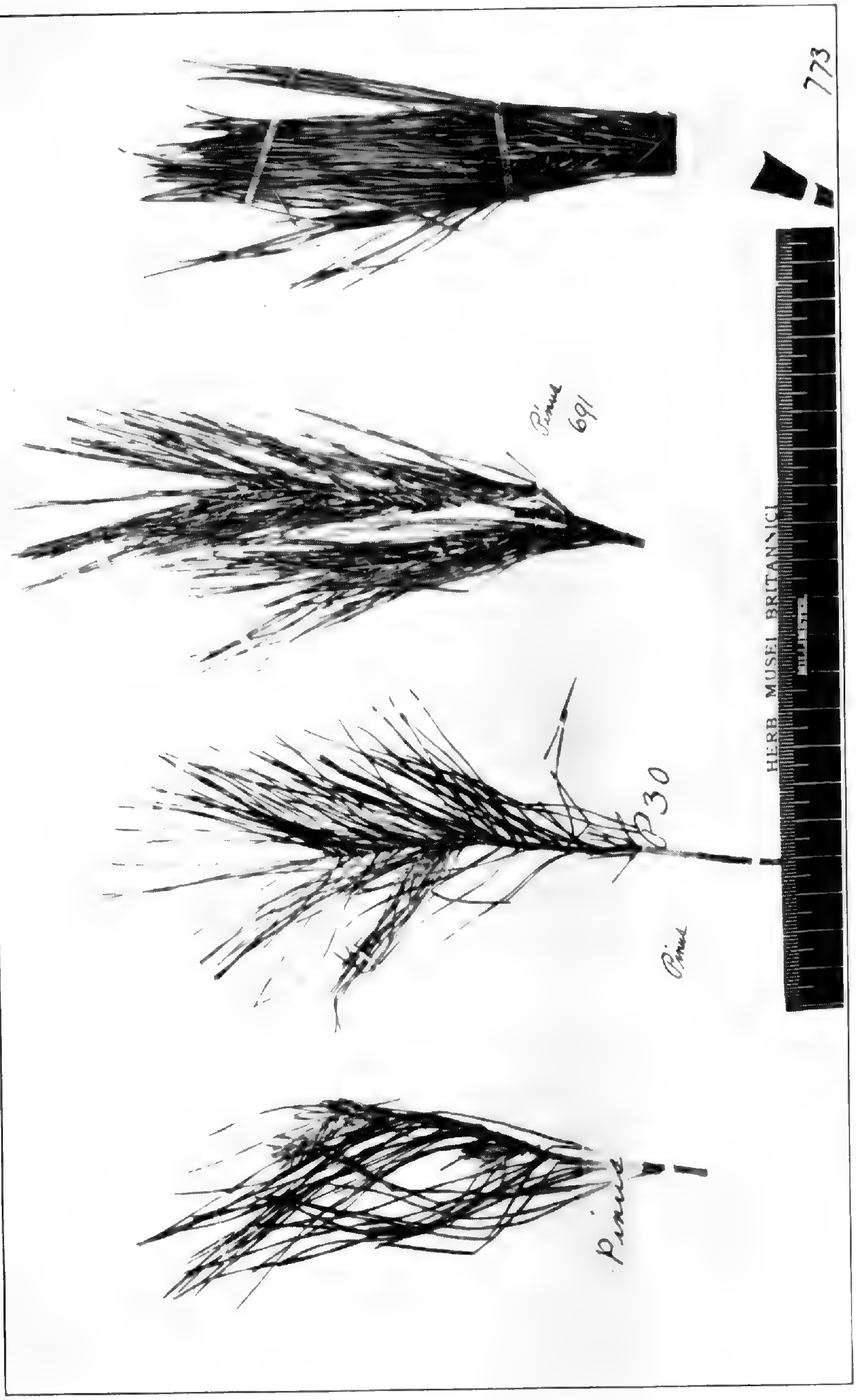

PLATE 1184. The four pine specimens in the "Walter Herbarium" in the British Museum of Natural History. The extreme left-hand specimen, for convenience of illustration, is shown out of its original position.

The third specimen from the left ("Pinus 691") is about 17 cm. long; the twigs are rather coarse; the leaves are in 2's, about 70 mm. long, coarser than those of the two specimens to its left and not at all glaucous. It is possible that this may be the type of Walter's *P. squarrosa.* The right-hand specimen ("773") is about 19.5 cm. long; the leaves are in 2's, about 110 mm. long and notably coarser than those of the other specimens. These two right-hand specimens (691 and 773) appear to me to be shortleaf pine (*Pinus echinata* Mill.).

Summary: The "Walter Herbarium," so far as pines are concerned, consists of four sterile fragments, all of 2-needled pines. Obviously the *Pinus lutea* and *P. palustris* of Walter's Flora Caroliniana are not represented. His *Pinus glabra* and *P. squarrosa* (the latter a synonym of *P. echinata*) are probably represented. I was not allowed to remove portions of the needles for later microscopical study. It is hoped that somebody in the British Museum may be induced to make that study, as the results might add appreciably to these preliminary findings.

PINUS CALIFORNIANA LOISEL. IN DUHAM.

Henri Louis Duhamel du Monceau's 7-volume folio work "Traité des Arbres et Arbustes que l'on cultive en pleine terre en Europe, et particulièrement en France" (1801–1819) appears to be very rare in libraries in this country. Some years ago Mrs. Janet R. Sellars, formerly of the Arnold Arboretum Library, kindly sent me a copy of the original description of *Pinus Californiana* Loisel. from Vol. 5, p. 243–244 of that work; she told me that Loiseleur-Deslongchamps was the author of Vols. 5–7 of the work mentioned. That description follows:

"15. Pinus Californiana. P. foliis geminis ternisve, gracilibus; strobilis folio multò longioribus.

"Je n'ai pas cru devoir négliger de faire connaître cette espèce, quoique le seul individu que j'aie vu au Jardin des Plantes n'eût ni fleurs ni fruit; la note qui m'a été communiquée par M. le professeur Thouin ne pouvant laisser de doute sur l'existence de ce Pin, comme espèce distincte. 'Cet arbre croît dans le voisinage de Monte-Rey, en Californie. Un des ses cônes, recueilli par Colligon,[4] jardinier de l'expédition de la Peyrouse, fut

[4] Presumably this is a slip for Collignon. See Guillaumin, A. Collignon, jardinier du voyage de La Perouse. [(Paris) Mus. Nat. Hist. Natur. Bul. (ser. 2) **20:** 96–100. 1948.] Jean-Nicolas Collignon was born in Metz in 1762 and apparently was not heard of again after December, 1788. He disappeared in the South Pacific, after seriously injuring his right arm in an explosion; whether lost at sea, murdered by savages or dead from other cause "nul ne saura jamais."

envoyé au Muséum d'Histoire naturelle en 1787. Ce cône avait la forme de celui du grand Pin maritime, (*N.B.* I assume that *Pinus pinaster* Ait., syn. *P. maritima* Lam., is intended—W.A.D.) mais il était plus gros d'un tiers dans toutes ses dimensions. Sous chacune de ses écailles se trouvaient deux semences de la grosseur de celles du Pin Cembro, (*N.B.* Presumably Swiss stone pine, *P. cembra* L. is referred to—W.A.D.) et dont l'amande était bonne à manger. Ces graines, semées au Muséum, ont produit deux jeunes plantes, qui, cultivés dans l'orangerie, se sont conservés pendant long-temps. La plupart ont été donnés à des cultivateurs des départemens meridionaux. Il en existe encore un pied au Jardin des Plantes, placé depuis quelques années en pleine terre dans le lieu nommé la petite butte; sans être tres-vigoureux il se maintient en santé.' J'ajouterai que cet arbre a environ sept pieds de haut; que ses feuilles sont longues de trois pouces, très-menues, d'un vert peu foncé, et qu'elles sont réunies deux ou trois ensemble dans la même gaîne."

Loudon (Arboretum et fruticetum Brittanicum. 1838), under the heading "Species of 3-leaved pines which cannot with certainty be referred to any of the preceding section, but of which there are living plants in England," describes (p. 2268–2269): "31. *P.* californiana *Lois.* The California Pine," based on Loiseleur's description above, so that the matter is not further clarified unless, to be sure, the British specimens he mentions are still living and can be located.

In 1840 Hooker & Arnott (Botany of the Beechey Voyage, p. 393) give a check list of seven then known California pines, including besides bishop, Coulter, Digger, and Monterey pines (the last-named under three different botanical names): "5. P. *Californica. Lois.—Loud. l. c.* p. 2268. Hab. Monterrey. *Colladon*[5]—A very dubious species." Note the misspelling, Californi*ca*.

The writer's main concern with the name *P. californiana* Loisel. is in connection with what immediately follows.

Knobcone Pine

In July 1846 Hartweg was in Monterey and wrote[6] that, in view of the hostilities between United States and Mexican troops, "I cannot venture far away from Monterey, nor is it advisable that I should do so, as I might fall in with a party of country people, who could not be persuaded that a person would come all the way from London to look after weeds, which in their opinion are

[5] See footnote 4.

[6] Hartweg, Theodor. XXIX.—Journal of a mission to California in search of plants. London Hort. Soc. Jour. 2: 187–191. 1847.

not worth picking up, but might suppose that I have some political object in view; I, therefore, confine my excursions within a few miles of the town." However, in later August of that year he had the good fortune of spending a day or two in the mountains across Monterey Bay near Santa Cruz where he discovered his *Pinus benthamiana* Hartw. (a synonym of *P. ponderosa* Laws.). He then adds this note (p. 189):

> "Another kind of pine that I found within a few hundred yards of the foregoing species, is, probably, the doubtful and little known Pinus californica; the trees seem to be of slow growth, and do not attain any great height, seldom more than 25 feet by 8 inches in diameter. The leaves are in bundles of three, 4½ inches long; cones 5 to 5½ inches long by 2 broad, the outer surface curved, the inner straight, scales on the outer surface more developed, enclosing two small, flat, winged seeds. The cones are only produced on the main stem; when ripe, they are of a light-brown colour, and stand off at nearly a right angle; when old, of a silvery grey, pressing firmly upon the stem, and remain on the trees for a series of years without opening or shedding their seeds."

The above appears to be the first published description of knobcone pine, antedating the presently accepted scientific name of that species (*P. attenuata* Lemmon, Mining and Sci. Press **64:** 45. 1892 and Gard. and Forest **5:** 65. 1892) 45 years. It is true that Engelmann (in Brewer, Watson and Gray, Botany of California **2:** 128. 1880), adopts the homonymous *P. tuberculata* Gordon (1849) for knobcone pine, dismissing *P. californica* Hartw. as a *nomen provisorium*, with the comment: "Hartweg's name of *Californica*, though much older, was applied only through a mistaken identification of the species with Loiseleur's plant above mentioned, and must therefore be dropped." Technically, no doubt, the Rules (Art. 37) may still be cited to support Engelmann's statement in this matter. However, *Pinus californica* Hartw. does not violate Art. 70 as it is not an "orthographic variant" of *P. californiana* Lois., the trivial adjective being a quite different one, and it is not a source of confusion, being certainly less so, say, than *Hieracium greenei* A. Gray and *H. greenii* Porter & Britton, both of which are legitimate. J. G. Lemmon (Notes on Cone-bearers of North-west America.—I. Garden & Forest **5:** 64–66. Feb., 1892) discusses *Pinus californiana* Lois., claiming that it should be accepted as the scientific name for Monterey pine, but, in an emendatory suffixed note, C. S. Sargent takes the position that the name is too uncertain.

A little later, Lemmon [Notes on West American Coniferae.—III. Erythea **1** (11): 224–231. Nov., 1893] writes that Monterey pine "is practically the only pine that would be noted for miles around (Monterey) except by keen-eyed botanists like Douglas and Coulter" but seems to agree with Sargent that *P. californiana* Lois. should be rejected. He also defends his name *P. attenuata* for knobcone pine as against *P. californica* Hartw.

Disregarding for the moment the rather specious and highly legalistic argument that Hooker & Arnott's typographical error in the spelling of Loiseleur's species makes *P. californica* Hartw. homonymous, and considering that Hartweg was the discoverer of knobcone pine and wrote an excellent description of it long before anybody else did, it seems to me that his name, even though tentatively given, has sufficient merit to make it worthy of consideration by the Executive Committee, to which the Rules indicate that "doubtful cases should be referred."

Bristlecone Fir

It is a familiar fact that the name-bringing synonyms of bristlecone fir, *Pinus bracteata* D. Don and *P. venusta* Dougl. were both published in 1836 but priority between the two has not hitherto been established. Little [Notes on nomenclature in Pinaceae. Amer. Jour. Bot. **31** (9): 587–596. Nov., 1944] indicates that *Pinus venusta* Dougl. (Comp. Bot. Mag. **2**: 152. 1836) was published December 1, but adds that "the exact date has not been determined" for *P. bracteata* D. Don [Linn. Soc. London Trans. **17** (3): 442. 1836]. He concludes: "The name established in usage by Sargent more than fifty years ago [viz, *Abies venusta* (Dougl.) K. Koch—W.A.D.] should be retained for the present." Keck [Bibliographic notes on Abies bracteata and Pinus Coulteri. Madroño **8** (6): 177–179. Apr., 1946] challenged Little's conclusion, claiming an 1832 date for *Pinus bracteata* D. Don in Lambert. Little rebuts Keck's argument in his paper "Lambert's 'Description of the genus Pinus,' 1832 edition" [Madroño **10** (2): 33–47. Apr., 1949]. He states that *Pinus bracteata* was not published in 1832, and that the name appears in extra pages of two known copies only, somewhere between 1837 and 1839, as shown by watermark dates. He again recognizes *Abies venusta* (Dougl.) K. Koch as the acceptable scientific name for bristlecone fir but adds: "However, if the exact date of publication in 1836 of part 3 of Volume 17 of the Transactions of the Linnean Society of London should ever be established as before December 1, as is mathematically probable, then it would be necessary to take up the name *Abies bracteata* (D. Don) Nutt.

No. 377. **ESTABLISHED UPWARDS OF THIRTY YEARS.**

BENT'S MONTHLY LITERARY ADVERTISER

LONDON, JULY 11, 1836.

NEW PUBLICATIONS, *From June 9, to July 9, 1836.*

Tattersall's (Geo.) Lakes of England; post 8vo, 12s.
Taxæ Sacræ Penitentiariæ Apostolicæ, 12mo, 3s.
Thornton's Treatise on the Teeth and Gums, 8vo, 2s 6d.
→Transactions of the Linnæan Society, Vol. 17, Pt. 3, 4to, 1l 1s.
Tribunal of Manners, a Satyricon, post 8vo, 5s.
Trollope's (Mrs.) Life and Adventures of Jonat. J. Whitlaw, 3 vol. post 8vo, 31s 6d.
Twamley's Romance of Nature; or, the Flower Season illustrated, 8vo, 31s 6d.

Fig. 1. A portion of Bent's Monthly Literary Advertiser, No. 377, for July 11, 1836, showing the date of publication of Vol. 17, Pt. 3 of The Transactions of the Linnean Society of London.

On July 4, 1950, which obviously is no holiday in Britain, it was my privilege to visit the headquarters of the Linnean Society in London. There Mr. Spencer Savage, the Librarian and Assistant Secretary, very kindly showed me the famous collection of Linneana—his letters, manuscripts, library, herbarium, shells, etc. There is no record there of the *exact* date of *Pinus bracteata* D. Don, but I did find this interesting handwritten note in their records of Part 3, Vol. 17 of the Society's Transactions: "At end of June or beginning of July. Council Meeting 21 June 1836 the price of the Part was fixed (at £1/1). In Monthly Literary Advertiser 1836. No. 377 p. 84 the Part is recorded as on the market. J.S." Through the kindness of Messrs. C. B. Oldman, Principal Keeper, Department of Printed Books, and L. C. Punter of the Photographic Service, British Museum, I have obtained a photostatic copy of Bent's Monthly Literary Advertiser (No. 377. July 11, 1836), which (because of its great rarity or perhaps entire absence in American libraries) is partly reproduced in Fig. 1 herewith, showing that Vol. 17, Part 3, of the

Transactions of the Linnaean Society was issued sometime between June 9 and July 9, 1836. It is obvious, therefore, that *Pinus bracteata* D. Don has about five months or so priority over *P. venusta* Dougl., and that the correct botanical name of bristlecone fir is *Abies bracteata* (D. Don) Nutt., as Dr. Little surmised (*loc. cit.*, Madroño), and as Dr. Keck indicated (*op. cit.*) though on another premise.

TWO OAKS

Quercus × **hawkinsi** Sudw., Amer. Forestry 23: 685, illus. 1917.

In the 1944 processed Forest Service CheckList[7] I called attention to the fact that the spelling of the trivial name should be corrected to *hawkinsiae,* the late Mr. Sudworth having said in his original description: "It is proposed to designate this hybrid oak . . . in honor of its discoverer, Mrs. Eugene Hawkins," whose picture he furnishes by the side of the type tree in Carroll County, western Tennessee.

It might be explained that the Check List referred to was prepared by Dr. Elbert L. Little, Jr., under the supervision of of the Forest Service Committee on Tree and Range Plant Names whereof Dr. Homer L. Shantz was then chairman. Dr. Little, who had been with the Ecuador forest survey party in 1943, under the auspices of the Nelson Rockefeller Office of Inter-American Affairs, was transferred late in the year to the Cinchona survey project in Colombia and, Dr. Shantz having retired, the Check List mss. was entrusted to me. It was necessary for me to obtain answers to questions Dr. Little had entered on the mss., to proofread the stencils, and to prepare an introduction and the indexes. In the course of proofreading the stencils it seemed desirable for me to intercalate 37 notes, among which was the note on this oak hybrid.

The original spelling *hawkinsi* seems to be "a clearly unintentional orthographic error" subject to correction under Art. 70 of the Rules. Prof. Fernald has accepted this correction in the eighth edition of Gray's Manual (1950). This hybrid occurs under the name "× *Q. hawkinsii* Sudworth" (p. 28) in Ernest J.

[7] Little, Elbert L., Jr., and U. S. Forest Service Tree and Range Plant Name Committee. Check list of the native and naturalized trees of the United States, including Alaska. 325 p. Mimeogr. 1944.

Palmer's "Hybrid oaks of North America" [Arnold Arbor. Jour. 29 (1): 1–48. Jan., 1948]. Prof. Rehder adopted the name *Q.* × *porteri* for this cross between black and northern red oaks in his Manual and also in his "Bibliography of cultivated trees and shrubs" (1949) but, as Dr. Little has indicated in the Check List, *Q.* × *hawkinsiae* antedates the valid publication of *Q.* × *porteri.*

Quercus virginiana var. **eximea** Sarg., Bot. Gaz. 65: 447. 1918.

Again, in the 1944 mimeographed Forest Service Check List, I indicated that the above varietal name should be changed to *eximia,* under Art. 70, as either a typographic or unintentional orthographic error. I have discussed this matter with Prof. George M. Harper, Jr., chairman of the classical department of Williams College, who states that there is no authority for the spelling *eximeus, -a, -um.* Incidentally, it seems to be a fairly common (and unhappy) botanical practice to employ *exiguus* and *eximius* as synonyms of *angustus* ("narrow"); *exiguus* means "scanty"; *eximius* (literally, "taken out") signifies "distinguished," " extraordinary."

Florida Doveplum

Coccoloba laurifolia Jacq., Plant. Rar. Hort. Caes. Schoenbrun. **3:** 267. 1798.

In the 1944 Forest Service Check List above referred to, Dr. Little followed the traditional practice of placing the doveplum of southern Florida under the above name. In a note on that species (p. 71) I stated that, before a final revision of the Check List was made, "it is desirable that, so far as possible, the relationship of *Coccolobis laurifolia* Jacq., whose type locality is Caracas, Venezuela, to the Floridian species, *C. floridana* Meisn. (in DC., Prodr. Syst. Regni Vegetab. 14: 165–6. 1856) and *C. curtissii* Lindau (in Engler, A., Bot. Jahrb. 13: 159. 1890) should be inquired into. This may, of course, for final solution, require study of type material, presumably in Europe, and further field study. It is quite possible, indeed, that true *C. laurifolia* does not occur naturally in Florida. Jacquin and Meisner (*opp. cit.*) indicate that *C. laurifolia* has included stamens; *C. floridana* is described with exserted stamens. Leaf shape and the presence or absence of teeth on the stamineal tubes of these forms are among other matters that need further study. Mr. E. P. Killip of the U. S. National Herbarium agrees with me that the present knowledge concerning the relationship of these forms is unsatisfactory."

Little [Nomina conservanda proposals for ten genera of trees and shrubs. Madroño **7** (8): 240–251. Oct., 1944] proposed *Coccoloba* P. Br. for conservation, chiefly on the ground that most authors are using that name, and this was approved by the nomenclature committee of the American Society for Plant Taxonomists though not formally ratified by the International Congress in Stockholm in 1950.

It may be worthy of note that the U. S. National Museum Florida material of "*C. laurifolia*" is now placed in folders labeled *C. floridana.* Unfortunately the South American material of *C. laurifolia* is, at this writing, not on file in that herbarium. If one compares the original descriptions of *C. laurifolia* Jacq. (Plant. Rar. Hort. Caes. Schoenbrun. Descr. Icon. **3:** 267. 1798) with that of *C. floridana* Meisn. (*op. cit.*) and Jacquin's plate (267) with that, say, of Sargent (Silva of North America **6:** 119–120, tab. 300. 1894) some noteworthy differences will be observed. For example, Jacquin's figure of his type of *C. laurifolia* shows a plant with leaves of an oblong type, whereas Sargent's plate of Florida "*C. laurifolia*" has leaves narrowed at the base and of a narrowly obovate or oblong-obovate type, and this agrees substantially with Meisner's description of his *C. floridana.* Admittedly, however, size and shape of leaves in this genus are variable in the same species. Moreover, *C. floridana* is described with leaves less rigid, the reticulations less prominent, and with the margins recurved as compared with those of *C. laurifolia. C. floridana* also was described with exserted stamens and included styles, whereas *C. laurifolia* was described with included stamens and exserted styles. The calyx of *C. laurifolia* is reported to be rounded at base and that of *C. floridana* attenuated, its pedicels noticeably more often in pairs and it is described as a considerably larger tree than *C. laurifolia,* and there appear to be other minor described differences.

To Richard A. Howard [The genus Coccoloba in Cuba. Arnold Arbor. Jour. **30** (4): 388–424. Oct., 1949] appears to belong the credit of first calling attention to the fact that this genus is dioecious. He says (p. 389): "In all specimens examined in the field the plants were found to be dioecious and the staminate and pistillate plants are readily distinguishable." For example, Sargent (both in his Silva and the Manual) describes the flowers as "unisexual." Howard's findings would seem, therefore, completely to set aside the exserted *vs.* included stamens and styles stressed by other authors. Howard remands *C. floridana* Meisn., *C. curtissii* Lindau, and the "*C. laurifolia*" of authors to synonymy under *C. diversifolia* Jacq. He was not able to make final disposition of *C. laurifolia* Jacq., but thinks it may yet perhaps prove to be a synonym of the earlier-published *C. diversifolia* Jacq. Certainly, taking Jacquin's original description and plate of *C. laurifolia* it seems to key clearly to *C. diversifolia* in Howard's key. Apparently, therefore, our Florida doveplum is better placed under the name *C. diversifolia* Jacq.

Rhus

Rhus copallinum L., Sp. Pl. 266. 1753.

It is a familiar observation that Linnaeus' genders under *Rhus* are confused. Possibly this may be correlated with the fact that the ancients regarded Sicilian sumac (*Rhus coriaria* L.)—an important tanning plant of the Mediterranean region and Near East and which was the species of *Rhus* known to them—as two-sexed, male and female. Ροῦς in Greek and *Rhus* in Latin may be either masculine or feminine. But in modern botany *Rhus* is uniformly treated as a feminine noun. The simplest procedure relative to *Rhus copallinum* seems to be to regard "*Copallinum*" in Species Plantarum as a typographical error for *copallinum*, which should now be feminized as *copallina*. *Rhus copallina* is, in fact, the spelling generally adopted by present-day botanists.

I wish to express my appreciation of Dr. Little's kindness in reviewing the manuscript of this paper and giving me the benefit of his criticism.

U. S. Department of Agriculture Forest Service,
Washington, D. C.

AN OLD LOCAL HERBARIUM OF NEW SALEM, MASSACHUSETTS

Una F. Weatherby

In the summer of 1947 my husband Alfred and I accidentally met a Mr. Gregory Smith and were given an old herbarium which had belonged to his great uncle of whom he knew little except that he had lived and died in New Salem, Massachusetts, and for sixty years or more had practiced medicine there and on his professional rounds had become interested in the flora of the region and had made a collection of the plants.

The New England Botanical Club Herbarium specializes in local flora and to get an herbarium of a very local place of a region most of which is now under water seemed desirable and Alfred said if there was sufficient data the Club would like it. Later in the fall we went down, saw the hérbarium, which was mounted on newspapers sewed into a book. The specimens had been very carefully pressed and mounted and there seemed to be enough data to make it worth while so we brought it home.

Mr. Smith could give us very little information about this uncle and it seemed we had an herbarium made by Dr. George Peirce, who lived in New Salem for most of the 19th century, but that was all. [The plants were dated from around 1840 to 1850.] Alfred being of an investigating mind and above all things desiring accurate information set about to find out more about Dr. Peirce and the precise source of his herbarium specimens.

The first thing we did was to go to New Salem and make inquiries. We couldn't find any one who had known him but almost every one knew about him. Evidently he had been a doctor of reputation—locally at least. We spent a morning in the old cemetery reading every stone with a Peirce on it, and there were many, about half of them, but unfortunately there was no George Peirce. We went to all the nearby towns and investigated their cemeteries but without success. Finally we found a lady who was in charge of the little local museum in which a few mementoes of Dr. Peirce were kept also a picture of his house. He never married so had no direct heirs. We were given the name of a niece of his living in Petersham. From her we secured the following information: George Peirce was born Feb. 5th 1808, son of Rev. Warren Peirce and Lydia Farrer, his wife. Died Oct. 14th 1896. Aged 88 years 8 months and 9 days. The unusual spelling of the name is doubtless due to the fact that they were descended from Lord Percy, hence the e before the i "as occurs in those of Irish origin."

Alfred spent many evenings at the Gray Herbarium carefully removing the specimens from the old newspapers and had labels printed and the data ready for mounting. He said to me "The old Doctor took great pains to make and press such good specimens I do want them preserved." Alfred was also writing it up for RHODORA and a few days before his death he said to me: "I have finished the Peirce article but think I'll keep it and add the names of the plants."

Professor Fernald wanted it for the next issue of RHODORA and days were spent trying to find the manuscript but it has never been found so I am doing the best I can to replace it. A letter from the above mentioned niece, Mrs. Mabel Coolidge and Alfred's reply will give all the information I have.

COOLIDGE
"Lydford Fels"
Petersham Massachusetts Sept. 29th. 1947

Mr. C. A. Weatherby:—

My dear Sir:—

Your letter seems almost too increditable to believe, as I well remember Uncle George's herbarium kept on my mother's bureau waiting to be sent according to his directions when he had no more use for it! I knew he died and it was sent while I was away from home, some fifty years ago! and I thought that was the last of it until we were preparing for a scrap drive two years ago, and overhauled every available band-box and drawer and I found the key to that herbarium which was no use to us with its principal gone. I cannot imagine why my mother didn't send it along unless it did not come to light until she had forgotten about it . . . I did find the letter of instruction for sending it . . .

I know that my mother's uncle did a marvelous work as physician during an epidemic of typhoid fever in New Salem in the summer of 1859—resulting from the stagnant waters of Miller's River in Athol and Orange, and I suppose he spent most of his life in New Salem.

He was a very gentle and patient man greatly loved by his family and fellow townsmen, and I am gratified if some of his handiwork is still in existance. . . .

Yours truly.
Mabel A. Coolidge

Dear Mrs. Coolidge:—

I have been away for a month, moving about and getting mail only occasionally; that must be my excuse for having been so long in acknowledging your kind letter of September 29th, in regard to Dr. Peirce.

I am really delighted to have the information in regard to him which you give me and the pleasant picture of the man which emerges from what you and the people at New Salem have told me. If the key to the herbarium turns up, I shall be much pleased to have that too, for in some cases the information in regard to the specimens which we need for scientific purposes is lacking, and the key might supply it.

Yes, the herbarium was given to us by Gregory Smith, now, as you very likely know, an artist at Old Lyme, Connecticut, and quite accidentally. Mr. Smith was in charge, last summer, of the exhibition of the Old Lyme Art Association, which my wife (who is interested in art) and I are in the habit of visiting. In conversation with him the fact that I am a botanist was casually mentioned; he then told me of the herbarium which he had kept out of sentiment, but now felt, since none of his family were interested, that, if it were of any use, it should be placed in some institution. It proves to be an excellent collection, comprising a good representation of the flora of New Salem beautifully pressed and mounted and accurately named. Some of the specimens are from localities now under the waters of the Quabbin Reservoir.

The collection probably was made between 1840 and 1850; the style and paper of the book and the fact that he obviously used in naming his plants works of John Torrey, the latest of which was published in 1843, indicate that. Had they been worked up much after 1850 he would almost certainly have used Gray's or Wood's manual.

With my hearty thanks,

Sincerely yours,

C. A. Weatherby.

Mr. Weatherby died before the work was completed but Mr. F. W. Hunnewell has recently had the plants mounted and at long last, after a hundred years, the painstaking work of an amateur botanist has come to rest in a place where it may be useful.

Flowering Arundinaria gigantea in Illinois.—Botanists and plant collectors are aware of erratic and infrequent flowering of *Arundinaria gigantea* (Walt.) Muhl.; a species of cane usually found in lowland areas which may be flooded annually. During early July 1951 the writer visited an area west of Sandusky in Alexander County, Illinois, in which two colonies of cane were observed. In this locality *A. gigantea* produced short, leafy, flowering culms profusely, but another colony about 500 yards distant showed no flowering culms.

According to some authorities each species of cane has been thought to flower at the same time over considerable areas. With this prevalent idea in mind a visit was made to other localities in Gallatin, Pope, Massac, and Pulaski counties in which *A. gigantea* grows. None of the localities explored showed colonies with flowering culms.

Temperatures in this southern portion of Illinois were far below normal during the past winter. Most upper portions of the cane are dead, and such a killing back of sterile branches was very likely caused by sub-normal winter conditions. Mrs. Agnes Chase, in a communication, reported a collection of flowering culms of *A. tecta* (Walt.) Muhl. in southeastern Virginia where "the canebrake had been cut through to make a road, and the canes along the cut had sent up great numbers of the flowering basal shoots." When flowering culms were first observed in the Alexander County locality it was thought that killing of the upper parts of sterile branches might have induced abundant production of flowering culms in other southern Illinois areas, but observation has revealed that this is not the case. Throughout its range in Illinois *A. gigantea* has not flowered simultaneously this season. Destruction of sterile shoots is evidently only one of the factors which causes flowering. It will be interesting to keep this same locality and colony under observation during subsequent years, and to report on its behavior.

Specimens of flowering *A. gigantea* from the Alexander County locality have been deposited in herbaria of the following institutions: (No. 7214) Illinois State Museum, University of Illinois, United States National Herbarium, Chicago Natural History Museum, and (No. 7266) Gray Herbarium.—GLEN S. WINTERRINGER, ILLINOIS STATE MUSEUM, SPRINGFIELD, ILLINOIS.

ARIZONA FLORA[1].—While residents of many of our states have no manual or other guide-book devoted to the plants growing within the borders of their states, the people of Arizona are fortunate in having several. Treating special categories of plants are *The Cacti of Arizona* by Lyman Benson, and a *Manual of Southwestern Desert Trees and Shrubs* by Benson and Robert A. Darrow, both excellent sources of information. Discounting

[1] *Arizona Flora.* By Thomas H. Kearney, Robert H. Peebles, and collaborators. viii + 1032 pages, 45 photographs on 32 pages, colored frontispiece. University of California Press. Berkeley, 1951. $7.50.

the hastily compiled and unsatisfactory *A Flora of Arizona and New Mexico* by Ivar Tidestrom and Sister Teresita Kittell, the standard work on the flora of the state as a whole has been *Flowering Plants and Ferns of Arizona* [now out of print] by the same authors as the book under review. The present volume is largely a revision, on a rather broad basis, of the earlier work. Aside from changes in type-style, format, method of literature citation, indexing, etc., which are incidental and of no great importance to the quality of the work itself, the new book possesses some marked deviations from the older volume. The most significant of these appears to have resulted from a continuing interest and study of the flora by the authors during the period between publication of the two books. In the present work, one family, thirty-two genera, and one hundred ninety species are added to those included in the older publication.

A very adequate glossary is a new feature of the present volume. There are some excellent new photographs which are added to a number from the earlier work to form a single section of the book. Although this arrangement is less desirable than having the photographs in their logical position as determined by the related printed matter, the photographs were undoubtedly placed together as a measure of economy in book-manufacture. Appropriately enough, since the Malvaceae have been the special study of Dr. Kearney for many years, a colored photograph of *Sphaeralcea ambigua* against the background of an Arizona landscape is reproduced as the frontispiece. Arizona Flora is obviously the product of sound research and scholarship. It will be found by those interested in knowing about the plants of the southwest to be superior to its predecessor for that purpose.—R. C. ROLLINS.

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W. L. White

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THE NORTH AMERICAN REPRESENTATIVES OF SMELOWSKIA (CRUCIFERAE)

W. H. Drury, Jr.[1] and Reed C. Rollins

In a revision of the genus *Smelowskia* for North America by one of us (Rollins, 1938), typical *S. calycina* was considered to be present in both Asia and North America. Though originally described from the Altai Mountains of Siberia, this species was shown to be widely distributed in the Rocky Mountain and Cascade Ranges of western North America. In that paper, the suggestion was made that the Siberian and North American populations are the remains of a once continuous distribution and that var. *integrifolia*, occupying certain Bering Sea coastal sites in Alaska and Siberia, is a trace population situated along or near the migration route from one continent to the other. Thus *S. calycina* was thought to be the key species tying together the Asiatic and American elements of the genus. Assuming an Asiatic origin, the existence of *S. ovalis* in Washington, Oregon, and northern California seemed to point to a relatively minor differentiation of the genus once it was established on the American continent. That this is an oversimplified statement of the situation has become increasingly clear as new materials have accumulated.

A year ago (Rollins, 1950) *Smelowskia Holmgrenii*, an apparently restricted species in Nevada, was added to the genus. But of even greater significance, contributing toward a more thorough understanding of *Smelowskia*, has been the rapid assembly of new collections from Alaska and western Yukon Territory. Perhaps of greatest importance, from our particular

[1] The Society of Fellows of Harvard University.

point of view, was the discovery of a new species, *S. pyriformis*, found in limestone slide-rock on Farewell Mountain on the northwest edge of the Alaskan Range. Some features of this species immediately raised the question as to the relationships of *Smelowskia* and a group of plants variously placed in the genera *Melanidion*, *Acroschizocarpus* and *Ermania*.

The Problem of Genera

In a recent treatment of the Alaska and Yukon representatives of this alliance, Hultén (1945) recognized *Smelowskia calycina* subsp. *integrifolia* and *Ermania borealis*. In the latter species, he placed plants described originally by Greene (1912) as *Melanidion boreale* and by Gombocz (1940) as *Acroschizocarpus Kolianus*. As a result of our studies, we agree that these two, *Melanidion* and *Acroschizocarpus* are congeneric and conspecific, but we believe that there are four varieties represented in the material available to us. Furthermore, we find that the natural relationships of these plants are found in *Smelowskia* rather than in the genus *Ermania* as Hultén concluded.

In setting up the genus *Melanidion*, Greene pointed to such characteristics as (1) the greatly elongated inflorescence, (2) the whitened villous pubescence, (3) the persistent purplish calyx, (4) the obsolete septum, and (5) the formation of a thick narrow wing-like projection around the replum formed by turned valve margins, as being distinctive. Comparing these points in turn with *Smelowskia*, we find the following: (1) The exaggerated length of the inflorescence is not significant because the racemose inflorescence tends to vary greatly in length, this variability being well shown in *Smelowskia calycina*. The subsecund position of the pedicels results from the stems lying on the ground. The pedicels on the lower side of the axis naturally turn toward the upper side, thus producing a feature noted as distinctive by Greene, but one that is not found on stems growing upright. Subsecund inflorescences are also found in prostrate plants of *S. calycina*. (2) *Smelowskia* characteristically has a whitened villous pubescence. (3) A persistent calyx is present in typical *S. calycina* and this is a characteristic feature of *S. ovalis*. Therefore, it could scarcely be made the basis of a new genus. As to the purple color, this is commonly found in both the sepals and petals of many populations of *S. calycina.* (4) The septum is very thin in *Smelowskia* and is commonly perforate in *S. ovalis.* Siliques with a perforate septum can be found in *S. calycina* though it is an uncommon feature of that species. Actually, with more material for study than was available to Greene, it is clear that the septum is not consistently obsolete in the species he called *Melanidion boreale*, as pointed out by Porsild (1945). In young siliques, the septum is complete, but as maturation of the silique proceeds it may be sufficiently stretched to produce a perforation, or at maturity the septum may be almost completely torn apart. However, siliques can be found on the same plant with an entire septum, a perforate septum, or one that is torn and nearly obsolete. (5) An interesting feature of the siliques of *Melanidion boreale* is the thick wing-like ridge formed by the compressed edges of the valves where they come together over the replum. The valves actually extend beyond the replum margin in a perpendicular fashion. But this is not a unique characteristic of *M. boreale.* A less-developed ridge is present in *Smelowskia ovalis* and *S. calycina.* In *S. pyriformis* there is a very marked ridge present, being even more prominent than in *M. boreale.* Finally, there is considerable variation within the species *M. boreale* (*Smelowskia borealis*) on this character. In var. *villosa*, the ridge is no better developed than in *S. calycina* and in var. *Kohana*, the development is like that in *S. ovalis.*

In connection with an evaluation of *Acroschizocarpus*, Hultén (1945) has provided an excellent analysis. He points out the regular agreement in major characteristics of the genus of Gombocz (1940) and *Melanidion.* Furthermore, his suggestion that the supposedly distinctive dehiscence of the siliques, i. e. from the top of the valve downward, is at least partly the result of pressure being placed upon the specimens while they were being dried, seems valid. In a relatively short unflattened fruit of the type present on these plants, any pressure is more direct on the shortest axes, which in this case is toward the sides and apex. However, even if pressure is not the major factor in bringing about an opening of the silique at the apex first, this feature is not sufficiently marked to be significant. In most *Cruciferae* with short siliques, there is but little if any difference in timing of valve abscission between the lower and upper portions of the silique. We note a tendency for the valves to open toward the top first in *Smelowskia pyriformis* as well as the material formerly placed in *Melanidion* and *Acroschizocarpus*, but this does not appear to be a significant departure from the usual situation in other short-fruited *Cruciferae*.

The type species of *Ermania*, *E. Parryoides*, might with some propriety also be included in *Smelowskia*. However, that species has siliques definitely flattened parallel to the septum and the fruit is of an elongated type not unlike that of *Parrya* or *Arabis* where it has been placed at one time or another. If one follows the interpretation of Schulz (1936), *Ermania* consists of a group of species of central and southern Asia with affinities in a direction away from *E. Parryoides* and quite unlike any species of *Smelowskia*. Hultén's action in placing *Melanidion boreale* in *Ermania* was not completely unjustified if *Smelowskia* and particularly the new *S. pyriformis* which he has not had the opportunity to study, were not taken into account. From *S. calycina*, which we might think of as a central point of reference in *Smelowskia*, there is a stepwise progression of relationship to *S. ovalis*, *S. pyriformis*, and *S. (Melanidion) borealis*. Basically, all of these species have the same type of growth-form, leaves, pubescence, inflorescence, flowers, fruits, and seeds. There is not a single characteristic so far discovered that would justify separating any one of them into a genus different from the rest.

The Cytological Evidence[2]

Viable seeds of the Alaskan *Smelowskia borealis*, var. *villosa* (Olaus Murie, Aug. 16, 1950) were received through the kindness of Mr. A. E. Porsild of the National Museum of Canada. Successful cytological preparations were made from this Alaskan plant and four collections of *S. calycina*, var. *americana* from Wyoming, Colorado, and Utah (*Rollins & Porter 51274; Rollins & Weber 5161* and *5162; Rollins 51219*). The chromosome number was the same in all five collections (2n = 12, Fig. 1). Observations were made on root-tip preparations from germinated seeds, except in nos. 5161 and 5162, where suitable figures were found in cells of ovary tissue.

[2] We are very much indebted to Dr. L. O. Gaiser for the information upon which these cytological notes are based and for the drawings of Figure 1.

The karyotypes of *S. borealis*, var. *villosa* and *S. calycina*, var. *americana* were similar in many ways, the individual chromosomes being of the same general size and shape and showing the

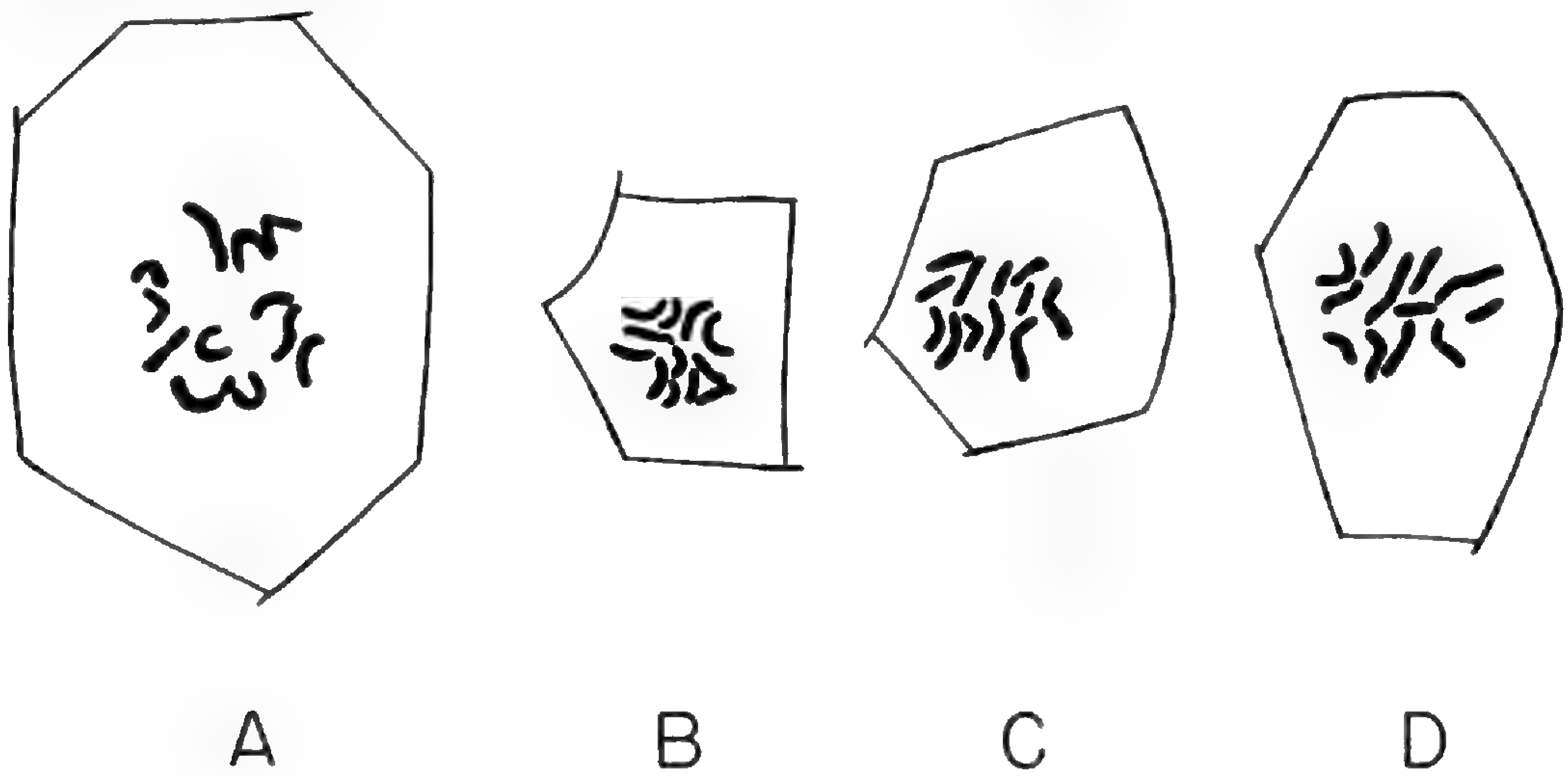


Fig. 1. Chromosomes of Smelowskia. × 2000

A. *S. borealis*, var. *villosa*. Large periblem cell from root-tip. Seeds from top of Sable Mountain, Mt. McKinley National Park, Alaska, collected by *Olaus Murie* s. n., Aug. 16, 1950. (Specimen in the Herbarium of the National Museum of Canada.)

B., C., and D. *S. calycina*, var. *americana*. B. Cell of ovary tissue. Material collected at 12,500 ft. on Hoosier Ridge, Summit Co., Colorado, *Reed C. Rollins* and *William A. Weber 5161* (Spec. in Herb. Gray and Univ. of Colorado). C. Periblem cell of root-tip. Seeds collected at 10,000 ft. on Clay Butte, Northwestern Park Co., Wyoming, *Reed C. Rollins* and *C. L. Porter 51274* (Spec. in Herb. Gray and Univ. of Wyoming). D. Periblem cell of root-tip. Seeds collected at 11,000 ft. in the Tushar Mts., 12 miles west of Marysvale, Piute Co., Utah, *Reed C. Rollins 51219* (Specimen in Herb. Gray).

same general range of types. Among the chromosomes of *S. borealis*, there were two pairs of distinctly greater length than the rest. The chromosomes of one of these pairs were subterminally constricted, those of the other pair showing median constrictions. A medium pair was also subterminally constricted. The well-spread karyotype figured consisted of an additional rod-shaped pair and two successively shorter V-shaped pairs which were medium to somewhat shorter. All showed median constrictions.

In the karyotypes of *S. calycina*, var. *americana* there were two longer pairs. One pair showed submedian constriction, the other median constriction. A pair of medium length had subterminal constriction and three medium to shorter pairs of chromosomes were constricted at or near the median point. The karyotypes of the four different collections of this variety were uniform.

It is evident from a critical comparison of the karyotypes of the two species that they are basically similar. The differences found are of the sort that might more reasonably be expected in two species of the same genus rather than two distinct genera. Thus the cytological evidence so far obtained supports our conclusions that "*borealis*" is congeneric with *Smelowskia calycina* and is therefore properly placed in the genus *Smelowskia*.

While observing *Smelowskia calycina*, var. *americana* on Hoosier Ridge, Summit County, Colorado, it was noted that some clumps of this plant possessed relatively much larger flowers than others of the same colony. The possibility of polyploidy being present to account for the larger flower-size was immediately recognized and fixations and specimens of the large- and small-flowered forms were made. Number 5161 represents the large-flowered form, no. 5162 the small-flowered form. However, polyploidy was not found, the chromosome number in both collections being 2n = 12 as indicated above. That there is actually a rather marked difference in the size of the flowers of the two is borne out by measurements of the specimens collected. An explanation of these easily observed differences obviously does not lie in a simple diploid-polyploid relationship of the two forms and must be sought elsewhere.

The S. calycina Complex

Smelowskia calycina is at once the most variable and widely distributed species of the genus. Recent treatments of Asiatic material referable to this species (Busch, 1939; Schulz, 1924) show variants thought worthy of nomenclatural designation, such as vars. *glabrata* and *pectinata*, in addition to var. *calycina* with which the type is associated. The American populations of this species deviate in certain respects from the Altai plants and are set apart as four varieties. The most widespread of these is var. *americana*, occurring from Colorado and Utah to southern Alberta and British Columbia and in the Cascade Mountains of western Washington. Though formerly treated as typical *S. caly-*

cina (Rollins, 1938), this variety differs in having a more slender and longer silique which tapers in a balanced way from the middle in both directions. The American plants consistently shed the calyx while it is persistent in Siberian material. Variety *americana* is closest to var. *media*, a somewhat variable population of northern Yukon and northeastern Alaska.

On the barren hilltops of northwestern Alaska, var. *integrifolia* survives as a clearly marked taxon with entire or shallowly few-toothed cauline leaves and short-petioled oval to ovate basal leaves that are entire or shallowly lobed at their apices. The siliques are borne on widely divergent pedicels and are considerably shorter and more asymmetrical than those of var. *americana*. In the mountain areas of the interior of Alaska, there appears another variety with usually entire cauline leaves, long-petioled (as long or longer than the blades), and narrowly oblanceolate entire to very rarely shallowly lobed basal leaves. The latter we have named var. *Porsildii*. In a key position phylogenetically is var. *media* which connects the American varieties with those of Asia. This population appears to be variable both as to the extent and nature of lobing of its basal and cauline leaves and as to the shape of its siliques. From the limited specimens we possess, the total range of variation cannot be satisfactorily determined, but it seems clear that an accentuation of various trends could have produced the other taxa of the *calycina* complex in North America. *S. calycina* on the North American continent, then, is composed of four infraspecific taxa that are geographically separated but intergrade in certain morphological characters.

The S. borealis Complex

The *Smelowski borealis* group is remarkable for the extremes of variation found in the siliques. Members of the population in the east, var. *borealis*, in the Mackenzie Mountains, have firm, ovate, short pods with conspicuous secondary nerves. Plants from the Brooks Range and the western Richardson Mountains, var. *Jordalii*, have spatulate, membranaceous pods. The populations of the Alaska Range are of two types: the siliques are elongate-oblong and firm in var. *villosa*, and elongate-oval and membranaceous-inflated in var. *Koliana*. However, the flowers and vegetative parts of these plants are remarkably uniform and largely form the basis for including them within a single species. If only the extremes of variation are considered, it would be very hard indeed to admit that the latter two populations belong to the same species. It is almost as if in this plastic extreme of a plastic group, the *Cruciferae*, we are able to see a group of new species in the process of formation. Such extremes of variation are not unexpected in a plant series in which populations have become isolated under conditions where intense selection-pressure is operative. We do not agree with Gombocz who created a new genus to accommodate the plants here called var. *Koliana*. Hultén (1940 and 1945) convincingly showed the unity of *Melanidion* and *Acroschizocarpus*, and that intermediates between the taxa separately described under these two genera occur. But our greater material indicates that there is a taxon present in the population of the Alaska Range, originally described as *A. Kolianus*, which we are maintaining as a variety.

The Geographical Distribution

The geographical distribution of the known species of *Smelowskia* strongly supports the suggestion made of a formerly continuous population from Siberia across Alaska, down the mountain chain into the United States. Fragments of this once continuous population are what concerns us in this paper (Fig. 2).

Smelowskia calycina, var. *americana* is the most widespread, and the commonest in herbaria. It centers along the Rocky Mountain continental divide from Banff National Park in southern Alberta and British Columbia south to the San Juan Mountains of southern Colorado, but apparently not into New Mexico. The range extends in the south from the Front Range in Colorado to the Wasatch Mountains in Utah, with but a few scattered populations on the isolated mountain ranges in the Great Basin of Utah and Nevada. From Colorado, the main population follows the sinuous course of the Rocky Mountains west through the Uinta Mountains and north to Yellowstone Park. There the population extends from the Lewis and Absaroka Ranges in Montana and Wyoming west to the Salmon River and Wallowa Mountains of Idaho and Oregon. The variety is again found in the Cascade and Olympic Mountains of Washington.

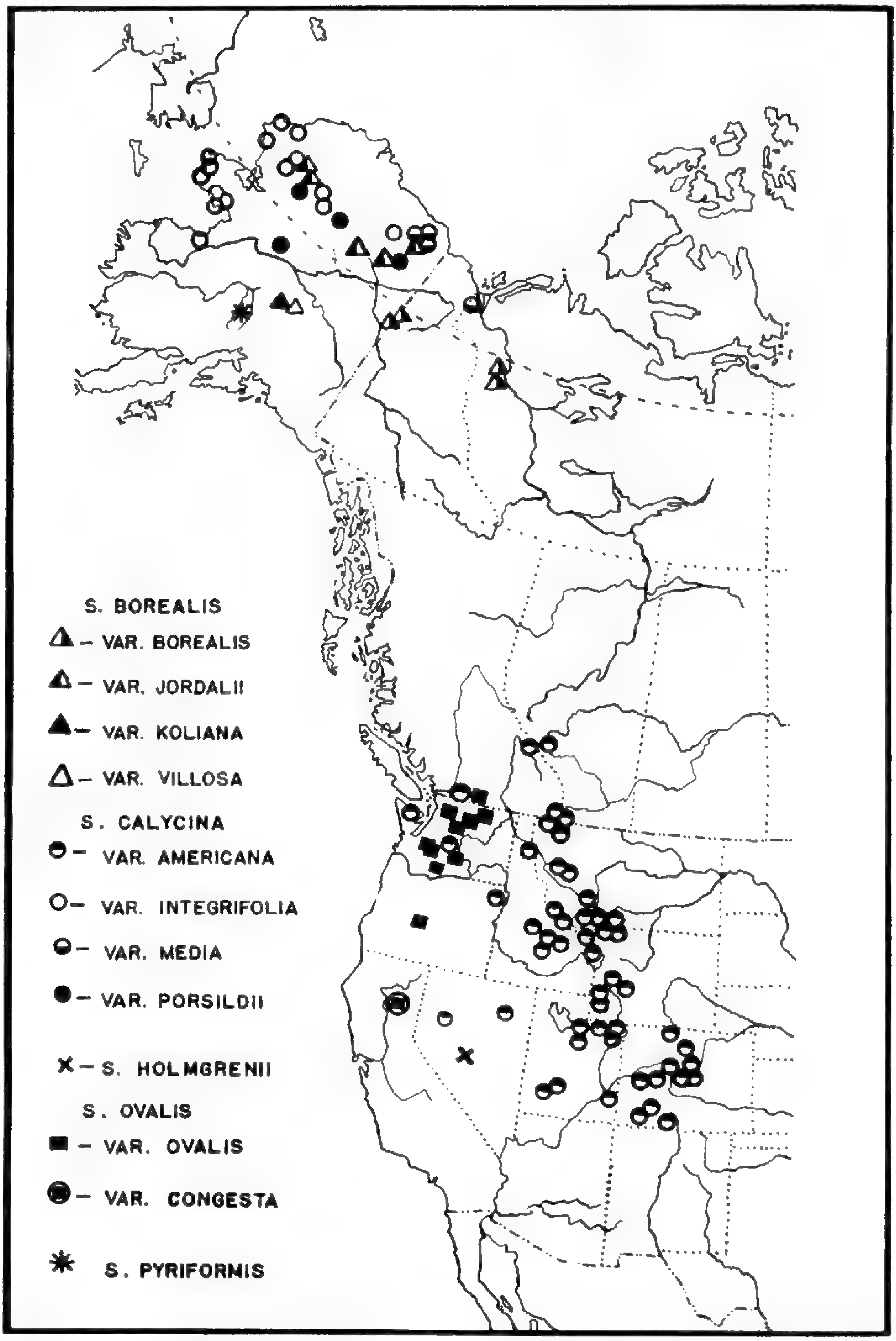


Fig. 2. The Geographic Ranges of Smelowskia in North America.

As Rollins (1938) pointed out, there are variations on the margins of this range. Plants of the Olympic Mountains population differ in features of indument and length of inflorescence, while those in southern Utah have noticeably short and fat pods. In the northern extreme of the Rocky Mountain chain, *S. calycina*, var. *media* occupies the Richardson Mountains along the continental divide between the Brooks Range and the Mackenzie Mountains. *S. calycina*, var. *integrifolia* is found in a half-moon shaped area on the north slope of the Brooks Range, the northwest arctic coast, around to Seward Peninsula and the Norton Sound area. *S. calycina*, var. *Porsildii* occurs on the south slope of the Brooks Range and the western part of the Yukon Plateau in the drainage that runs into the Yukon from the north. These elements can be suggested to have survived pretty much *in situ* in the general region that Hultén (1937) has called the "North Beringian Refugium." The populations must have survived as isolated units in a general area of persistence of plant species. Furthermore, it may well be that the extensive variation within var. *integrifolia* in the Norton Sound area reflects the mingling of the northern population with a small one from a second general area of survival, "southern Beringia."

Smelowskia borealis in the collections available to us, shows four populations: (1) in the Brooks Range, (2) in the Ogilvie-Selwyn part of the Mackenzie Mountains, and (3) and (4) in the northwest part of the Alaska Range. *Smelowskia pyriformis*, also in the northwestern Alaska Range, is a member of this variable complex, but definitely of specific rank.

Smelowskia ovalis is distributed in the Cascade Mountains of Oregon and Washington, while *Smelowskia Holmgrenii* occurs very locally in southwestern Nevada.

The great majority of these plants grow at high altitudes, on gravel ridges, open slopes and slide-rock. The relative rarity of the genus in collections (except for *S. calycina*, var. *americana*) combined with the frequent comment on abundance where found, seems to indicate what Fernald (1925) has called "species senescence." There are a number of small, isolated populations occupying specialized environments. The populations seem not to have migrated far from their areas of survival.

The evident adaptation of the species is to the highest altitudes and bleak, exposed summits: *S. ovalis* is reported at the highest levels at which vascular plants grow on Mount Rainier; *S. calycina,* var. *integrifolia* at the highest altitudes from the Brooks Range, and var. *americana* from the highest peaks of the Rocky Mountains; *S. borealis,* var. *villosa* from the top of Sable Mountain, Mount McKinley National Park. Thus it would appear that survival occurred in relatively small populations scattered over the mountainous regions of America where rocky remnants were not covered by Pleistocene ice. This type of population survival produces numerous, scattered, small, rather homogeneous groups. These would not lend themselves to organization into an historical geographical pattern, because they probably have not expanded from their areas of survival. It is possible that the mere existence of a population of the genus indicates an area of persistence. Such survival areas must have been especially common in the huge, partly glaciated areas of the mountains of interior Alaska. The specific and infra-specific segregations in the genus strongly support this conception of its historical and geographical development.

The present geographical distribution indicates that the genus formerly extended, probably without disruption, from the Altai to the cordillera of the United States. However, present knowledge of the species would indicate that it is probably not the case that the center of origin was in central Siberia where there are two species, but rather in the mountains of North America where there are five. If such an area is suggested, it is possible to visualize the spread of the genus in both directions, into Siberia to the west and along the Rocky Mountain chain to the south. It would seem dangerous to suggest Alaska as such a center, because the nature of survival of the genus in that area (in small isolated populations) would lead to exaggeration of any variations already in existence in the ancestral stock. Such a type of variation is an artifact of the history of the plant, not evidence of a center of dispersal.

If central Siberia be suggested as a center of dispersal, it would be necessary to explain why there was little spread to the west while the genus extended northeast to the American continent and down half its length.

The most reasonable center of dispersal would appear to be somewhere in the northern cordillera region of North America, although the evidence is not conclusive for either an American or an Asiatic origin for the genus.

In the citation of specimens, the following abbreviations have been used for the herbaria from which material was obtained: Natural History Museum, Stockholm (S); Chicago Museum of Natural History (C); Gray Herbarium (G); National Museum of Canada (Can); R. S. Sigafoos personal collection (specimens not yet distributed) (Sig); United States National Herbarium (US); University of Minnesota (M); University of Wyoming (W). We would like to express our appreciation to the curators of these herbaria who have kindly loaned us specimens for examination.

Key to the Species

Leaves stiff, entire and glabrous except for small, marginal, tooth-like trichomes; stems greenish and glabrous.......1. *S. Holmgrenii.*
Leaves soft and pliable, usually lobed, densely pubescent with matted trichomes; stems canescent.
  Caudex mostly branched, slender; stems usually simple, each arising from a separate caudex branch; pedicels divaricate to ascending.
    Mature siliques oblong, tapering at both ends; sepals caducous (in the American varieties); basal leaf-bases strongly ciliate with long acicular trichomes...2. *S. calycina.*
    Mature siliques ovate to slightly oblong; truncate at the base; sepals persistent; basal leaf-bases not ciliate.3. *S. ovalis.*
  Caudex mostly simple, stout (more than 5 mm. in diameter); stems branched from near the base upwards, becoming decumbent in fruit; pedicels widely divergent to arcuate.
    Basal leaves pinnately cut to the midrib the full length of the blade, ca. 9-lobed; petals white or cream-colored; sepals tan, ca. 1 mm. long; siliques elongate pear-shaped, 5–6 mm. long, ca. 2 mm. wide, tan..4. *S. pyriformis.*
    Basal leaves palmately 3–5-lobed, lobes short; petals purple; sepals purple, ca. 2.5 mm. long; siliques broadly ovate to oblong, or linear, 5–19 mm. long, 3–6 mm. wide.................................5. *S. borealis.*

1. **Smelowskia Holmgrenii** Rollins

S. Holmgrenii Rollins, Contrib. Gray Herb. 171, p. 50 (1950).

Caespitose perennial of alpine rocky places, with a deep tap root branching at the crown; caudex thick, 5–10 mm. in diameter, 1–3 cm. long, branched, densely covered with old leaf-bases, each sobole terminating in a dense crown of leaves; stems several, slender, glabrous, terete, erect, somewhat gyrate, branched above, 1–2 dm. high; basal leaves petiolate, stiff, erect, lanceolate to linear-oblanceolate, acute, 2–5 cm. long, 3–5 mm. wide, blade tapering very gradually into the petiole, glabrous except the margins which are sparsely ciliolate; petioles 5–25 mm. long, ca. 1 mm. wide, glabrous except the margins which are sparsely ciliolate; leaf-bases glabrous, sparsely ciliolate on the margin; cauline leaves 3–5, linear, glabrous, 1–2 cm. long, 1.5–3 mm. wide. Inflorescence racemose, 5–15 cm. long in fruit; pedicels glabrous, straight, ascending, filiform, slightly expanded above, 3–8 mm. long; sepals caducous, linear-oblong, non-saccate, scarious-margined, purplish, glabrous, ca. 2 mm. long and 1 mm. wide; petals white, spatulate, 3.5–4.5 mm. long, ca. 1.5 mm. wide, claw about one-half the blade length; stamens nearly equal; filaments terete, ca. 2 mm. long; anthers oval, less than 0.5 mm. long; siliques erect linear-oblong, tapering at base and apex, slightly flattened parallel to septum, 5–12 mm. long, 1–1.5 mm. wide; firm, not inflated; valves nerveless or very slightly nerved at the base, purplish, depressed between the seeds; style less than 0.5 mm. long; stigma entire, unexpanded; seeds brown, wingless, not flattened, ca. 2 mm. long, ca. 1 mm. broad, slightly pointed at each end, in a single row in the siliques; radicle slightly exceeding the cotyledons at the funicular end; cotyledons incumbent. (Illustrated Plate 1185: C 1–4). United States. **Nevada:** Locally frequent, crevices of rocks in rocky prominence above middle fork of Pine Creek, Toquima Range, 10,000 ft., Nye Co., August 4, 1947, *Arthur H. Holmgren* and *Cecil Ballenger 7076* (Type) (G); other specimens from the same general location: Summit above Pine Creek Basin, 11,300 ft., July 16, 1945, *Bassett Maguire* and *A. H. Holmgren 25814* (G); same location, 11,400 ft., July 17, 1945, *Maguire* and *Holmgren 25829* (G).

This species is fully discussed and illustrated (Fig. 1, p. 49) in Rollins, 1950 (Contrib. Gray Herb. 171, pps. 48–51, 1950).

2. **Smelowskia calycina** (Stephan) C. A. Meyer

Perennial plant of arctic-alpine gravels and slide-rock; caespitose, the caudex branched, up to 10 cm. long or longer, clothed with persistent leaf-bases; root stout and long with few coarse branches; stems few to numerous, simple, 1.5 to 20 cm. long, sparsely to densely pubescent with short branched and long simple or few-branched trichomes; basal leaves along 1–3 cm. of caudex, few to numerous, petiolate, blades shorter to longer than petioles, linear to obovate, entire to pinnately divided, 3–25 mm. long and 1–16 mm. wide, segments short and rounded to oblong or cuneate 1–9 mm. long, sparsely to densely whitish puberulent with short chiefly branched trichomes and sparsely hirsute with simple trichomes; petioles 1–70 mm. long, usually puberulent and hirsute with short branched, and long simple trichomes; leaf-bases straw-colored, glabrous on the back, strongly ciliate on the margin with long white acicular trichomes; cauline leaves 1–9, linear and simple to ovate and deeply pinnately divided, 3–30 mm. long, similar to the basal but with shorter petioles, lobes if present more linear, tending to be reduced upward on the stem. Inflorescence single, in fruit 1.5–10 cm. long; pedicels ascending to widely divaricate, in fruit 3–10 mm. long, pubescent with long usually simple trichomes; sepals oval or oblong, 2–3.5 mm. long, 1–1.5 mm. wide, pubescent on the back with long simple trichomes, tan or pink with a colorless or pink hyaline margin, persistent or caducous; petals white or cream to lavender, rounded at the apex, differentiated into claw and blade, 3–8 mm. long (blade 2.5–4 mm. long), 2–4 mm. wide; filaments flattened, 1.5–3 mm. long; anthers cordate-ovate, 0.5–0.8 mm. long; siliques linear to narrowly oblong, broadest at or above the middle, tapering at both ends, 4–13 mm. long, 1–2.5 mm. wide, glabrous or rarely pubescent with simple hairs, slightly flattened parallel to the septum or terete, sometimes slightly curved in the same plane as the replum when young; tip of the replum acute beneath the style; valves nerved from base to apex by a strong single nerve half way between the valve margins, smooth or with inconspicuous, anastomosing, impressed secondary nerves; style 0.5 or less to 1.5 mm. long, stigma usually expanded in fruit; seeds few (1–10), 2–2.5 mm. long, wingless; cotyledons incumbent.

Key to the American Varieties of S. calycina and Variety calycina

Sepals persistent; plants of central Siberia................2a. var. *calycina*.
Sepals caducous; plants of North America.
  Basal leaves entire or shallowly lobed at the tips; cauline leaves entire or shallowly 3-lobed.
    Basal leaf-blades obovate to oval; petioles shorter than the leaf-blades; pedicels widely divaricate, angle of divergence between 60° and 90°...............2b. var. *integrifolia*.
    Basal leaf-blades linear to narrowly spatulate; petioles longer than the leaf-blades; pedicels divaricately ascending, angle of divergence less than 60°......2c. var. *Porsildii*.
  Basal leaves pinnately lobed or with some leaves nearly entire in var. *media;* cauline leaves pinnately lobed.
    Pedicels widely divaricate, angle of divergence 50° to 80°; siliques broadest above the middle; cauline leaves few-lobed, 2–3 per stem..............................2d. var. *media*.
    Pedicels ascending, angle of divergence less than 50°; siliques broadest at the middle, tapering equally above and below; cauline leaves many-lobed, 3–7 per stem ....2e. var. *americana*.

2a. **Smelowskia calycina,** var. **calycina**

S. calycina C. A. Meyer in Ledeb. Fl. Alt. III: 170 (1831).
Lepidium calycinum Stephan in Willd. Spec. Pl. III[1]: 433 (1801).
Hutchinsia calycina Desv. Journ. Bot. III. 4: 168 (1814); DC. Syst II: 388 (1821) & Prodr. I. 178 (1824); Ledeb. Fl. Ross. I: 200 (1842).

Stem ca. 8–11 cm. long, sparsely pubescent with short branched and long simple or few-branched trichomes; basal leaves oblong to oval, ca. 5–12 mm. long, ca. 2–5 mm. wide, pinnately 7–9 divided, segments oblong to cuneate, ca. 1–3 mm. long, pubescent with chiefly short branched trichomes; petioles ca. 1–2.5 cm. long, pubescent; cauline leaves ca. 5, deeply pinnately divided, the lobes fewer and shorter upward on the stem, ca. 7 on the lower, nearly sessile upward, petioles ca. 9 mm. at the base. Inflorescence in fruit ca. 1.5–3 cm. long; pedicels in fruit divaricately ascending, angle of divergence 45° to 65°; sepals persistent, oblong, 2–3 mm. long; petals white to cream-colored, ca. 4–5 mm. long; siliques broadly oblong, ca. 6–9 mm. long, 2 mm. wide, slightly flattened parallel to the septum; style 0.5–1.2 mm. long; stigma expanded in fruit; seeds few (ca. 6). (Illustrated Plate 1185: F 1–4.)

The species is distributed in central Siberia from Taschkent, eastern Turkestan to the Altai Mountains. SIBERIA: Locality uncertain: Herbar. Bung. Flor. orient. altaica. 1839 (G); nov. sp. e Siberia (probably isotype) (S).

This variety is characterized by widely divaricate pedicels, persistent calyx, and rather fat and flattened siliques. The cauline leaves are 5–7-lobed and the basal leaves 7–9-lobed.

2b. **Smelowskia calycina,** var. **americana** (Regel & Herder.) comb. nov.

Hutchinsia calycina β *americana* Regel & Herder, Bull. Soc. Nat. Mosc. XXXIX²: 101 (1866).

S. calycina, prol. *americana* O. E. Schulz in Engler, Pflanzenr. IV¹⁰⁵: 356 (1924).

S. americana Rydb. Bull. Torr. Bot. Club XXIX: 239 (1902). Not based on var. *americana* of Regel and Herder.

S. lineariloba Rydb. Bull. Torr. Bot. Club XXXI: 555 (1904).

S. lineariloba, f. *virescens* O. E. Schulz in Engler, Pflanzenr. IV¹⁰⁵: 357 (1924).

S. lobata Rydb. Bull. Torr. Bot. Club XXXIX: 327 (1912).

Stem 4–20 cm. long, pubescent with short branched, and long simple or few-branched trichomes; basal leaf-blades oblong to oval 0.5–(1–2)–5 cm. long, 4–(6)–16 mm. wide, pinnately divided, segments oblong to cuneate, 2–(4)–12 mm. long, sparsely to densely pubescent to canescent with chiefly short branched trichomes; petioles 3–(15)–70 mm. long, pubescent; cauline leaves 3–9, grade into the basal, deeply pinnately divided (–13 lobes) near the base of the stem, sessile to 17 mm. petiolate, 5–29 mm. long, with fewer lobes upward on the stem. Inflorescence in fruit 2–(3–6)–10 cm. long; pedicels in fruit ascending or divaricately ascending, angle of divergence less than 50°; sepals caducous, oblong, 2–3.2 mm. long; petals white to cream-colored or rarely pink to lavender, 3–(5–6)–8 mm. long; siliques narrowly oblong to linear, 5–9 mm. long, slightly flattened parallel to the septum or terete; style 0.2–1 mm. long; stigma expanded in fruit; seeds few (6–10). (Illustrated Plate 1185: A 1–4.)

Southern Colorado, Utah, and Nevada north in the Rocky Mountains to Alberta and British Columbia and in the Cascades and the Olympic Mountains of Washington. For citation of specimens, see RHODORA Vol. 40, pp. 297–299, August 1938.

This taxon is characterized by its ascending pedicels, caducous calyx, and relatively slender, terete to somewhat flattened siliques. The cauline leaves are 5–13-lobed and the basal leaves usually 7–11-lobed although they vary from 5–13 lobes. These plants are characteristically rather densely caespitose. The variation in the population has been discussed by Rollins (1938). It suffices to repeat that plants from the Olympic Peninsula of Washington tend to have a longer inflorescence, more cauline leaves (6–10 rather than 3–6) with broad, blunt segments arranged sub-palmately, and basal and cauline leaves conspicuously canescent. Scattered colonies from as far north as Waterton Lakes in Canada, in Washington and in Wyoming, but especially in southern Utah closely approximate the typical variety in their short and fat siliques.

Flower size and color have been shown to vary over broad limits within one population. On Hoosier Ridge, Colorado, there is a population the flowers of which may be white, cream, or lavender. Petal length in this population varies from 4 mm. to 8 mm. and width from 2 mm. to 5.5 mm. On Uncompahgre Peak, Colorado, a population has been seen with deep lavender or purple flowers.

2c. **Smelowskia calycina,** var. **media** var. nov.

Stems up to 13 cm. long, sparsely pubescent with short branched, and long simple or few-branched trichomes; basal leaf-blades broadly oblong to ovate, 0.8–1.5 cm. long, subentire with 1–3 short teeth to deeply pinnately divided, the segments 2–4 mm. long and oblong to elongate oval, densely whitish puberulent with short branched and sparsely hirsute with simple trichomes; petioles 5–12 mm. long, pubescent and hirsute; cauline leaves 2–5, grade into the basal, may be simple at the base of the inflorescence and deeply pinnately divided (7-lobed) near the base, short petioled, ovate-spatulate to linear, 3–9 mm. long. Inflorescence single, in fruit 2–5.5 cm. long, pedicels in fruit widely divaricate, their angle of divergence 50° to 80°; sepals caducous, ca. 2 mm. long; petals ca. 5 mm. long; siliques narrowly oblong, 5–8 mm. long, not flattened; style 0.5 mm. long or less; stigma expanded in fruit; seeds few (1–5). (Illustrated Plate 1185: E 1–3.)

Herba perennis, foliis basalibus oblongis vel ovatis, subintegris vel alte pinnate 7-lobatis; foliis caulinis alte pinnate 7-lobatis vel sursum integris; sepalis caducis; pedicellis late divaricatis, angulo 50°–80°.

The Richardson Mountains of northeastern Alaska and northern Yukon Territory. **Alaska:** Shaviovik River, E. Fork, alone in crevices, 3500 ft. ridge top, common, lat. 69° 21′ N., long. 146° 43′ W., May 30, 1947, *L. A.*

Spetzman 208 (M); Shaviovik River, E. Fork, on outcrops and rocky talus, common, lat. 69° 28′ N., long. 146° 35′ W., June 13, 1947, *L. A. Spetzman 266* (M); Arctic north slope, Ignek Valley, sandstone slope, common, lat. 69° 35′ N., long. 145° 10′ W., elev. 3000 ft., Aug. 3, 1948, *L. A. Spetzman 1318* (S, M); Arctic north slope, Lake Schrader, sunny sandstone mountain slope, common, lat. 69° 25′ N., long. 145° 00′ W., elev. 4000 ft., July 10, 1948, *L. A. Spetzman 653* (Type at Minnesota) (S, M). CANADA: **Northwest Territories:** Eastern slope of Richardson Mts., west of Mackenzie River delta, from 1,000 to 4,000 feet above sea level, approx. lat. 68° N., and long. 136° W., barren alpine ridges, June 16, 1931, *O. Bryant 6596* (Can); Eastern slope of Richardson Mts., west of Mackenzie River delta, from 1,000 to 4,000 feet above sea level, approx. lat. 68° N., and long. 136° W., barren gravel ridges, 3000′, July 7–10, 1933, *A. E. Porsild 6680* (Can); Eastern slope of Richardson Mts., west of Mackenzie River delta, from 1,000 to 4,000 feet above sea level, approx. lat. 68° N. and long. 136° W., barren alpine ridges, August 15–17, 1933, *A. E. Porsild 6821* (Can).

This variety is characterized by divergent pedicels, caducous calyx, rather short and fat siliques, and but few, few-lobed stem leaves. The cauline leaves are 3–7-lobed and the basal are entire or 3–7-lobed. The plant is usually rather densely caespitose. The population is closely related to the plants of the central and southern Rocky Mountains from which it differs in its divergent pedicels and fewer stem leaves. Variety *media* is also related to the plants from the Altai area of Siberia from which it is most conveniently distinguished by its caducous calyx. Specimens that are intermediate between var. *media* and var. *integrifolia* are found on the western edge of the Richardson Mountains.

The characteristics of its variation and the resemblance of this population both to var. *calycina* of the Altai area and var. *americana* of the Rocky Mountains seem to indicate that it is close to the ancestral type of *S. calycina* in Alaska before differentiation into local populations took place. The limited number of collections, however, prevent us from establishing the real limits of variation.

Porsild (1943 and 1951) refers this population to *Smelowskia calycina* (var. *americana* of the present treatment) rather than its var. *integrifolia,* which were the two taxa he dealt with. He is certainly right in his decision of relationships. He comments (1943), "Although the plants flower profusely, the fruiting is very poor, and but a single silique, containing one good seed, could be found." However, we were able to get good fruiting material from L. A. Spetzman's collections from northeast Alaska.

2d. **Smelowskia calycina**, var. **integrifolia** (Seeman) Rollins

Hutchinsia calycina, var. *integrifolia* Seeman, Bot. Voy. Herald: 25 (1852).
H. calycina, var. β Hook. Fl. Bor.-Am. I: 59 (1830).
H. calycina, var. γ Ledeb. Fl. Ross. I: 201 (1842).
S. calycina, prol. *americana* f. *integrifolia* O. E. Schulz in Engler, Pflanzenr. IV[105]: 356 (1924).
S. calycina, subsp. *integrifolia* Hultén, Lunds Univ. Årssk. **41:** 869 (1945).

Stem 2.5–15 cm. long, pubescent with short branched and long simple or few-branched trichomes; basal leaf-blades narrowly to broadly oblong, cuneate at the base and entire or less often broadly oblong to spatulate, rounded to cuneate at the base with 1–5 blunt, shallow teeth toward the apex, densely whitish puberulent with short branched trichomes, and sparsely hirsute (more so in exposed locations) with long simple or few-branched trichomes, 3–(5–8)–12 mm. long and 1–(3–5)–8 mm. wide; petioles 1–(5)–9 mm. long, pubescent and hirsute; cauline leaves 1–(3)–7, 4–6 mm. long, on petioles 0.5–7 mm. long, entire or usually 1–(3)–5-toothed toward the base of the stem. Inflorescence single, in fruit 2–8 cm. long; pedicels in fruit widely divaricate, the angle of divergence 60° to 90°; sepals caducous, oval or oblong, 2–3.5 mm. long; petals 3.5–(4)–6 mm. long; siliques narrowly oblong, 4–(6)–13 mm. long, not flattened; style 0.5 mm. long or less; stigma usually expanded in fruit; seeds few (1–5). (Illustrated Plate 1185: 1–4.)

Northwestern Alaska; the north and west slopes of the Brooks Range, the northwest Arctic coast, and south across Seward Peninsula to the east shore of Norton Sound. **Alaska:** Norton Sound: low volcanic hills at Qiqertariaq, 63° 35′ N., 161° W., elevation about 1,000 feet, barren gravelly ridges, July 27, 1926, *A. E.* and *R. T. Porsild 1056* (S, G, Can, US); Seward Peninsula: south coast near Bluff, 64° 33′ N., 163° 45′ W., elevation sea-level to 1,500 feet, dry gravelly slope, August 5–6, 1926, *A. E.* and *R. T. Porsild 1240* (S, G, Can, US); same locality, collectors and date, *1240 A* (Can, G); dry slopes, Anvil Mt., 5 miles north of Nome City, August 16, fr., July 8, fl., 1900, *J. B. Flett 1631* (US); vicinity of Nome, Anvil Mt., June 29, 1918, *C. W. Thornton 307* (US); Nome, Anvil Hill, and Dexter Creek, about 64° 30′ N., 165° 20′ W., elevation sea-level to 1,500 feet, barren gravel ridges, August 6–10, 1926, *A. E.* and *R. T. Porsild 1358* (G, Can); Nome, Alaska, on Anvil Ridge, alt. 500 feet, slope 20%, moisture fair, soil rocky loam, associated plants: *Salix reticulata*, *Rhododendron* ——, *Anemone multiceps*, *Myosotis alpestris*, distribution wide, abundance scattered, June 23, 1929, *W. B. Miller 128–c* (US); Nome, July 1936, *G. N. Jones 9094* (S); Nome, on Seward Peninsula, Aug. 3–4, 1949, *E. Scamman 5373* (G); Nome, Anvil Hill, loose rocky slopes, Cooper Gulch, NE facing, July 19, 1949, *M. D.* and *R. S. Sigafoos 1696* (Sig); Nome, Anvil Hill, steep, calcareous, south-facing rocky slope, July 20, 1949, *M. D.* and *R. S. Sigafoos 1858* (Sig); Nome, Anvil Hill, thin soil, marble cliff, July 31, 1949, *M. D.* and *R. S. Sigafoos 2259* (Sig); Nome, Anvil Hill, calcareous rocky slope, Aug. 6, 1949, *M. D.* and *R. S. Sigafoos 2545* (Sig); Kigluaik Mts., Mt. Distin, steep creek, east-facing talus slope, Aug. 29, 1949, *M. D.* and *R. S. Sigafoos 3131* (Sig); Port Clarence, July 12, 1899, *F. V. Coville* and *T. H. Kearney, Jr., 1898a* (US); vicinity of Port Clarence, Teller Reindeer Station, on gravelly flats near beach, July 14, 1901, *F. A. Walpole 1444* (US); Teller, Aug. 1901, *E. O. Campbell* (US); Teller Reindeer Station, vicinity of Port Clarence, on gravelly flats, Sept. 9, 1901, *F. A. Walpole 2041* (US); Teller, on Port Clarence, Bering Strait, Teller Mission, Aug. 6–20, 1949, *E. Scamman 5524* (G); York Mts., Lost River, 100 ft. terrace 2 mi. west of river, June 16, 1950, *M. D.* and *R. S. Sigafoos 3512* (Sig); York Mts., Lost River, 50 ft. terrace west of river, June 18, 1950, *M. D.* and *R. S. Sigafoos 3397* (Sig); Northwest Arctic coast: North shore Kotzebue Sound, at Kivalina or Kotzebue, 1930, *Mrs. D. A. Wagner 1* (US); Cape Lisburne, Aug. 7, 1938, *J. P. Anderson 4520* (S); along the Kukpowruk River, NW Alaska, between latitudes 68° 30′ and 60° (sic) 30′ N., June–July 1949, *R. M. Chapman 155* (US); Brooks Range: Lake Noluk, dry conglomerate rubble mountain top, ½ mi. S. of the lake, common, lat. 68° 47′ N., long. 160° 00′ W., elev. 2700 ft., June 9, 1950, *L. A. Spetzman 3513* (M); Nuka River, south facing slope, common, lat. 68° 45′ N., long. 159° 45′ W., elev. 2000 ft., June 13, 1950, *L. A. Spetzman 3622* (M); Lake Noluk, conglomerate ridge ½ mi. S. of the Lake, abundant, lat. 68° 47′ N., long. 160° 00′ W., June 28, 1950, *L. A. Spetzman 3676* (M); dry rocky ridges, 1 mi. southwest of Lake Noluk, lat. 68° 47′ N., long. 160° 00′ W., north slope of the Brooks Range, Arctic Alaska, elev. 2300 ft., July 30, 1950, *H. J. Thompson 1312* (G); Sagavanirktok River, W. Fork, 130 mi. from Arctic Ocean, high sandstone hogback, scarce, lat. 68° 45′ N., long. 148° 45′ W., elev. 4000 ft., June 8, 1946, *L. A. Spetzman 32* (M); N. of Brooks Range, Oolamnagavik River, west of Killik River, 68° 35′–154° 30′, June 18, 1946, *R. M. Chapman 64* (US). Doubtful specimens (incomplete): Nimiuktuk River, sandstone rubble slopes, abundant, lat. 68° 20′ N., long. 159° 55′ W., elev. 1500 ft., June 10, 1950, *L. A. Spetzman 3558* (M); Killik R., N. facing Mt. summit ridge, quartzite shale, s. s. (sandstone) rubble, sparse growth in crevices, lat. 68° 15′ N., long. 154° 00′ W., elev. 6100 ft., Aug. 15, 1949, *A. Lachenbruch 35* (M) (may be var. *Porsildii*).

This variety is characterized by widely divergent pedicels, caducous calyx, husky and often purple-tinted siliques and few, entire to 3-lobed cauline leaves. The basal leaves are entire or have 1–5 blunt, short teeth toward the tip. The whole plant is characteristically canescent and densely caespitose. The plant is strikingly different from the other varieties except at the margins of its range.

There is considerable variation in the material included in this taxon. However, this variation is not continuous and may be separated into four types. The original description is based on material that came from the northeast shore of Kotzebue Sound, at Cape Mulgrave. Old atlases have the name Mulgrave Hills on what are called now the De Long Mountains, and Hultén (1945) suggests that Cape Kruzenstern is the same locality as Cape Mulgrave. Material from this area that has been available to us is all entire-leaved. The basal leaves are narrowly oblong, cuneate at the base, and the stem leaves are entire as well. The leaves are densely short-pubescent, but do not have a dusty appearance (like "dusty miller"). This type is most in evidence on the northwest coast of Alaska and on the north slope of the Brooks Range.

A second type is found in the Teller region on Seward Peninsula. This is a conspicuously "dusty-pubescent" population with oblong to broadly oblong or oval leaves that may be rounded at the base. They are healthy, high-grown plants. The basal leaves are entire, but the cauline leaves occasionally have minor lateral lobes near the base of the stem. These two populations are the only ones in the genus found at low altitudes, because in their areas, an alpine flora with high altitude-like environments occurs at sea-level.

A third population is found in the westernmost end of the Brooks Range (the Lake Noluk region and the head of the Coville and Noatak Rivers). It is similar to the material from the volcanic hills on the eastern end of Norton Sound (Qiqertariaq), in which the basal leaves are narrowly oblong, not "dusty", long-leaved and long-petioled, and quite constantly with minor rather acute teeth or minor lobes toward the tips of the leaves. The cauline leaves are long-linear, often with 2 linear, lateral lobes near the base of the blade.

The fourth population is very homogeneous and occupies the central part of the Seward Peninsula: the Kigluaik Mountains, Anvil Hill near Nome, and the hills at Bluff, all about 100 miles apart. The heavy tomentum of this population gives them a "dusty" look; the leaves are oblong or broadly oblong to spatulate, usually 7–11 mm. long and 4–8 mm. wide; many are decidedly rounded at the base and definitely 3–5-blunt-lobed at the tip. The stem leaves are usually 3-lobed with the lateral lobes nearly the size of the terminal.

It seems entirely reasonable to suggest that the plants from the Lake Noluk and Qiqertariaq regions are intermediate between the Seward Peninsula population of var. *integrifolia,* and var. *Porsildii* from the interior. The evidence for this is their sharing with the interior race the longer-bladed and longer-petioled leaves with more sparse pubescence while retaining the divaricate pedicel branches and broad leaf-blades of the northwestern material. The same type of overlap seems to be repeated in the Anuktuvuk Pass—Oolamnagavik River area.

That the variation involved in these populations is deep seated is supported by examinations of large-flowered plants collected by Coville and Kearney at Port Clarence where two populations meet. In this material the flowers have petals 6 mm. long instead of the usual 4 mm., and the pollen is large and conspicuously irregular ($9.6 \times 10.3\mu$, some pollen grains are 9μ and others 11.2μ in diameter). A more typical average is a diameter of 8.5μ (plants from Colorado and Alaska).

The area that this variety occupies has within it many isolated small or large mountain ranges. The discrete, homogeneous populations within the variety support and emphasize our suggestion that this taxon survived in scattered colonies throughout a general area of persistence. The nature of the adaptation of the species should prepare it for survival under the bleakest conditions of periods of glacial advance and widespread frost activity. However, the species is clearly adapted to dry alpine habitats, not wet tundra. This is pointed up by the appearance of the plant on the well drained gravels of the low altitude Teller Reindeer Station and the gravelly ridges of Anvil Hill while the huge areas of wet tundra habitat in between are empty of the plant. Its populating of slide-rock areas indicates that it is not limited by soil instability.

2e. **Smelowskia calycina,** var. **Porsildii** var. nov.

Stem 1.5–15 cm. long, sparsely puberulent with short branched and long simple or few-branched trichomes; basal leaf-blades shorter than the petioles, linear to narrowly spatulate, 6–(11)–25 mm. long, 1–4 mm. wide, simple or with one or two small teeth at the tip, densely puberulent with whitish, chiefly branched trichomes; petioles 4–(15)–25 mm. long, sparsely puberulent and hirsute; cauline leaves 2–3, linear, entire or with 2 tooth-like lobes, grading into the basal, 5–10 mm. long, on petioles 1–10 mm. long. Inflorescence in fruit 1.5–(3)–7 cm. long; pedicels in fruit divaricately ascending, their angles of divergence less than 60°; sepals caducous, oval or oblong, blunt, 2–3 mm. long; petals 3–3.5 mm. long; siliques narrowly oblong, 7–10 mm. long, not flattened; style 0.5 mm. long or less; stigma expanded in fruit; seeds few (1–5). (Illustrated Fig. 3: A 1–4.)

Herba perennis, foliis basalibus linearibus vel anguste spatulatis, 6–(11)–25 mm. longis, 1–4 mm. latis, integris vel 2-dentatis apice; petiolis longioribus quam laminis, 4–(15)–25 mm. longis; foliis caulinis linearibus, integris vel 2-dentatis; sepalis caducis; pedicellis divaricate ascendentibus, angulo minus quam 60°.

The northwestern part of the Central Alaska Uplands and Plains Province (Lobeck 1948) and the south and east slopes of the Brooks Range. The area drains into the Yukon River from the north. **Alaska:** Oolamnagavik R., (west of Killik R. approx. lat. 68° 30′ N., long. 154° 30′ W.) June, 1950, *R. Chapman* (no number) (M); Anaktuvuk Pass, dry E.-facing sunny alluvial fan, stony soil with limestone pebbles, common especially near active talus sliding, lat. 68° 17′ N., long. 151° 25′ W., elev. 3000 ft., July 11, 1949, *L. A. Spetzman 1894* (M); Brooks Range, dense tufts in phyllite rubble, alt. ca. 3500 ft., Signal Mt. NW of Old John Lake, July 25, 1950, *L. H. Jordal 3710* (Can); Kokrines (approx. lat. 65° N., long. 154° 45′ W.) 1925, *L. J. Palmer 1566* (US); Kokrines, 1925, *L. J. Palmer 1588* (US); Kokrines Mountains, north side of divide towards Melozitna River, 65° 20′ N., 154° 30′ W., elev. 800–4000 ft., dry, gravelly slopes, 2500′, June 23–July 5, 1926, *A. E.* and *R. T. Porsild 741* (Type at Gray Herbarium) (Can, G).

This taxon is characterized by ascending pedicels, caducous calyx, rather fat siliques, and few, entire or 3-lobed stem leaves. The basal leaves are linear with the petioles longer than the blades, entire or with 1–2 sharp teeth at the tip. Plants are densely caespitose with many-branched caudices, each crown with a few leaves, and noticeably green in contrast to the canescent varieties.

The variety has been named for A. Erling Porsild, who has made a number of creditable botanical contributions to our knowledge of the Northwest. His herbarium annotations indicate that he seriously considered describing this variety himself. Porsild (1939) commented on these plants: "Our No. 741 differs from the remainder of the material cited above by having all leaves entire, narrowly ligulate, 20 to 40 mm. long and 3–4 mm. wide, finely clothed with a thin but very dense stellate pubescence."

The population occupies an odd area which seems to be marginal to a region which has produced a very rich endemic flora. Hultén has called it variously, part of Northern Beringia, or an area containing elements of Continental West American Radiants. It is the hilly interior area through which the Yukon and Tanana flow. This "Uplands and Plains Province" was only locally glaciated by mountain glaciers and constituted a large region of persistence. *Smelowskia* seems to have occupied the refugium in the habitats suited to it.

3. **Smelowskia ovalis** M. E. Jones

Smelowskia ovalis M. E. Jones, Proc. Calif. Acad. Sci. V²: 624 (1895).

Loosely caespitose perennial of rocky alpine slopes; caudex rather slender, 1–6 mm. thick, 1–20 cm. long, branched, densely covered with old leaf-bases, each branch terminating in a crown of leaves; stems single to several, slender, simple or usually branched, erect, 5–15 cm. long, sparsely to densely pubescent with short branched and long simple trichomes; basal leaves few to numerous, petiolate, blades oblong to broadly obovate, 3–20 mm. long, 3–15 mm. wide, pinnately divided, the segments obovate and dissected to the midrib, 1–8 mm. long, densely clothed with whitish chiefly branched pubescence; petioles 0.8–(25)–60 mm. long, ca. 1 mm. wide, pubescent with short branched and long simple trichomes; leaf-bases densely pubescent to glabrous in age on the back, not ciliate on the margin; cauline leaves few (1–5), similar but short-petiolate and lobes more slender, tend to be reduced upwards on the stem and may be entire in the base of the inflorescence, densely pubescent. Inflorescence corymbose, elongating but dense in fruit, 1.5–5 cm. long in fruit; pedicels ascending, in fruit 3–8 mm. long, densely pubescent with long simple trichomes; sepals persistent, oblong, 2.5–3.5 mm. long and 1–1.5 mm. wide, pubescent on the back with long simple trichomes, greenish, brown or purple, with a colorless or pink hyaline margin; petals white, cream, or lavender, rounded at the apex, differentiated into claw and blade, 3.5–5 mm. long, ca. 2 mm. broad; stamens nearly equal; filaments terete but often flattened just below the anther making a narrowly club-shaped structure, 2–2.5 mm. long, anthers cordate-ovate, ca. 0.5 mm. long; siliques ovoid to ovate, 3–6 mm. long, 1.5–3 mm. broad, firm, glabrous, slightly expanded at right angles to the replum which is narrowly oblong, obtuse below the style; valves nerved from base to apex by a strong single nerve half way between the valve margins, smooth or with anastomosing raised secondary nerves at the base; style 0.2–0.9 mm. long; stigma expanded in fruit; seeds few (2–6), oblong but pointed on the distal end, marginless; cotyledons incumbent. (Illustrated Plate 1185: B 1–4.)

Typical *S. ovalis* occurs on the high peaks of the Cascade Range in Washington and Oregon. Variety *congesta* has been found only on Lassen Peak in California. The latter has not been collected since the last eruption of the volcano and the explosive disappearance of the upper portion of the peak. Otherwise there is nothing additional to the information previously noted (Rollins, 1938).

4. **Smelowskia pyriformis** sp. nov.

Perennial plant of slide-rock; caudex single, up to 16 cm. long, clothed with old leaf-bases; root simple and long; stem highly branched, single, up to 14 cm. long, pubescent with short branched and long simple trichomes; basal leaves spread along 3 cm. between caudex and stem, broadly oblong to ovate, 2.5–4 cm. long, deeply pinnately divided, segments as much as 6 mm. long, oblong to elongate oval, densely clothed with whitish chiefly branched trichomes; petioles 1–2.5 cm. long; leaf bases and petioles densely pubescent and hirsute with long, white, simple trichomes; cauline leaves grade into the basal, short petioled, narrowly ovate-spatulate to nearly linear, 1–3 cm. long, the lobes shorter and tending to be reduced upwards on the stem. Inflorescences numerous, 4–9 cm. long, terminating each of many spreading and ascending branches which arise from the axils of leaves along the entire length of the stem; pedicels divaricate to ascending, 3–7 mm. long, pubescent with short branched and long simple trichomes; sepals oval, caducous, 1.5–2 mm. long, 0.8–1.2 mm. wide, sparsely hirsute with long trichomes; petals white or cream-colored, rounded at the apex, differentiated into claw and blade, 2.8–3.2 mm. long, ca. 1 mm. wide; siliques pyriform, rounded above and tapering to the base, 5–8 mm. long, 1.5–2.1 mm. wide, glabrous, often slightly curved in the same plane as the septum when young, not flattened; valves nerved from base to apex by a strong single nerve half way between valve-margins, with a reticulate pattern of barely raised anastomosing secondary nerves, the margins extend beyond the edge of the replum forming a ridge; style 0.5 mm. long or less; stigma inconspicuous in fruit; filament ca. 1.5 mm. long; anthers ca. 0.5 mm. long, cordate-ovate; seeds few (1–5), 2–3 mm. long, wingless; no mature seed examined. (Illustrated Fig. 3: B 1–5.)

Herba perennis lapidis-lapsus, caudice simplice, ad 16 cm. longo, cum basibus foliorum veterum convestita, radice longa, simplice; caule bene ramoso, 14 cm. alto, dense pubescente, pilis ramosis brevibusque et longis simplicibusque; foliis basalibus late oblongis vel ovatis, 2.5–4 cm. longis, 0.75–1.5 cm. latis, alte pinnatifidis, segmentis ad 6 mm. longis, oblongis vel anguste ovalibus, dense incanis, pilis plerumque ramosis; petiolis 1–2.5 cm. longis; basibus foliorum petiolisque dense pubescentibus et capillis longis albis hirsutis; foliis caulinis breve petiolatis, anguste ovato-spatulatis vel paene linearibus, 1–3 cm. longis, ad summam caulis lobis brevioribus reductisque. Inflorescentiis plurimis, 4–9 cm. longis, in apicibus ascendentium-pandentium ramorum, in axillis secundum caulem totum ad summam caulis, pubescentibus, pilis ramosis brevibus paucisque longis simplicibus; pedicellis ascendentibus vel pandentibus, 3–7 mm.

longis, pubescentibus, pilis ramosis brevibus et simplicibus longis; sepalibus ovalibus, sparse longe hirsutis, 1.5–2 mm. longis, 0.8–1.2 mm. latis; petalis albis, apice rotundis, ungue laminaque distinctis, 2.8–3.2 mm. longis, ca. 1 mm. latis; siliculis obovatis vel pyriformibus, apice obtusis, basim attenuatis, 5–8 mm. longis, 1.5–2.1 mm. latis, glabratis, teretibus sed nervatis

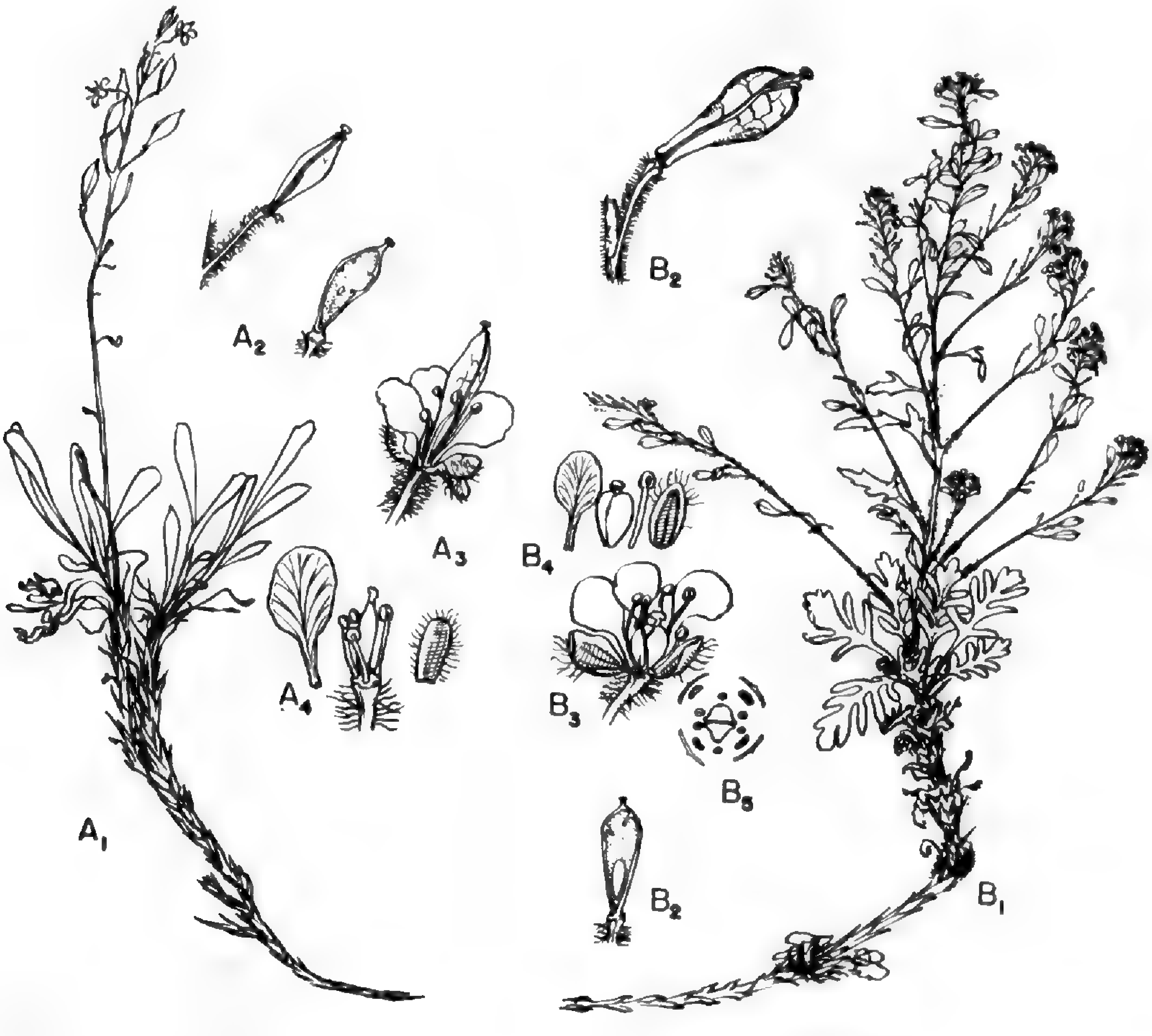


FIG. 3. SMELOWSKIA CALYCINA, VAR. PORSILDII AND SMELOWSKIA PYRIFORMIS.

A. *Smelowskia calycina*, var. *Porsildii:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 2½); 4) Petal, stamens and young fruit, sepal (× 3). B. *Smelowskia pyriformis:* 1) Habit (× ½); 2) Silique and replum (× 2); 3) Flower detail (× 3); 4) Petal, young fruit, stamen, sepal (× 3); 5) Floral diagram.

inter margines valvarum, valvis reticulatis nervis secundariis anastomosantibus haud elevatis; stylis 0.25–0.5 mm. longis; stigmatibus in fructu haud expansis; filamentis ca. 1.5 mm. longis; antheris ca. 0.5 mm. longis, cordato-ovatis; seminibus paucis (1–5), 2–3 mm. longis, exalatis, seminibus maturis non visis.

Alaska: Kuskokwim River Drainage Basin, Farewell Mountain, growing in active, open, limestone slide-rock; north slope near the top, August 8, 1949, *W. H. Drury, Jr., 2783* (Type) (G).

One plant of this clearly marked, new species was collected on the top of a limestone mountain that has been over-ridden by glaciers sometime in the past, as is indicated by the presence of an erratic boulder at the summit. It was very probably not covered during the most recent ice advances.

Smelowskia pyriformis occupies an intermediate position between *Smelowskia* and what has been called variously *Melanidion*, *Ermania*, and *Acroschizocarpus*. That this is the case is amply demonstrated by the following points: (1) The plant grows on active slide-rock, the habitat of the "*Melanidion*" type. *Smelowskia* is usually on gravelly ridges and slopes, but not slide-rock. (2) The flowers are small (petals 3 mm. long) and cream-colored, like *Smelowskia*. Flowers in "*Melanidion*" are purple and larger (3–6 mm. long). Purple flowers do occur in *S. calycina*, var. *americana* and petals 6 mm. long have been found in *S. calycina*, var. *integrifolia*. (3) The stems are branched like "*Melanidion*" or *S. ovalis*. (4) The siliques are marked with raised reticulate veins like "*Melanidion*" (*S. borealis*, var. *borealis*) and *S. ovalis*. (5) The valves extend over the margin of the replum to form a ridge like that in *S. ovalis* and *S. borealis*, var. *Koliana* and less so than in *S. borealis*, var. *borealis* ("*Melanidion*"). (6) The siliques are clearly blunt at the tip and inflated in a plane at right angles to the septum. In this it resembles "*Melanidion*." In *Smelowskia*, the replum is acute at the apex and the siliques barely inflated to slightly so as in *S. ovalis*. The valves are thinner and less firm in all the varieties of *S. borealis* ("*Melanidion*") than in the rest of *Smelowskia* and in this *S. pyriformis* resembles the *S. ovalis-calycina-Holmgrenii* group. (7) The basal leaf-blades are pectinately divided like those of *S. calycina* and *S. ovalis*, not resembling those of "*Melanidion*." (8) The caudex is unbranched, like "*Melanidion*"; those of the rest of *Smelowskia* are branched.

The basal leaves, the flowers, and the pods make it impossible to put this plant into a different genus from *Smelowskia ovalis*. Careful examination, however, showed that the plant actually has more characters of the "*Melanidion*" (*S. borealis*) group to which this species is also inescapably related. On this evidence, there can be no separation of the two genera.

Mature seeds were not found; so that the important character of the position of the cotyledons cannot be established.

5. **Smelowskia borealis** (Greene) comb. nov.

Perennial plant, typically of slide-rock; caudex stout (5 mm. or more in diameter) and simple, or with slender (2 mm. in diameter) stolon-like off-shoots, clothed with old leaf-bases, about 5 cm. long; root stout and long with few branches; stem short, 2–3 cm. long, heavily branched to the base; branches up to 20 cm. long; stem and branches pubescent with short branched, and long simple or few-branched trichomes; basal leaves cover about 1–4 cm. of the caudex and its crown, their blades oblong to ovate to obspatulate, 5–20 mm. long, 5–12 mm. broad, from palmately 3–7-shallow-lobed with the lobes blunt, to sub-pinnately 5-lobed with the lobes slender and acute, pubescent to densely canescent pubescent with short branched trichomes and sparsely to heavily villous with long simple or rarely few-branched trichomes; petioles 5–20(–40) mm. long, pubescent and usually sparsely hirsute with short branched, and long simple or few-branched trichomes; leaf-bases pubescent or glabrous on the back, not conspicuously ciliated in the margin; cauline leaves simple in var. *borealis* to slenderly 5-lobed in var. *Jordalii*, grading into the basal, short petioled, linear to obspatulate, 3–15(–30) mm. long, tending to be entire upwards on the stem. Inflorescences simple, in flower erect, in fruit 8–15 cm. long, often lying along the ground; pedicels becoming recurved after anthesis, secund, 1–2 cm. long, pubescent with short branched, and long simple or few-branched trichomes; sepals oblong, 1.5–3 mm. long, ca. 1 mm. wide, blunt, purple with a purple-hyaline margin or rarely green, hirsute on the back with sparse, simple trichomes; petals differentiated into claw and blade, 3–6 mm. long, 1.5–3 mm. wide (blade oblong to orbicular tapering into the claw), rounded at the tip, lavender to deep purple; filaments 1.5–2(–3.5 in var. *villosa*) mm. long, winged toward the base or tip; anthers ca. 0.3 mm. long, cordate-ovate; siliques obovate to nearly linear, blunt to acute at the tip, 5–19 mm. long, 3–6 mm. wide, wider above than below the middle, glabrous, firm or membranaceous, inflated or uninflated, flattened or expanded in a plane at right angles to the septum; valves nerved from base to apex by a strong single nerve half way between the valve margins, with inconspicuous or conspicuous, anastomosing raised secondary nerves; valve margins extended beyond the replum to form a ridge; style 0.2–1.2 mm. long; stigma expanded or not expanded in fruit; seeds few (5–12), ca. 3 mm. long, wingless; cotyledons incumbent.

Key to the Varieties of Smelowskia borealis

Calyx persistent; styles more than 0.5 mm. long; rachis and pedicels either white-villous or with less prominent trichomes.
 Pubescence of leaves, stems and pedicels sparse to dense, not predominantly of white-villous trichomes; siliques ovate to obovate, the valves rigid or membranaceous; petals 3–4.5 mm. long.
  Siliques rigid, uninflated; replum narrowly obovate; leaves incanous . . . . 5a. var. *borealis*.
  Siliques membranaceous, inflated; replum broadly oblong to lanceolate; leaves densely pubescent, but scarcely incanous . . . . 5b. var. *Koliana*.

Pubescence of leaves, stems and pedicels predominantly of white-villous trichomes; siliques oblong, the valves rigid; petals 4–6 mm. long. . . . . .5c. var. *villosa.*

Calyx caducous; styles less than 0.5 mm. long; rachis and pedicels white-villous with an understory of minute branched trichomes. . . . . .5d. var. *Jordalii.*

5a. **Smelowskia borealis,** var. **borealis**

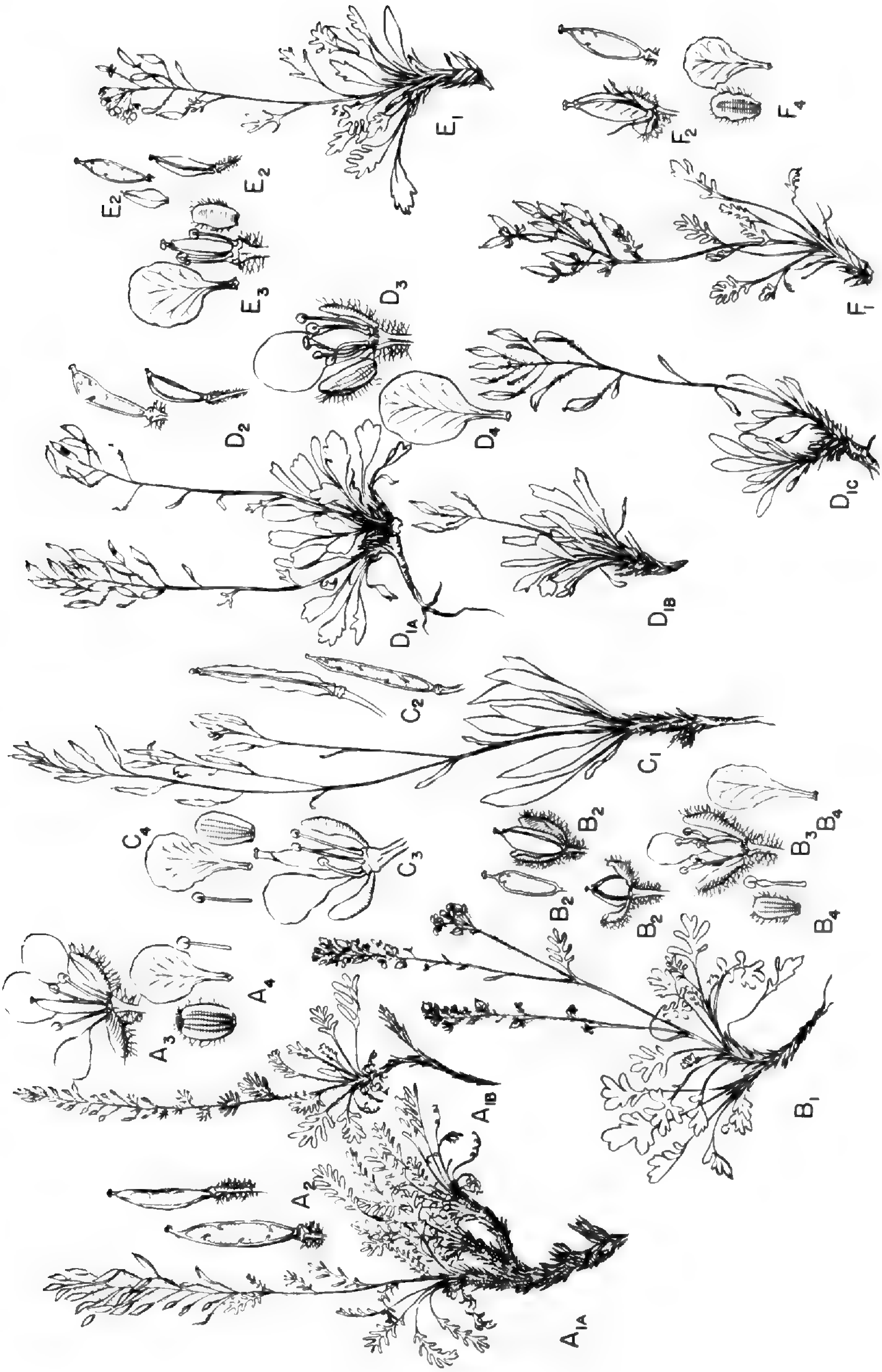
Melanidion boreale Greene in Ottawa Nat. **25:** 146 (1912).
Ermania borealis (Greene) Hultén in Fl. Alaska and Yukon, no. 5, 878 (1945).

Caudex stout and simple (5 mm. in diameter) or slender (2 mm. in diameter), with few branches and scattered leaf bases where growth has been rapid; stem and branches in fruit rather sparsely pubescent; aestival flowering stems are slender, leafy, and the few flowers are in axils of the entire cauline leaves; basal leaves oblong, ovate, to spatulate, entire or palmately 3-lobed; blades 5–15 mm. long, 2–10 mm. broad, (if tri-lobate the terminal lobe largest), narrowly oblong, blunt, 1–8 mm. long, the base tapering into a broad, 1–2 cm. long, 1–3 mm. wide petiole, densely canescent pubescent with short branched trichomes, and sparsely hirsute with long simple or rarely few-branched trichomes; cauline leaves simple, entire, oblong or linear, sessile or with petioles to 8 mm. long near the base of the stem; pedicels becoming recurved after anthesis, hirsute with long simple or few-branched trichomes; sepals persistent, oblong, 1.5–3 mm. long, with a pale hyaline margin, purple or green; petals 3–4 mm. long; siliques obovate, not inflated, 4–8 mm. long, 2.5–5 mm. wide, valves firm, with conspicuous, anastomosing, raised, secondary nerves; replum obovate to broadly oblong; style 0.7–1.0 mm. long. (Illustrated Plate 1186: C 1–4.)

The Mackenzie Mountains of the Northwest Territories, Yukon Territory, and the Alaska-Yukon boundary.—Canada: **Yukon Territory:** Runt Creek, 66° 18′ N., 141° W., elev. 2300′, July 7, 1911, *D. D. Cairnes*

Plate 1185. Smelowskia calycina, Smelowskia Holmgrenii and Smelowskia ovalis.

A. *Smelowskia calycina,* var. *americana:* 1a) Habit, Rocky Mountain population (× ½); 1b) Habit, Olympic Mountains population (× ⅓); 2) Silique and replum (× 1½); 3) Flower detail (× 2); 4) Sepal, petal, stamen (× 2). B. *Smelowskia ovalis:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 2½); 4) Sepal, stamen, petal (× 2½). C. *Smelowskia Holmgrenii:* 1) Habit (× ½); 2) Silique and replum (× 1½); 3) Flower detail (× 3); 4) Stamen, petal, sepal (× 3). D. *Smelowskia calycina,* var. *integrifolia:* 1a) Habit, Nome population (× ½); 1b) Habit, Norton Sound-Lake Noluk population (× ½); 1c) Habit, Arctic Coast—North Slope population (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 3); 4) Petal (× 4). E. *Smelowskia calycina,* var. *media:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Petal, stamens, and young fruit, sepal (× 2½). F. *Smelowskia calycina,* var. *calycina* (? isotype): 1) Habit (× ½); 2) Silique and replum (× 1); 4) Sepal and petal (× 2).



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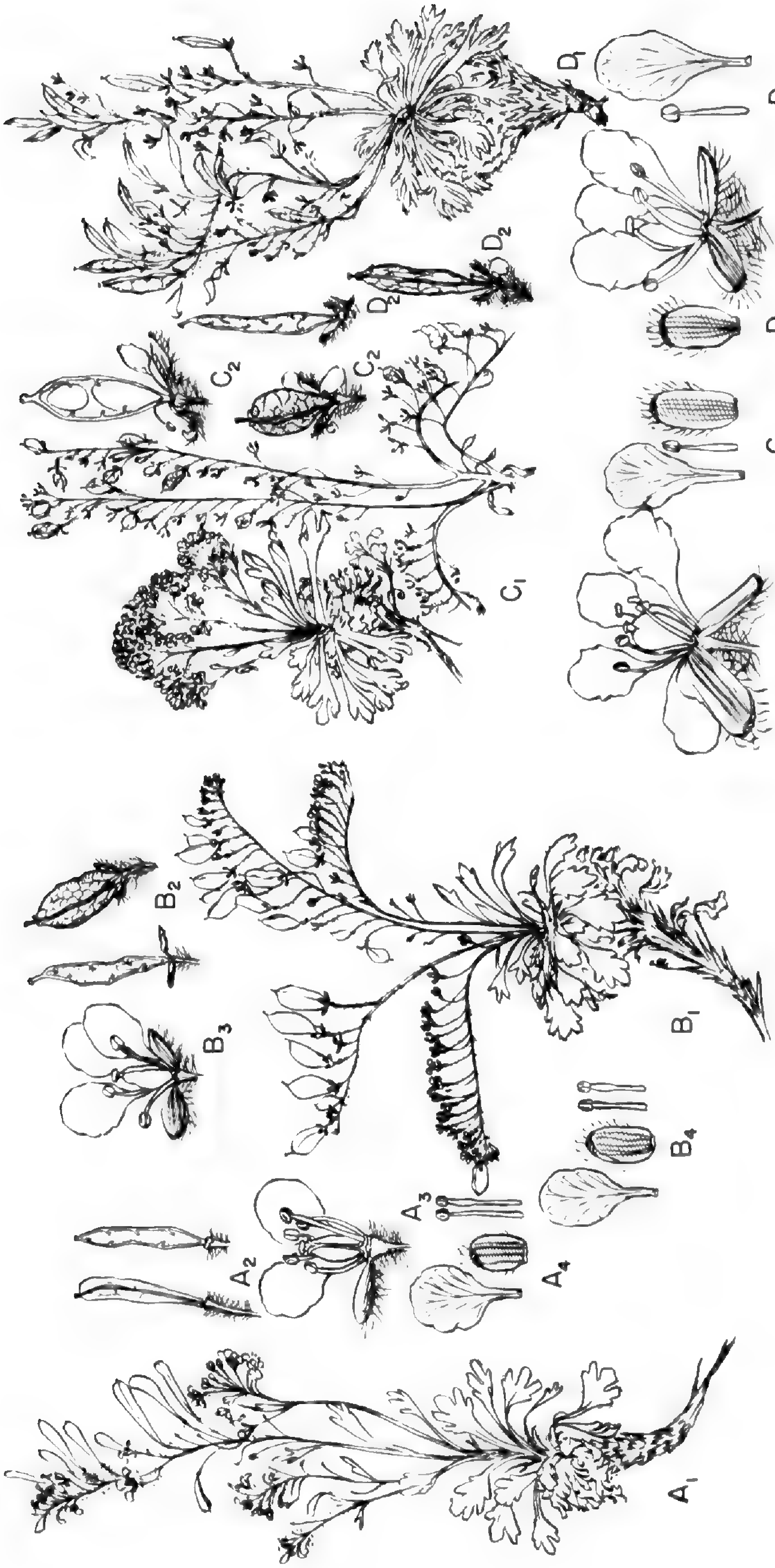
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81.249 (Type?) (Photograph in G ex Can); 67° N., 141° W., June 12, 1912, *D. D. Cairnes 83.047* (Photograph in G ex Can). **The Northwest Territories:** Mackenzie Range, Sekwi River, mile 174 E., Pump Station 5, elev. 3625′, in a limestone scree, Sept. 6, 1944, *A. E. Porsild* and *A. J. Breitung 11.865* (Can, G); Canol Road, Mountain Range west of head of Bolstead Creek, 6 miles northwest of Pump Station No. 4, mile 111 E., July 25, 1944, *V. C. Wynne-Edwards 8318* (Can); Canol Road, Mackenzie Range, Plains of Abraham, mile 82 E., elev. about 6,000′, bald, windswept summit of mt., on barren, windswept limestone rubble, September 9, 1944, *A. E. Porsild* and *A. J. Breitung 11809* (Can).

This population is characterized by its short, ovate or obovate siliques with conspicuous, anastomosing secondary veins; persistent calyx; cauline leaves usually simple; basal leaves spatulate, usually equally 3-blunt-lobed, canescent pubescent; stem, branches, and pedicels not conspicuously villous-hairy; style longer than 0.5 mm.; flowers small; sepals 3 mm. long and often with spaces between them.

Porsild (1945) discusses the history of this plant up to the time of publication. His collections considerably extended the range of it and in that report he gives a very complete description of his material. His description includes reference to forking into minor branches at the top of the caudex, and the structure of aestival flowering stems. The herbarium sheets of this material seem to indicate successive periods of burying in the active slide-rock, which would support the explanation that these are adventitious shoots resulting from unusual conditions. He mentions that the flowering stems are stiffly erect and elongate rapidly toward maturity, but does not comment on their fruiting condition in the field. Herbarium sheets indicate the branches become recurved and prostrate in fruit.

PLATE 1186. SMELOWSKIA BOREALIS.

A. *Smelowskia borealis*, var. *Jordalii:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 3); 4) Petal, sepal, stamens (× 3), note filament is sometimes enlarged toward the tip. B. *Smelowskia borealis*, var. *Koliana:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 2½); 4) Petal, sepal, stamens (× 3), note filament may be enlarged toward tip. C. *Smelowskia borealis*, var. *borealis:* 1) Habit (× ½); 2) Silique (× 1) and replum (× 2); 3) Flower detail (× 3½); 4) Petal, stamen, sepal (× 3½), note filament may be enlarged toward the base. D. *Smelowskia borealis*, var. *villosa:* 1) Habit (× ½); 2) Silique and replum (× 1); 3) Flower detail (× 2½); 4) Sepal, stamen, petal (× 3), note filament may be enlarged toward the base.

5b. **Smelowskia borealis,** var. **Koliana** (Gombocz) comb. nov.

Acroschizocarpus Kolianus Gombocz, Bot. Kolzlemenyek **37:** 1 (1940).

Caudex stout, simple, ca. 5 mm. in diameter; stem and branches in fruit sparsely pubescent; basal leaves obovate to broadly spatulate, palmately 3–5-lobed; blades 4–20 mm. long, 3–13 mm. wide; lobes narrowly oblong and acute –7 mm. long, or short and blunt 1–5 mm. long, the terminal one or three longest; leaf-blades tapering rapidly into broad petioles 5–21 mm. long, 1–3 mm. wide; leaves sparsely to densely pubescent with short branched, and long simple or few-branched trichomes; cauline leaves entire upwards, three long-lobed toward the base of the branches, 5–10 mm. long, on petioles 2–15 mm. long; pedicels becoming recurved after anthesis, sparsely hirsute with long simple trichomes; sepals persistent, 2–3 mm. long, dark with narrow scarcely hyaline margin; petals 3.5–4.5 mm. long; siliques oblong, blunt or usually acute, 6–14 mm. long, 4–6 mm. broad, definitely inflated; valves membranaceous, with often conspicuous anastomosing raised secondary nerves; replum narrowly oblong, acute; style 0.8–1.2 mm. (Illustrated Plate 1186: B 1–4.)

Known only from Mount McKinley National Park on the northwest corner of the Alaska Range.—**Alaska:** Alaska Range: Mount McKinley National Park; at the head of the Savage River, July 21, 1936, *Elizabeth Kol 64* [published photograph of type (*Acroschizocarpus Kolianus*)]; near the Muldrow Glacier, on top of McGonnigal Pass (collected by Harold Herning), August 3, 1939, *Aven* and *Ruth A. Nelson 4315* (W, US); Rocky slope near Camp Eilson, "66," August 11, 1939, *Aven* and *Ruth A. Nelson* (no number) (W); Rocky slope near Stony Pass (collected by Fred Warren), July 3, 1939, *Aven* and *Ruth A. Nelson W-2218* (W, US); Rocky slope near Stony Pass, pods inflated, flowers lavender (collected by Fred Warren), July 3, 1939, *Aven* and *Ruth A. Nelson 3642* (W, US). Identification doubtful: Alaska: Copper River Region: Ridge between forks of Eagle Creek, alt. 5000 ft., seen only on ridge in rock slides, growing quite flat, 1–2.5 inches in diam., August 22, 1902, *William L. Poto 157* (US).

This population is characterized by its rather long, membranaceous, inflated siliques that are acute at both ends and may have conspicuous secondary veins; persistent calyx, cauline leaves lobed, the lower with long acute lobes; basal leaves palmately 5-lobed with a clearly marked blade, and blunt tooth-like lobes; the stem, branches, and pedicels not conspicuously villous-hairy; style longer than 0.5 mm.; flowers small.

5c. **Smelowskia borealis,** var. **villosa** var. nov.

Caudex very stout, 5–10 mm. in diameter, simple; stem and branches in fruit rather shaggy hirsute; basal leaves oblong or obovate, pinnately or palmately 5(–7)-lobed; blades 8–19 mm. long, 4–12 mm. wide; lobes narrowly oblong, usually acute, 1–10 mm. long, the terminal three often

Tabular Summary of the *pyriformis*—*borealis* Group of *Smelowskia*

Character	*S. pyriformis*	*S. borealis*			
		var. *borealis*	var. *Koliana*	var. *villosa*	var. *Jordalii*
Silique length	5.8 mm.	4.5 mm.	6–14 mm.	7–15 mm.	8–19 mm.
Silique proportion length—width	2.5 ×	2 ×	2.5 ×	3 ×	3 ×
Silique texture	firm not inflated	firm not inflated	membranaceous inflated	firm not inflated	membranaceous not inflated
Valves	rounded on back	keeled	keeled	keeled	keeled
Secondary nerves	not conspicuous	conspicuous	conspicuous	not conspicuous	not conspicuous
Replum	obtuse-obovate	acute or obtuse, obovate or ovate	long, acute	long, acute	long, acute
Style	less than 0.5 mm.	0.7–1.0 mm.	0.8–1.2 mm.	0.5–1.0 mm.	0.2–0.5 mm.
Calyx	caducous	persistent	persistent	persistent	caducous
Petal length	2.8–3.2 mm.	3–4 mm.	3.5–4.5 mm.	4–6 mm.	4–4.5 mm.
Fruiting stem and pedicels	sparsely hirsute	sparsely hirsute	sparsely hirsute	shaggy hirsute	shaggy hirsute
Basal leaves	pinnately 7–9-lobed	palmately 3-lobed at tip	palmately 3–5-shallow-lobed	palmately 5-lobed	palmately 3–5-lobed
Basal leaves	densely canescent	densely canescent	thinly pubescent	pubescent	densely pubescent
Basal leaves	sparsely hirsute	sparsely hirsute	sparsely hirsute	hirsute	sparsely hirsute

equal; leaf-blade tapering into a broad petiole 8–15 mm. long, 1–2 mm. wide; leaves sparsely pubescent with short branched trichomes, and shaggy-villous (sometimes sparsely) with long simple or few-branched trichomes; cauline leaves entire upwards on the stem, 3-lobed near the base of the branches on petioles 4–10 mm. long; pedicels becoming recurved after anthesis, shaggy villous with long simple trichomes; sepals persistent, oblong, 2.5–3.7 mm. long, dark with a narrow scarcely hyaline margin; petals 4–6 mm. long; siliques narrowly oblong acute or blunt at the tip, 7–15 mm. long, 2.5–4 mm. wide; not inflated; valves firm with inconspicuous anastomosing raised secondary nerves; replum narrowly oblong, acute; style 0.5–1.0 mm. long. (Illustrated Plate 1186: D 1–4.)

Herba perennis, foliis basalibus oblongis vel obovatis, pinnate vel palmate 5–7-lobatis; pedicellis in fructu recurvatis, hirsute villosis; sepalis persistentibus; siliquis anguste oblongis, acutis vel obtusis, 7–15 mm. longis, 2.5–4 mm. latis, non-inflatis, firmis; stylo 0.5–1.0 mm. longo.

Known only from Sable Mountain, in Mount McKinley National Park on the northwest corner of the Alaska Range.—**Alaska:** Alaska Range: Mt. McKinley Park, top of Sable Mountain, August 16, 1950, *Olaus Murie* (no number) (Type) (Can); McKinley Park, high up on Sable Mt., June 24, 1941, *Adolph Murie 179* (W).

This population is characterized by its long, oblong siliques with firm valves and raised anastomosing secondary veins; persistent calyx; cauline leaves lobed; basal leaves rather deeply 5-lobed and villous hairy; stems, branches and pedicels villous hairy; style longer than 0.5 mm.; flowers large (petals about 6 mm. long); sepals contiguous.

The two specimens are one in full flower and one in fruit. Viewed by themselves, they are very distinctive, but on the basis of the intergradation in the other areas of the species we prefer to maintain this as an infra-specific unit. We feel that the four taxa: var. *borealis*, var. *Koliana*, var. *villosa*, and var. *Jordalii* are roughly equivalent. Because there is intergradation between some of them and as yet insufficient evidence that they are distinct species, all should be treated conservatively.

5d. **Smelowskia borealis,** var. **Jordalii** var. nov.

Caudex stout ca. 5 mm. in diameter and simple or 1–3-branched; stem and branches in fruit rather sparsely pubescent; basal leaves generally obovate, unusually spatulate, palmately (3–)5-lobed; blades 3–15(–20) mm. long, 3–10 mm. wide; lobes narrowly oblong, blunt, 1–6 mm. long, the terminal longest; leaf-blade-bases tapering usually rapidly into broad petioles 5–20(–40) mm. long, –2 mm. wide; leaves sparsely to densely pubescent with short branched and few long simple trichomes; cauline leaves 3–5-lobed, petioles 2–22 mm. long; pedicels becoming recurved after anthesis, hirsute with long simple trichomes; sepals caducous, oblong, 2–2.5 mm. long, dark with a narrow hyaline margin; petals 4–4.5 mm. long; siliques spatulate, blunt, 8–19 mm. long, 2–4 mm. wide, not inflated; valves membranaceous, with inconspicuous anastomosing raised secondary nerves; replum spatulate; style 0.2–0.5 mm. long. (Illustrated Plate 1186: A 1–4.)

Herba perennis, foliis basalibus obovatis, plerumque palmate 3–5-lobatis; pedicellis in fructu recurvatis, hirsutis; sepalis caducis; siliquis spatulatis, 8–19 mm. longis, 2–4 mm. latis, non-inflatis, membranaceis; stylo 0.2–0.5 mm. longo.

The Brooks Range and Romanzof Mountains of north and northeast Alaska.—**Alaska:** Brooks Range: Lake Noluk, shale rubble slope, 5 mi. S. of the lake, lat. 68° 47′ N., long. 160° 00′ W., elev. 2500 ft., June 7, 1950, *L. A. Spetzman 3511* (M); Pimple Peak, limestone talus, scattered, lat. 68° 40′ N., long. 157° 22′ W., elev. 2700 ft., August 3, 1950, *Irv. Tailleur 25* (M); Single tufts from long-extended tap roots in rock rubble on bare, steep, high alpine scree-slope, alt. ca. 4000 feet on limestone peaks above Bettle's River, 20 miles northeast of Wiseman, July 13, 1949, *Louis H. Jordal 2281* (US, Can); on steep phyllite scree, alt. ca. 3500 feet, Signal Mt., NW of Old John Lake, July 25, 1950, *Louis H. Jordal 3706* (Can). Richardson Mountains: Lake Peters, Romanzof Mountains, sunny mountain shale slope, west-facing, scarce purple-flowered herb, lat. 69° 20′ N., long. 145° 00′ W., elev. 4500′, July 11, 1948, *L. A. Spetzman 597* (Type at Minnesota) (M, S).

This variety is characterized by long membranaceous siliques, blunt at the tip, tapering to the base, with obscure secondary veins; caducous calyx; cauline leaves lobed; basal leaves 5-lobed with rather long and acute lobes; stem and branches, but especially the pedicels, villous hairy; style less than 0.5 mm. long; flowers small; sepals contiguous.

We have named this plant for Dr. Louis H. Jordal who collected during two seasons in the Brooks Range. In the course of those seasons he collected very good material of this plant, including a sheet which seems intermediate between this and var. *borealis*. This sheet is critical in our decision to retain the four entities as varieties of one species. Louis Jordal was killed in an airplane crash in Iran in December, 1951 while acting as Visiting Professor of Botany at the Royal College of Pharmacy and Chemistry at Bagdad.

Vars. *borealis* and *Koliana* are homogeneous and constant populations as is most of the material of var. *Jordalii*. However, in the limited material available in collections at present, we cannot find features of reliable constancy to correlate with the wide differences in fruits. Jordal's *3706* from near Old John Lake in the Brooks Range combines characters of var. *Jordalii* (the caducous calyx, short style, and elongate fruits) with those of var. *borealis* (fruit shape, firm valves with raised anastomosing secondary veins, and spatulate basal leaves that tend to be shallowly lobed).

Other than in the fruits, the plants of all four populations are very similar, and without more mature fruiting material, we cannot be sure that many intermediates do not exist in the fruiting structures as well.[3]

It cannot be over emphasized that many isolated populations can be expected in this genus, each exhibiting peculiar variations. The explanation of the origin of the colonies and their variation and homogeneity is clear, but recognizing and evaluating the taxa represented by these populations is still not easily done.

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[3] We have recently had access to material collected in 1944 by Stuart K. Harris in the Saint Elias Range at the south end of Kluane Lake: lat. 61° 02′ N., long. 138° 32′ W. This collection is among undistributed material in Hugh M. Raup's collections from along the Alaska Highway in 1944.

The sheet contains a single plant in flower with many immature fruits. It has a stout caudex heavily clothed with pubescent old leaf-bases over ca. 4 cm. of its length; the stem, characteristically, is branched to the base, the branches 11–15 cm. long; the stem and branches are thinly pubescent and hirsute; basal leaf-blades are orbicular, 6–8 mm. long, by 6–8 mm. broad with usually 5 blunt teeth at the tip, sparsely pubescent with short branched and long simple trichomes; petioles are 1 cm. long and 2 mm. wide, pubescent; cauline leaves are spatulate with 3 acute terminal teeth. Inflorescences on each of 9 branches, 11–15 cm. long, with flowers or fruits to the base; pedicels becoming recurved after anthesis, hirsute with long simple or few-branched trichomes; sepals persistent, oblong, 1.5–2.5 mm. long, rather heavily hirsute on the back, purple without a hyaline margin; petals ca. 4 mm. long, purple or lavender; siliques (young) elongate and blunt, up to 13 mm. long, membranaceous, not clearly becoming inflated, with inconspicuous secondary nerves; style 0.5–1 mm. long.

This plant shows the very characterisitc caudex and basal leaves, the inflorescense with flowers and fruits nearly to the base, the branching of the stem and all the characteristics of *S. borealis*, but it cannot be satisfactorily assigned to any of the varieties described in this paper. It is to be expected that another taxon should exist in this area some 350 miles from the nearest station of identifiable material. This sheet is too young for more definite treatment.

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Rudbeckia amplexicaulis Vahl in Southern Illinois.—On June 19, 1951, a single plant of *Rudbeckia amplexicaulis* Vahl. was observed growing at the north edge of the city of Murphysboro in Jackson County. The plant was about eighteen inches in height and the habitat was a siding of the Gulf, Mobile & Ohio railroad. The soil was largely of cinders.

A check of several sources,[1,2] reveals that *Rudbeckia amplexicaulis* has not been reported as occurring in Illinois. Future exploration of southern Illinois may reveal this plant in other locations.

Previous collections of *Rudbeckia amplexicaulis* Vahl. have been recorded for several states to the southeast and southwest of Illinois and it seems fairly safe to conclude that the plant grew from seed carried in from the south by the railroad. The distribution as given in the 8th edition of Gray's Manual of Botany[3] is: Ga. to Tex., n. to Mo. and Kansas.

Specimens of this collection have been deposited in the herbarium of the Illinois State Museum, Springfield, and in the herbarium of Southern Illinois University, Carbondale. Verification of identity of the specimen was made by Dr. John W. Voigt.—John W. Hardy, Southern Illinois University.

[1] Correspondence with Dr. Glen S. Winterringer regarding records in the herbarium of the State Museum.

[2] Jones, G. N. Flora of Illinois, The University Press, Notre Dame, Indiana. 1950.

[3] Fernald, M. L. Gray's Manual of Botany. American Book Company. 1950.

Edible Mushrooms.[1]—This is a splendid book. It is intended primarily for amateurs who are interested in eating wild mushrooms and who wish to learn the more common and interesting forms. The body of the work, chapters 2–8, is made up largely of descriptions, keys and illustrations. These chapters, plus the first dealing with general information and 9 to 12 dealing respectively with gathering, selection of edible forms, preparing for the table, and poisoning, provide an unusually well-rounded out treatment. The reader is instructed on how to recognize the species, how, when, and where they grow, how they fit into nature's scheme of things, the terminology applied to them and their parts, how and when to gather them, kinds to look for as food and kinds to avoid, how to prepare herbarium specimens, ways of preparing for the table, poisoning and what to do in an emergency. It is written in such a style and at such a level as to make it comprehensible and interesting to anyone, yet it is so filled with sound information that the professional botanist could scan it profitably.

The term mushroom as used in the title is interpreted broadly to include all the prominent fleshy fungi that might be considered edible. The major portion of the book is of course devoted to the agarics, with separate chapters for those of each spore color group. Following the agarics there are treated in order the boletes, Clavarias, Hydnums, polypores, puffballs, morels, and a few miscellaneous forms. The classification and nomenclature is the traditional thing dating back to Fries. In the opinion of this reviewer no other scheme of presentation would have been possible, since modern attempts to improve the Friesian system have resulted in an everchanging nomenclature that is incomprehensible even to the professional.

The work contains 5 colored plates and 58 pages of black and white photographs, illustrating a total of 127 species. The general morphological characteristics of fleshy fungi are illustrated in 7 pages of line drawings. The book is the product of a cooperative effort between Dr. Pomerleau and the well-known botanical artist Mr. H. A. C. Jackson, himself an assiduous student of the fungi. It is not a pocket manual; it is $10\frac{3}{8} \times 7$ inches and bound in stiff cloth covers.—W. Lawrence White. Farlow Herbarium of Harvard University.

[1] **Mushrooms of Eastern Canada and the United States,** by René Pomerleau in cooperation with H. A. C. Jackson. 302 pp., 5 col. pl. with 44 fig., 7 pp. line drawings, 58 black and white photographs. Les Éditions Chantecler Ltée, 8125 St-Laurent, Montreal 14. 1951. Price $9.00.

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GEOGRAPHICAL VARIATIONS IN SHORTIA GALACIFOLIA

P. A. Davies

Asa Gray, while at the Jardin des Plantes, Paris, in 1839, found in Andre Michaux's herbarium an unnamed specimen bearing the label, "Hautes montagnes de Carolinie, *An pyrola spec.*? *An genus novum*?" Dr. Gray named the plant *Shortia galacifolia* in honor of his friend and botanical colleague Charles W. Short of Kentucky who sent him many well-prepared trans-Alleghanian specimens.[1] There is evidence to indicate that Michaux found this specimen in 1787 or 1788 at the sources of the Keowee River in South Carolina. On returning to New York, Gray and other plant collectors, mistaking Michaux's label to mean the high mountains northeast of Ashville, sought in vain for *Shortia* in this area. In the spring of 1877, George M. Hyams rediscovered *Shortia* on the banks of the Catawba River in McDowell County, North Carolina, about five miles north of Marion.[2] Nine years later (1886), Charles S. Sargent found it in Oconee County, South Carolina, at the confluence of the Toxaway and Horse Pasture (Green) Rivers.[3] The same year, Frank E. Boynton discovered large quantities of *Shortia* on Bear Camp Creek, a lower tributary of the Horse Pasture River,[4] and three years later (1889) found acres of it in the area about the junction of the Whitewater River and Devil's Fork Creek, and in the lower Jocassee Valley, all in Oconee County.[5] In the spring of 1890, T.

[1] Gray, Asa, Amer. Jour. Sci. & Arts, 42: 1–49, 1842.
[2] Letter, J. W. Congden to Asa Gray, Oct. 18, 1878 (Gray Herb.).
[3] Sargent, C. S., Amer. Jour. Sci. & Arts, Ser. III, 32: 466–473, 1886.
[4] Letter, F. E. Boynton to C. S. Sargent, Nov. 7, 1886 (Gray Herb.).
[5] Boynton, F. E., Garden & Forest, 2: 214–215, 1889.

G. Harbison discovered *Shortia* in great abundance on the Horse Pasture River, between its junction with the Toxaway River and Bear [Camp] Creek.[6]

Recently, Charles F. Jenkins sought for specimens of *Shortia galacifolia* in thirty-one of the leading herbaria in the United States and found ninety-eight sheets. From information on the specimen-sheets he gives the following distributions: "Of these forty-four were collected along the banks of the Whitewater River in Oconee County, S. C. Fourteen more are listed as coming from the Jocassee Valley, also in Oconee County. Thirteen were found in McDowell County, N. C. more definite locations not being given. Eight were found in the Toxaway Gorge in Transylvania County, N. C., three along Bear Camp Creek and two along the Horse Pasture River, both locations in Transylvania County. One each from "the mountains of N. W. Carolina," "4 miles N. W. Salem, S. C." and "Macon Co., N. C." The remainder are specimens with labels giving no definite locality or coming from cultivated plants."[7] Through the kindness of William C. Coker, University of North Carolina, a map was received showing all the locations of *Shortia galacifolia* known to him.[8] On his map were shown stations of *Shortia* not indicated in Jenkin's report. Numerous stations were located on the sources of the Little River in Oconee County; several stations on the right bank of the Keowee, above the entrance of Eastatoe Creek, also in Oconee County; and two stations on the left bank of the Keowee, below the entrance of Eastatoe Creek in Pickens County. The latter is a new county record. H. J. Oosting, of Duke University, collected *Shortia* in the Toxaway Gorge in Transylvania County, North Carolina.[9] The Rev. A. Rufus Morgan, Franklin, North Carolina, found it on the Toxaway River above the North Carolina border and on the Whitewater River just above its junction with the Thompson River.[10]

Wilbur H. Duncan, Haskell Venard, and G. W. McDowell discovered in March, 1949, a colony of *Shortia* (eight by four

[6] Clute, W. N., Amer. Bot., 32: 65–68, 1926.

[7] Jenkins, C. F., Arnoldia, 2: 13–28, 1942.

[8] Map, W. C. Coker, Botany Dept. Uni. North Carolina, copy sent to P. A. Davies, May, 18, 1948.

[9] Specimen in Gray Herb. collected July 15, 1936.

[10] Map, A. Rufus Morgan to P. A. Davies, Aug. 8, 1951.

feet) near Reed Creek in Rabun County, Georgia, and in August of the same year the senior author found a small colony near the original one.[11] The writer examined a specimen sent to the Gray Herbarium by Duncan, Venard, and McDowell from Rabun County, Georgia and found it to have the same characteristics as plants collected from the sources of the Keowee River.

The range of *Shortia* on the tributaries of the Catawba River in McDowell County, North Carolina, is rather small. A few colonies are present on Lackey Branch, a small tributary of Tom's Creek. Numerous colonies can be found on the Fish Hatchery Creek (John's Creek) above the hatchery. On the upper part of the creek (no name) and its branches which run beside the road leading to the Joe McNeely farm, *Shortia* is rather abundant. F. M. Crayton has found *Shortia* on the Linville River west of Table Rock in Burke County, North Carolina.[12]

Distribution data show that *Shortia* is confined to two general areas. One comprising Oconee and Pickens Counties, South Carolina; Transylvania and Macon Counties, North Carolina; and Rabun County, Georgia. The other area, across about 60 miles of mountainous terrain is in McDowell and Burke Counties, North Carolina.

On March 22, 1951, the author had the opportunity of gathering *Shortia galacifolia* in flower on the Whitewater and Horse Pasture Rivers, tributaries of the Keowee River in Oconee County, South Carolina. The next day, March 23, he collected plants in flower on Fish Hatchery Creek (John's Creek) and on the creek running beside the road leading to the Joe McNeely farm, both tributaries of the Catawba River in McDowell County, North Carolina.

In the latter part of May, 1951, the writer collected specimens of *Shortia* in fruit on the Horse Pasture River; Bear Camp Creek; Toxaway River, both above and below its junction with the Horse Pasture River; at the confluence of the Toxaway and Whitewater Rivers; along the Whitewater below its junction with the Thompson River and about one half mile along the lower part of the Thompson River, all in Oconee County, South Carolina. Also two collections were made on the upper part of

[11] Duncan, W. H., Haskell Venard and G. W. McDowell, Rhodora, 52: 229–232, 1950.

[12] Letter, F. M. Crayton to P. A. Davies, June 22, 1951.

Bear Camp Creek in Transylvania County, North Carolina. On June 1, 1951, specimens in fruit were gathered on Lackey Creek, a small tributary of Tom's Creek; on John's Creek above the Fish Hatchery and on the creek which runs beside the road leading to Joe McNeely's farm, all in McDowell County, North Carolina.

Distinct floral variations are exhibited by *Shortia* from these two areas.

Keowee River	Catawba River
Petals 16.20–19.20 mm. long	Petals 14.0–16.5 mm. long
Apical petallary notches 7–13; 0.10–2.58 mm. deep	Apical petallary notches 14–21; 0.10–1.42 mm. deep
Veins of petals few	Veins of petals numerous
Staminodial hairs 0.24–0.25 mm. long	Staminodial hairs 0.10–0.11 mm. long
Styles 14.6–16.0 mm. long, slender	Styles 9.6–10.27 mm. long, stout

Michaux's type specimen lacked petals, stamens and staminodia. Drawings of this specimen, including a separate complete pistil, made by M. Joseph Decaisne in 1839 is in the Gray Herbarium. In order to determine the source of Michaux's specimen, an index was developed between the average length of mature ovaries and that of the styles. For specimens from the sources of the Keowee River the index was 1:2.37 and from the Catawba River was 1:1.28. Using the index, it shows that Michaux's specimen came from the sources of the Keowee.

Considering plants of *Shortia galacifolia* Torr. & Gray from the sources of the Keowee River as typical of the species as originally described, and plants from the sources of the Catawba River as variants from this type, the author is establishing a new variety for the plants from the sources of the Catawba River.

Shortia galacifolia Torr. & Gray var. **brevistyla,** var. nov., petalis 14.0–16.5 mm. longis, apice 14–21-serratis, sinubus 0.10–1.42 mm. altis; venis petalorum numerosis; staminodiis hirsutis pilis 0.10–0.11 mm. longis; stylo 9.6–10.27 mm. longo, crasso.

The type of *Shortia galacifolia* Torr. & Gray var. *brevistyla* Davies has been deposited in the Gray Herbarium.

Dept. of Botany, University of Louisville, Louisville, Kentucky.

FURTHER STUDIES OF THE OKLAHOMA FLORA

U. T. Waterfall

Further studies of the Oklahoma flora have resulted in increased data concerning the distribution of species within the state, including several not found previously recorded in monographs, floras or check-lists as occurring within Oklahoma. In the following account the latter taxa are prefixed with an asterisk. Unless otherwise indicated the cited material will be found in the herbarium of Oklahoma A. & M. College.

*Sagittaria papillosa Buchenau. So referred is *Wehling 55*, 6 miles east of Harris, McCurtain County, June 15, 1946. This number has the obovate achenes, glabrous filaments and papillose bracts as described for *S. papillosa* by J. G. Smith (Mo. Bot. Gard. Rept. 6: 55. 1894) rather than the falcate achenes and glabrous filaments of *S. ambigua*, or the falcate achenes and arachnoid filaments of *S. lancifolia*. The distribution of *S. papillosa* was given by J. G. Smith (l. c.) as "shallow ponds, Texas and Louisiana."

*Digitaria violascens Link. The collections referred to this have short, narrow spikelets (less than 2 mm. long and about 0.7 mm. wide), dark lemmas, winged rachises and glabrous sheaths. They are: *Waterfall 10458*, wooded flats with *Sabal*, 3 miles south of Tom, McCurtain County, October 13, 1951; *Waterfall 10513*, along Little River, 0.3 miles south of Honobia, Pushmataha County, October 14, 1951. In Hitchcock's Manual (p. 578, 1950) Arkansas and Texas are given as constituting the western limit of this species' range in the United States.

*Panicum gymnocarpon Ell. This species is characterized by its stipitate smooth fruit about one-third as long as the second glume, which is about 6 mm. in length, and slightly longer than the sterile lemma, the latter being a little longer than the first glume. It has previously been known from as far west as Arkansas and eastern Texas (Hitchcock's Manual, p. 706, 1950). We have it from the extreme southeastern part of Oklahoma as *Waterfall 10412*, edge of Taxodium swamp 3 miles south and 1 east of Eagletown, McCurtain County, October 13, 1951.

*Paspalum pubiflorum Rupr., var. pubiflorum. Our material has all hitherto been referred to var. *glabrum* Vasey which has glabrous spikelets. We have one sheet of the typical variety with pubescent spikelets. It is: *McLean*, along Red River, 5 (15?) miles south of Durant, Bryan County, June 20, 1936.

*Sporobolus asper (Michx.) Kunth, var. pilosus (Vasey) Hitchc. In the eighth edition of Gray's Manual (154. 1950) Fernald states that the range of this variety is "E. Kans. to Texas." Chase (Hitchcock's Manual p. 417. 1950) says "Kansas, Texas . . . and Montana." We have several sheets of *S. asper* with pilose sheaths and blades.

*Fimbristylis autumnalis (L.) R. & S., forma brachyactis (Fern.) S. F. Blake. The form with suppressed inflorescence rays, or with the inflorescence reduced to one spikelet, was collected as *Waterfall 10219*, in mud at edge of pond, 3 miles east of Braggs, Muskogee County, July 17, 1951.

*Scleria pauciflora Muhl., var. caroliniana (Willd.) Wood. The pilose variety was collected as *Waterfall, 10069*, open woods, top of limestone hill, 8 miles northeast of Tahlequah, Cherokee County, June 25, 1951. The nearest area from which the variety was previously known according to Fernald (Gray's Manual, 292. 1950) is Missouri.

*Juncus filipendulus Buckley. The individual plants are somewhat similar in appearance to *J. repens*, although they are not repent. However the capsule is obovate and shorter than the narrow, linear-triangular fruit of *J. repens*. Engelmann, in his North American Species of Juncus,[1] cites material from Arkansas and Texas. This is done under the substitute name *J. leptocaulis*, a manuscript name of Torrey and Gray "from a label in Mr. Durand's herbarium." Engelmann says "I had to change the only published name of this species, *J. filipendulus*, because it is absolutely wrong, the fibrous rootlets bearing no tubers at all . . ." This procedure is, of course, contrary to the present Rules. Article 59 states "A name . . . must not be rejected . . . merely because it is badly chosen . . ." Buchenau[2] gives the range as "Tennessee, Arkansas, Alabama and Texas; wohl auch in den dazwischen liegenden Staaten."

We have the species as *Waterfall 6494*, limestone prairie, 4 miles northeast of Sulphur, Murray County, June 3, 1946.

*Trillium recurvatum Beck is easily recognized by the sessile flowers, petiolate leaves, ovate-lanceolate petals, and short reflexed sepals. We have it as *C. W. Prier*, sin num., in woods and thickets, Tahlequah, Cherokee County, April 7, 1925. Gates[3] says the species occurs from "Ohio to Minnesota, south to Mississippi and Arkansas. Fernald (Gray's Manual, 445. 1950) likewise gives Arkansas as the western limit of its range.

*Polygonum hydropiperoides Michx., var. bushianum Stanford, forma **rubrum,** Waterfall, f. nov.; folium rubris zonis. The type of the form having leaves with red markings, often V-shaped, is *Waterfall 10484*, swamp, Grassy Lake, 4 miles south and 4 east of Tom, McCurtain County, October 13, 1951. It is in the Herbarium of Oklahoma A. & M. College.

*Polygonum sagittatum L. Easily recognized by the capitate inflorescences, sagittate leaves and retrorse-prickly, 4-angled stems is this species collected as *Waterfall 10420*, ditch, 2.5 miles north of Tom, McCurtain County, October 13, 1951.

*Suckleya suckleyana (Torr.) Rydb. This monotypic genus is characterized by the bracts of the fruit being united to the summit, rather

[1] Trans. St. Louis Acad. Sci. 2: 454. 1868.

[2] Buchenau, Fr. Juncaceae, Das Pflanzenreich . . . 4 (36): 244. 1906.

[3] Gates, R. R. A Systematic Study of the North American Genus Trillium . . . Ann. Mo. Bot. Gard. 4: 49. 1917.

than free as in *Atriplex* which it somewhat resembles. These bracts are also obcompressed and dorsally carinate. These features are well shown in a plate published with the original description.[4] In the North American Flora (**21** (1): 74. 1916) Standley states that the species occurs "in valleys, Montana to Colorado." Hershey and Leyendecker (Leafl. W. Bot. **4:** 23. 1944) report it from Union and Quay Counties, New Mexico. We have it as *Waterfall 9696*, sand, bed of the Cimarron River, one-half mile north of Kenton, Cimarron County, October 6, 1950.

*MIRABILIS GIGANTEA (Standley) Shinners. This species, characterized by its glabrous, ovate or ovate-oblong leaves, upwardly-incurved pubescent stems and puberulent involucres, was described[5] from sands in Dallas County, Texas. Shinners[6] states that it is "a restricted endemic of north-central Texas from the Red River south to Waco, and from Dallas west to Weatherford." To this species is referred *Waterfall 9150*, sand north of Thackerville, Love County, July 14, 1949. This area is a few miles north of the Red River and north-central Texas.

*SAPONARIA VACCARIA L., characterized by the large 5-winged fruiting calyx, was collected as *Rose*, sin num., 8 miles west of Ada, Pontotoc County, June 9, 1941.

*NUPHAR OVATUM (Mill. & Standl.) Standl. This species, characterized by the densely pubescent under-leaf surfaces and narrow leaf sinuses, is represented in our herbarium by *Stratton 569*, in water, 1 mile west of Broken Bow, McCurtain County, September 11, 1927. Described from Texas,[7] the distribution of the species was stated by Fernald (Gray's Manual: 639. 1950) to be "e. Tex., north to se. Kansas."

EUPHORBIA MISSURICA Raf., var. **calcicola** (Shinners) Waterfall, comb. nov., *Chamaesyce missurica* (Raf.) Shinners, var. *calcicola* Shinners, Field and Laboratory **17:** 69. 1949. This transfer is made to keep the above taxon in the genus *Euphorbia*, rather than segregated into *Chamaesyce*. Shinners (l. c.) states that the range of var. *calcicola* includes Oklahoma, Kansas and Missouri as well as Texas.

RHAMNUS CAROLINIANA Walt., var. MOLLIS Fern. This variety, with leaves pubescent beneath, was reported from the Arbuckle Mts. by E. J. Palmer.[8] In our herbarium we have a sheet, *John G. Brown*, sin num., rocky sandy soil, hillside 0.8 miles northeast of Tahlequah, Cherokee County, October 5, 1946.

*SIDA RHOMBIFOLIA L. This species somewhat resembles *S. spinosa*, but has cuneate-based, short-petiolate (2–4 mm.) leaves, and peduncles

[4] Gray, Asa. A Catalogue of Plants Collected East of the Rocky Mountains. Pacif. Railroad Reports. 12, pt. 2, no. 2: 47 + Pl. 4. 1860.

[5] Standley, Paul C. Allioniaceae of the United States. Cont. U. S. Natl. Herb. **12:** 348. 1909.

[6] Shinners, Lloyd H. North Texas Species of Mirabilis. Field and Lab. **19:** 177–178. 1951.

[7] Miller, Gerrit S. and Paul C. Standley. The North American Species of Nymphaea. Contr. U. S. Natl. Herb. **16:** 97–99. 1912.

[8] Palmer, Ernest J. Notes on Some Oklahoma Plants. Journ. Arn. Arb. **15:** 133. 1934.

several times longer (10–15 mm.) than the petioles of the leaves. In *S. spinosa* the cauline leaves are usually cordate, long-petiolate (10–20 mm.), and the peduncles are shorter (3–13 mm.) than the petioles. We have it as *Waterfall 9816*, edges of Taxodium swamp, 3 miles south of Eagletown, McCurtain County, October 21, 1950; and *Waterfall 10491*, swamp, Grassy Lake, 4 miles south and 4 east of Tom, McCurtain County, October 13, 1951. Small (Manual p. 850. 1933) states that the species occurs in the "Coastal plain, Florida to Texas and North Carolina."

*Ascyrum hypericoides L., var. oblongifolia (Spach) Fern. This Coastal Plain variety, having single stems branched above, oblong-lanceolate leaves and elongate flowering branches, was collected as *Waterfall 10452*, wooded flats with *Sabal*, 3 miles south of Tom, McCurtain County, October 13, 1951. Fernald (Rhodora **38:** 433. 1936) says it ranges from "Florida to Mississippi, north to eastern Maryland, western Tennessee and southeastern Missouri."

*Hypericum perforatum L. This introduced species was collected as *Waterfall 10160*, disturbed prairie, 2 miles east of Braggs, Muskogee County, July 10, 1951.

*Hypericum tubulosum Walt., var. walteri (Gmel.) Lott, is characterized by the 9 stamens in 3 bundles alternating with 3 glands, and by the oblong leaves. It was collected as *Waterfall 9797*, edges of Taxodium swamp, 3 miles south of Eagletown, McCurtain County, October 21, 1950, and *No. 10409*, Taxodium swamp, 3 miles north and 1 east of Eagletown, McCurtain County, October 13, 1951. In Gray's Manual, ed. 8, Fernald states that the range includes "Cypress and gum swamps, Florida to Texas, north to . . . south Indiana and southeast Missouri."

*Angelica venenosa (Greenway) Fern. This pubescent-fruited *Angelica* was collected as *Waterfall 10175*, richly wooded valley, 6 miles northeast of Scraper, in Adair County, July 11, 1951. Mathias and Constance (N. Am. Fl. **28B** (2): 199) give as the distribution of this species "Massachusetts to Florida, west to Minnesota and Mississippi."

Cymopterus macrorhizus Buckl. This species, recognizable by its scarious bractlets, fruit-wings nearly uniform rather than enlarged toward the base, and fruiting peduncles overtopping the leaves, is represented in our herbarium by *Waterfall 5536*, gypseous soil overlaying gypsum, low gyps hills, 1 mile west and ½ south of Weatherford, Custer County, May 13, 1944, and by *Stratton 6840*, gravelly clay pasture, 1.7 miles west and 2.4 north of Elk City, Beckham County, May 10, 1948 (det. by Lincoln Constance).

Mathias and Constance (l.s. 172.) state that the distribution of the species is in central Texas.

*Ipomoea heptaphylla (Rottb. & Willd.) Voight is easily recognized by its palmately 5–7 parted leaves and its filiform peduncles that sometimes spiral around adjacent objects. Small (Manual. 1087. 1933) says "near New Orleans, La., Nat. of Trop. regions." It was collected as *Waterfall 9831*, old field 4 miles south of Idabel, McCurtain County, October 21, 1950. Here it was quite abundant.

Gerardia pectinata (Nutt.) Benth. This species, characterized by its pinnatifid calyces and leaves, was cited from LeFlore County by Pennell[9] with the comment "species new to Oklahoma." We have it as *Waterfall 9847* in oak-pine woods on slopes near top of the Kiamichi Mountains, 3 miles east and 6 south of Albion, Pushmataha County, October 22, 1950.

*Physostegia angustifolia Fern. So referred are: *Waterfall 10007*, shallow soil on rock strata, 6 miles north of Braggs, Muskogee County, June 9, 1951; and *Waterfall 10088*, wet area in prairie 1.5 miles southeast of Braggs, Muskogee County, July 3, 1951. In our specimens the leaves are narrow and rigid as described by Fernald (Rhodora **45:** 462, 463. 1943). The fruiting inflorescences usually become rather remotely-flowered; however when first beginning to flower, they are often rather dense.

*Veronica polita Fries. This blue-flowered, long-pedicelled species is abundant on our campus, and various other places in this area in the early spring. We have it as *Waterfall 9900,* lawn, Oklahoma A. & M. Campus, Stillwater, Payne County, April 25, 1951.

*Hedyotis boscii DC. was collected as *Waterfall 10453,* wooded flats with *Sabal,* 3 miles south of Tom, McCurtain County, October 13, 1951. In Gray's Manual (1330. 1950) the range is given as Florida to Texas, north to southeast Virginia, Tennessee and southeast Missouri.

*Valerianella bushii Dyal. This species has flowers resembling those of *V. longiflora,* but has narrow, oblong pubescent fruits, with the sterile cells narrower than the fertile one, rather than orbicular fruit with large inflated widely divergent sterile cells as has *V. longiflora.* Dyal[10] cited specimens from Missouri and Arkansas. We have it as *Traylor 71,* sandy soil, northwest end of Spavinaw Lake, Mayes County, May 4, 1945; and *Wallis 500A,* open gravel bank of creek 0.7 miles south of Adair County line and 0.5 miles east of State highway 10, Cherokee County, May 27, 1951.

*Lobelia spicata Lam., var leptostachys (A. DC.) Mackenz. & Bush. In 1936 (Rhodora **33:** 306) and again in 1942 (N. Am. Fl. **32A** (1): 73) McVaugh gave "eastern Kansas and western Arkansas" as the western limit of the range of this variety. It is represented in our herbarium by *Waterfall 9574,* wooded valley, 3 miles south of Kansas, Adair County, July 7, 1950.

*Artemisia ludoviciana Nutt., var. latifolia (Bess.) T. & G. Referred to this variety are: *Waterfall 9702,* bank of Carrizozo Creek, 2 miles west of Kenton, Cimarron County, October 7, 1950 and *Waterfall 9725,* north slopes of Black Mesa, 3 miles north of Kenton, Cimarron County, October 7, 1950.

These collections have the short (3–4 cm. long), relatively broad leaf

[9] Pennell, Francis W., The Scrophulariaceae of Eastern Temperate North America. Acad. Nat. Sci. Phila. Monog. 1: 404. 1935.

[10] Dyal, Sarah C. Valerianella in North America. Rhodora **40**: 20. 1938.

blades as described for var. *latifolia* (Gray's Manual. 1523. 1950). *No. 9725* has divergent elongated branches.

*Aster linariifolius L. is represented in our herbarium by *Waterfall 9866*, in pine-oak woods, 10 miles north of Broken Bow, McCurtain County, October 22, 1950. Small (Manual. 1395. 1933) gave the range of this species (under *Ionactes*) as Florida to Texas, Minnesota and Michigan.

*Baccharis halamifolia L. Fernald (Gray's Manual. 1448, 1950) says this species occurs in open woods, thickets and borders of marshes near the coast, Florida to Texas and Mexico, north to coast of Massachusetts. We have it as *Waterfall 9827*, old field 4 miles south of Idabel, McCurtain County, October 21, 1950.

*Coreopsis tripteris L., var. deamii Standl. This variety, having leaves pubescent beneath, was collected as *Waterfall 10166*, open woods on stony slopes 1 mile east and 3 south of Kansas, Delaware County, July 11, 1951. Standley[11] in describing this variety cited specimens from Illinois, Indiana, Michigan, Missouri, Arkansas, Pennsylvania, North Carolina and Georgia.

*Echinacea purpurea (L.) Moench, var. arkansana Steyermark. *Burris 65*, sandy clay, 4 miles west of Idabel, McCurtain County is so referred. It has the smaller leaves, heads, rays, paleas and slender stem as described by Steyermark[12] from Sevier County, Arkansas.

*Erechtites hieracifolia (L) Raf., var. intermedia Fern. This variety, with broad-based sessile leaves which are reduced below the inflorescence, was collected as *Waterfall 9865*, slopes of mountain, hairpin curve, 12 miles southeast of Bethel, McCurtain County, October 22, 1950. Fernald (Gray's Manual. 1528. 1950) says it occurs from P. E. I. to west Ontario, south to Florida and Texas.

*Erechtites hieracifolia (L.) Raf., var. praealta (Raf.) Fern. The variety with upper leaves attenuate at the base was collected as *Waterfall 9781*, edges of Taxodium swamps, 3 miles south of Eagletown, McCurtain County, October 21, 1950. In Gray's Manual (l. c.) the range is given as Quebec to Wisconsin, south to Florida and Tennessee.

*Eupatorium capillifolium (Lam.) Small. This species, having finely-divided leaves, was collected as *Waterfall 10499*, old field, 0.5 miles north of Tom, McCurtain County, October 14, 1951. In Gray's Manual (1365. 1950) the western part of the range is stated to be ". . . to Texas, north to New Jersey."

*Euthamia leptocephala (T. & G.) Greene. So referred is *Waterfall 10489*, old field, 0.5 miles north of Tom, McCurtain County, October 14, 1951. Shinners[13] states that this is the common *Euthamia* of eastern

[11] Standley, Paul C. New Forms and Varieties of Indiana Plants. Rhodora **32**: 33–34. 1930.

[12] Steyermark, Julian A. Two Undescribed Plants from Arkansas. Rhodora **40**: 71. 1938.

[13] Shinners, Lloyd H. The Texas Species of Euthamia. Field and Lab. **19**: 137–138. 1951.

Texas. Fernald (Gray's Manual: 1412. 1950) includes "east Texas . . . and south Missouri" in the range of this species.

*HELIANTHUS HIRSUTUS Raf., var. TRACHYPHYLLUS T. & G. This variety, without long-hirsute internodes and with broad leaves, is represented by *Waterfall 10270*, oak-hickory woods, 4 miles southeast of Braggs, Muskogee County, July 19, 1951. Fernald (Gray's Manual: 1492. 1950) gives the range as west Pennsylvania to Wisconsin and Iowa, south to Tennessee and Arkansas.

*HIERACIUM GRONOVII L., var. FOLIOSUM Michx. is said to have "numerous cauline leaves extending nearly or quite into the inflorescence, . . . oval and rounded at the summit . . ." (RHODORA **37:** 185. 1935). Such material was collected as *Waterfall 10427*, pine-oak woods, 2 miles north of Tom, McCurtain County, October 13, 1951. Fernald (l. c.) says "it is dominant on the coastal plain, extending . . . northward in the interior to southern Indiana and Missouri."

*SOLIDAGO RUGOSA Mill., var. ASPERA (Ait.) Fern. So referred is material collected as *Waterfall 9821*, edges of Taxodium swamp, 3 miles south of Eagletown, McCurtain County, October 21, 1950. The leaves are rugose, but the branches are not elongated and divergent as in var. *celtidifolia*, and they produce flowers throughout most of their length. Fernald (RHODORA **38:** 222. 1936) includes Texas and Missouri in the western part of the range of this variety.

*SOLIDAGO RUGOSA Mill., var. CELTIDIFOLIA (Small) Fern. So referred is *Hopkins 5602*, deep, rich pine-oak-gum-hickory woods on slope of Rich Mountain, Ouachita Mountains, near Page, LeFlore County, October 13, 1940.

This specimen has the prolonged divergent branches, floriferous above the middle as Fernald describes var. *celtidifolia*.[14] This variety has been recorded previously from as far west as the neighboring states of Texas and Arkansas by both Small (Flora . . . 1198. 1903) and Fernald (l. c.).—DEPARTMENT OF BOTANY AND PLANT PATHOLOGY, OKLAHOMA A. & M. COLLEGE, STILLWATER, OKLAHOMA.

COLOR-FORMS OF THE MAY-APPLE

JULIAN A. STEYERMARK

IN 1948 Dr. Marcel Raymond of the Montreal Botanical Garden described (RHODORA **50:** 18) *Podophyllum peltatum* f. *Deamii*, based upon a plant with maroon or dark-reddish fruit found originally by Dr. C. C. Deam in 1927 in "a wood on the Arthur Miller farm near Mauckport, Harrison County," Indiana. From the living plants grown by Deam in his garden and sent to the Montreal Botanical Garden, the latter institution succeeded

[14] Fernald, M. L. RHODORA 38: 223–224. 1936.

in growing plants to maturity and eventually offered seeds for distribution to a number of other botanical gardens. So far as known, this color form existed in a wild state only in Indiana, although it was expected to be found eventually in a wild state throughout the range of ordinary *P. peltatum.*

About the time Dr. Raymond's form was published, Mrs. Mary C. Rodeman of Jefferson City, Missouri, wrote the present author that she had found a pink-flowered purplish-red-fruited form of the May-apple near Jefferson City, eventually kindly furnishing me with an herbarium specimen and a kodachrome slide as evidence. She had been acquainted with this color variation since 1923. In the spring of 1950 she had taken a couple of the plants to Dr. Edgar Anderson for planting at the Missouri Botanical Garden Arboretum.

Since I was curious to learn whether Mrs. Rodeman's plant was actually the same form as that found by Deam, I undertook a special trip to the Missouri locality in July, 1950. Mrs. Rodeman kindly offered to accompany me, despite the rain, to the exact spot where she knew the plants to grow. Mr. Albert Vatter, Jr., a graduate student at the University of Illinois, was the third member of the party. Mrs. Rodeman led us to a spot of undisturbed woodland on the slopes of a shallow ravine bordering a small creek tributary to the Moreau River south of the golf course of Hough Park and about three-quarters of a mile southwest of the city limits of Jefferson City, the state capitol. The woods were dominated by *Quercus alba, Carya tomentosa,* and *C. ovata,* with an understory of *Cornus florida* and *Sassafras albidum.* Acid-soil plants, such as *Ranunculus Harveyi,* were associated with the May-apple.

It was not long before we located several plants showing the maroon-colored fruits. Altogether nearly two-dozen plants of this form were seen in two separate colonies mixed with the ordinary yellow-fruited kind. A splendid opportunity was afforded here for noting the color differences in the field. We observed other characteristics besides the maroon-colored pericarp: the fleshy portion of the fruit was a sordid white suffused with a pinkish-lavender tinge, the seeds were maroon or dark vinaceous, somewhat similar in color to some apple seeds, the fruiting peduncle purplish, the tip of the rhizome reddish-purple, and the stems suffused with dull lavender. In contrast to this, the ordinary May-apple had a yellow-green or pale yellow pericarp, a white fleshy portion, yellow seeds, tip of the rhizome yellowish, and the stems and peduncle more predominantly yellowish-green.

Again in May of the following year the same locality was revisited in order to check on the nature of the flowering plants. Here the contrast was quite marked, as the petals of the maroon-fruited form were a delicate shade of pink or suffused with pinkish. Moreover, the stigma and ovary were of a deep or dark vinaceous color, whereas the short anthers were yellow and the filaments pale yellow. The peduncle, pedicel, and petiole were flecked throughout with lavender and the tip of the rhizome bud was a deep vinaceous color, as it had been in the fruiting specimen.

Herbarium material was collected on both trips from flowering and fruiting plants and is preserved in the Gray Herbarium, and the herbaria of the Missouri Botanical Garden and Chicago Natural History Museum. Living material from these collections was brought back to the author's wild flower preserve in northeastern Illinois. The plants are thriving, as are also those kindly sent to the author by Dr. Deam from his original colony. A careful examination of the Missouri plants leaves no doubt that they are the same as the Indiana forma *Deamii*, and comprise the second wild record within the natural range of the form.

The collection data for the Missouri specimens are as follows: *Steyermark 69987*, wooded (oak-hickory-flowering dogwood) slopes above small tributary at south end of Hough Park, a few hundred yards southwest of golf course hole no. 12, ½ mile south of limits of Jefferson City, T 44 N, R 11 W, west-central part of sect. 19, Cole Co., July 17, 1950, "about 20 plants seen in two colonies"; *Steyermark 71155*, same locality, May 6, 1951.

Although forma *Deamii* has as yet not been found in a wild state in Illinois, another variant in fruit color from Illinois was recently discovered by Mrs. Valerie Bordener, who called Mrs. Julian Steyermark's attention to an orange-colored form which she had found in a natural stand of woodland only a short distance from the author's home in the Biltmore Estates subdivision, north of Barrington, Lake County. She and the author's wife, Mrs. Cora Steyermark, collected fruiting specimens in 1950 from a colony of a dozen plants. The pericarp was of a rich apricot or mango orange color with yellowish-white flesh within. The seeds, however, unlike those of forma *Deamii*, are yellow as in ordinary *P. peltatum*. The peduncle is suffused with pale apricot orange. The rhizome and upper portion of the stem are yellowish-green, while the lower part of the stem is a pale brick color.

The following spring in 1951 I made observations of flowering material, but could detect no differences between the orange-fruited form and the ordinary kind with which it was growing. The plants were again checked in fruit during August, 1951 and the same plants showed the orange color of the pericarp as contrasted with the usual pale yellow color of surrounding specimens. All these plants grew in an upland forest dominated by *Quercus alba*, *Q. ellipsoidalis*, and *Carya ovata* on the upper slopes of a ravine bordering a small creek. In the same area occurs a natural stand of over two hundred plants of *Liparis lilifolia*. A couple of transplanted specimens of this may-apple are thriving in the author's wild flower preserve, and seedlings grown from the seed of this form are now in their second year and will be watched for future performance.

To commemorate the name of the general locality where the plants were discovered, this form may be known as,

Podophyllum peltatum, f. **biltmoreanum** Steyermark, f. nov., a typo differt pericarpio aurantiaco et carne luteo-albido.—North-facing open oak-hickory wooded slope on northeast side of creek, south of Eton Drive and west of Kimberley Road, on the property of George Foster, just southwest of Bordener's house, Biltmore Estates subdivision, 5 miles north of Barrington, Lake Co., Illinois, August 16, 1950, *Mrs. Valerie Bordener and Mrs. Cora Steyermark*, type, in Herb. Chi. Nat. Hist. Mus.—Chicago Natural History Museum and Missouri Botanical Garden.

STATUS OF PHRAGMITES COMMUNIS TRIN., VAR. BERLANDIÈRI (FOURN.) FERNALD ALONG THE SUDBURY RIVER IN EASTERN MASSACHUSETTS

Richard J. Eaton

This paper is contributed as an additional note on recent changes in the aquatic vegetation of the Sudbury River, primarily in the towns of Wayland, Sudbury and Concord, Massachusetts. Several years ago I published an article on this subject (Eaton, 1947) with particular reference to the weedy behavior of *Lemna minor* L., and *Trapa natans* L., and to the fading out of *Nymphaea odorata* Ait. The two former species prefer subneutral to slightly alkaline waters, whereas the latter thrives chiefly in neutral to slightly acid water overlying rich organic mud. These changes were correlated with marked concurrent increases in river pollution by alkaline sewage waters, a suggestion which has been generally accepted as a likely explanation of the observed phenomena.

Recent observations of the behavior of *Phragmites communis* Trin. var. *Berlandièri* (Fourn.) Fern. in the grassy meadows bordering the Sudbury River near Wayland add one more bit of information to the subject.

The North American variety of *P. communis* is considered an uncommon species in New England where it occurs chiefly near the coast on borders of brackish marshes, or on pond margins, etc., associated with underlying glacial clays. It appears to be very scarce inland in eastern Massachusetts, being cited as occurring inland only at Andover and S. Lincoln without reference to specimens (Boston District, 1913). Presumably the S. Lincoln station is on the Sudbury River meadows which border that town on the west. Until this year I have considered it a rare plant in the Sudbury River Valley. The Herbarium of the New England Botanical Club contains only one specimen from this area, collected in Wayland, July 31, 1859, by H. D. Thoreau. Although I have been familiar with these river meadows at all seasons of the year for about fifty years I never encountered *Phragmites* in the region until the winter of 1949–50, when I found a few scattered fruiting culms sticking up through the meadow ice on the west side of the river channel not far below the lower Wayland-Sudbury bridge. At that time I made an extensive survey on skates of a very large acreage of the meadows in order to ascertain the local distribution of the plant. Conditions were favorable for such a search, as the grass had not been cut for several years and the flooded meadows had frozen over for the first time a fortnight or so previously. No appreciable movement of the ice had occurred to shear off the embedded grasses. I found two small areas where scattered fruiting culms were exposed above the ice, both of them in the upper (Wayland) end of the meadows on the west side of the river channel.

This year on January 22, 1952, I made another survey on skates of the meadows on the west side of the river from the Concord line up to the Wayland bridge, a distance of about seven miles. No *Phragmites* was found below the areas noted in 1949–50, but fruiting culms were far more abundant in more extensive and numerous (four) patches. I returned two weeks later for specimens. The two additional colonies found this year were by far the most conspicuous. One of them, near the Wayland golf course on the east side of the channel, consisted of a narrow dense strip about thirty meters long; the other, across the meadows a third of a mile to the northwest, was a luxuriant growth about seventy-five meters long by twenty-five meters wide, and clearly visible through binoculars at a distance of a half mile. I am confident that these two patches did not fruit in 1949; otherwise I would not have overlooked them the following winter.

As judged by the winter occurrence of fruiting culms in this locality I think that *Phragmites* has prospered exceedingly well during the past few years and in all probability has increased strikingly in abundance and in vigor as well. During the past fifty years or more the Sudbury River meadows have been frequently explored by competent botanists. It is difficult to believe that it would have been overlooked by such men as M. L. Fernald, Emile Williams, A. W. Hosmer (of Concord) and many others, if formerly it had been as conspicuous and plentiful as now. (One large patch grows in the open meadow within fifty meters of the Wayland-Sudbury road.) Therefore, I hazard the guess that it has persisted sparsely in the area for a very long time in a depauperate and vegetative state, rarely fruiting until very recently.

Assuming that the status of this grass has in fact changed, it is reasonable to infer that it has done so in response to changed nutritional factors arising from increased sewage pollution. Fassett states that *Phragmites communis* in North America occurs mostly in brackish places (Fassett, 1940); Svenson characterizes it as an "indifferent halophyte" (Svenson, 1927); Fernald refers to it as commonly maritime (Fernald, 1910). Obviously, the acid soils and peats of central Middlesex County are not favorable to its proper development, whereas the annual flood waters of a heavily polluted stream, frequently stagnating on the meadows until well into May, are likely to furnish the alkalinity required for normal luxuriance.

In this connection, I am reminded of finding true *Potamogeton pusillus* L. (= *P. panormitanus* Biv.) in the Sudbury River near Wayland in the summer of 1933. Quoting from a note in RHODORA on the subject: "According to Fernald it shows a very striking preference for basic or slightly alkaline (or brackish) waters. Consequently it seems somewhat out of place in a sluggish river noted for its peaty meadows." (Eaton and Griscom, 1934.) In the light of my later *Lemna* article, the occurrence of this pond weed in the polluted river, infrequently if ever to be found in neutral to acid waters, seems less strange than when first collected. Even in 1933 the river was strongly polluted by sewage, as shown by chemical analysis (See Table of Water Analyses in Eaton, 1947). The increasing abundance of *Wolffia columbiana* Karst, another plant chiefly of alkaline waters, twelve miles farther downstream in Concord is also suggestive of vegetational changes in the river. It was first collected there in 1938, an eastward range extension from the general line, Lake Champlain-Connecticut River-western Connecticut (Eaton, 1939).

LINCOLN, MASS.

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The Type of Ulmus americana L.—The type of *Ulmus americana* L. has been a problem ever since the days of Asa Gray. So long as only one form of the white or American elm was recognized, the problem could be allowed to rest without disturbing taxonomists.

Now however since at least four different forms are recognized, a solution is more urgent. It becomes more important to ascertain which is the type and what are the distinctive characters of the type.

Dr. M. L. Fernald in proposing four forms stated: "so far as I can find, the actual type of Linnaeus has not been closely examined to determine to which of the four variations it belongs."[1] The photograph of the type which he had before him, he added, was "wholly inconclusive." (l.c.)

As war-time conditions doubtless made it impracticable to follow the matter further just then in order to solve the problem, the uncertainty continued through the publication of the eighth edition of Gray's Manual, which again described four forms without indicating which was typical.

Recently some correspondence with English botanists has thrown light on the question. I wish here to acknowledge with great appreciation the help of Mr. S. Savage, Assistant Secretary of the Linnaean Society of London, and especially of Dr. R. Melville, of the Royal Botanic Gardens, Kew. The latter has sent me conclusive information.

The first question is to determine with certainty what specimen is the type. In order to set forth the facts fully and avoid subsequent doubt on some points, three sheets in the Linnaean Herbarium may well be cited:

1. Sheet No. 321.1 needs to be mentioned only to eliminate it from consideration, as it is *Ulmus campestris* L. or, as that is regarded as a nomen ambiguum, it is better known as *Ulmus glabra* Huds. It has no bearing on the type of *Ulmus americana* L.

[1] Rhodora **47**: 132 (1945).

2. Sheet No. 321.2 is marked "2 americana" by Linnaeus. However, Asa Gray annotated it: "est Ulm. fulva Michx. A. G." Dr. Melville confirms the latter determination. *Ulmus fulva* Michx. is now regarded as a synonym of *Ulmus rubra* Muhl.

3. Sheet No. 321.3 has only "Ulmus" on the front in the handwriting of Linnaeus, but on the back he has written: "Ulmus altitudinis et crassitiei minori foliis latioribus rugosis Clayt. (n. 524)." Dr. Melville writes: "The reference in the Species Plantarum to Gronovius, Flora Virginica ties up with sheet 321.3 and the words on the back of the sheet referring to Clayton's no. 524 are repeated on p. 39 of the Flora Virginica, edition of 1762." If it were not for this annotation, there might be doubt as to whether this sheet or no. 321.2 should be chosen as the type.

Dr. Melville points out that "Linneus' conception of an elm species was very broad, for he included all the rough-leaved and smooth-leaved elms of Europe known to him in his *U. campestris* (Journ. Bot. **76:** 261, 1938). There is nothing incongruous therefore in the inclusion by Linneus of both the slippery elm and the American white elm under *U. americana.* The annotation on the back of the sheet and the reference to the Flora Virginica in the Species Plantarum leave no room for doubt that Linneus intended to include sheet no. 321.3 in *U. americana.* A choice must now be made between the two elements united by Linneus for the strict application of the name under the Rules of Botanical nomenclature. Fortunately it is possible to continue the long established usage of the name by selecting as the type of *U. americana* L. sheet no. 321.3. of the Linnean herbarium."

The second question is to ascertain which of the forms is the typical. Dr. Melville describes the type (no. 321.3) as follows: It is " 'Ulmus americana L.' as generally understood. It consists of a branch with fruits and young leaves. The leaves are glabrous above and are sparingly pubescent below, but this indumentum appears to be falling off and the leaves would be substantially glabrous on both sides at maturity. The young branchlets are glabrous. This sheet clearly represents *U. americana* L. f. *laevior* Fernald."

This information enables us to understand that typical *Ulmus americana* L. is the form with glabrous branchlets, and smooth (not scabrous) leaves, which Dr. Fernald (pending determination of the type) described as f. *laevior*. Forma *laevior* Fernald is therefore a synonym for typical *Ulmus americana* L.—FRANK C. SEYMOUR. TOMAHAWK, WISCONSIN.

A Color-form of Beech-drops.—The form of *Epifagus virginiana* (L.) Bart. in which the whole plant instead of its usual brown-madder shade is pale straw-colored to yellowish has been described by C. A. Weatherby as f. *pallida*, and is occasional in the White Mountain region, e. g., in Randolph and Gorham, N. H. For another even more striking color-variant, however, in which the whole plant (except the corolla) has a black-purple hue, there seems to be as yet no designation, and for convenience of reference it may be characterized as

Epifagus virginiana (L.) Bart., f. **atropurpurea** n. f., caulibus et squamis calycibusque atropurpureis.—Maine, Bickford Trail, Stow, 30 Aug., 1951 (*Pease*); New Hampshire, Randolph, 8 Sept., 1920 (*Pease 18087*, type) in N. E. B. C.

With these color-forms of *Epifagus* may be compared several in *Corallorhiza*, discussed by H. H. Bartlett in Rhodora, 24 (1922), 145–148, and by M. L. Fernald in Rhodora, 48 (1946), 197.—Arthur Stanley Pease, Randolph, N. H.

Stages in the Evolution of Plant Species[1]:—In a series of essays first presented as lectures under the Messenger Foundation at Cornell University, Clausen has brought together material and points of view largely derived from his own work on *Viola* and that of his research group at the Carnegie Institution of Washington on a number of plants, particularly of the Compositae. A fair proportion of the material covered in the book has appeared in print elsewhere, but there are a number of new illustrations, maps, charts, and diagrams. Furthermore, the subject matter has been considered in a logical sequence and from several points of view, although cytogenetics and experimental taxonomy have dominated the author's thinking. The following chapter headings give an idea of the book's contents: the evolution of our concepts of speciation; the local population as the basic evolutionary unit; the evolution of ecological races; the genetic systems of ecological races and morphological subspecies; the evolution of interspecific barriers; the evolution of groups of species; the physiologic-genetic species concept and the dynamics of the evolution of species and genera. The last chapter is significant because it represents an attempt to shift some of the emphasis from the negative aspects of the species problem to the positive. This is a trend that is long overdue and it is to be hoped that further information will be forthcoming from the laboratory of Dr. Clausen. On the whole, scientists interested in the genetic phases of speciation have in recent years been overly occupied with studies concerning barriers between species rather than with the nature of the species themselves.—R. C. Rollins.

[1] *Stages in the Evolution of Plant Species.* By Jens Clausen. viii + 206. Cornell University Press, Ithaca, 1951. $3.50.

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PHIPPSIA ALGIDA IN THE UNITED STATES

William A. Weber

The Central Rocky Mountains of Colorado occupy a focal position in studies of post-Pleistocene plant geography because they provide a residual Pleistocene environment of considerable area suitable for the maintenance of a number of plants primarily arctic and subarctic in distribution. Close inspection of certain areas in the Colorado Rockies in recent years by various botanists, notably C. W. T. Penland, Walter Kiener, and R. C. Barneby, has demonstrated that there are several centers of concentration of arctic-alpine epibiotics in the Colorado flora where a remarkable number of extremely rare species occur widely disjunct from their nearest arctic stations. Among the most notable rarities are *Armeria maritima, Aulacomnium turgidum, Braya* sp., *Crepis nana, Cystopteris montana, Eutrema penlandii, Gymnomitrium corallioides, Luzula sudetica, Ranunculus gelidus, R. pygmaeus,* and *Rubus acaulis.* The principal centers of concentration are the region of Hoosier Pass, Gray's and Torrey's peaks, Mount Evans, the Rabbit-Ears range, the Elk Mountains of Gunnison County, and Pikes Peak.

Phippsia algida (Phipps) R. Br., a tiny grass, was one of the first of these arctic rarities to be found in Colorado. Harry N. Patterson collected it in 1875, somewhere in the Clear Creek District west of Denver. Unfortunately, the citations in the literature with respect to Patterson's collection are not in harmony: "summit of Gray's Peak" (Hitchcock, Man. Grasses of U. S.); "Chicago Lake, near Georgetown" (Rydberg, Flora of Colorado); "high mountain peaks of Colorado, and probably Wyoming" (Coulter & Nelson, Manual of Rocky Mountain

Botany). Patterson's specimens were distributed among eastern herbaria and possibly to herbaria in Europe, but not a single specimen found its way into a herbarium in the Rocky Mountain region. This was unfortunate, because it now appears that considerable time and energy expended in efforts to rediscover *Phippsia* might have been saved had there been a readily available sheet of the original collection in a local herbarium.

In view of the fact that *Phippsia* was never collected elsewhere in the United States, nor was even represented in herbaria of the region in which it was first collected, the species has aroused considerable interest among Rocky Mountain botanists during the past half-century.

When a species is found only once in an area despite constant botanizing by many people over a period of 75 years, questions naturally arise as to whether it might have become extinct, or whether the plant really was collected in the area in the first place. With alpine species, such questions are tantalizing but solutions are seldom forthcoming because of the vastness and high degree of inaccessibility of the terrain above timberline. A collector's itinerary may be traced in regions where there are well-marked communities, trails, or roads, but on the tundra it is hard to guess at the direction a former collector was most likely to have taken. Even if this were possible, one might easily pass within a few yards of a coveted species without seeing it.

Phippsia, I am convinced, is about the most elusive alpine fugitive that could be imagined. It is extremely small, it possesses no outward distinctiveness of its own, and it grows in a region where numbers of other species might be easily mistaken for it. *Phippsia* is what some botanists would call a "belly-plant," standing only a few centimeters high (1–2 cm. in our specimens), having rather glaucous green, soft, smooth leaf-blades with boat-shaped tips, as in *Poa.* In the vegetative state it might be passed over for a small *Poa*, such as *P. annua*. The inflorescence is a rather tight, short, inconspicuous panicle hardly exceeding the leaves. The spikelet is one-flowered, and the diagnostic features are the very unequal glumes which are much shorter than the floret. The first glume is sometimes lacking. Considering the minute size of the plant, its drab appearance, our lack of specimens readily available for comparison, the absence of precise locality, habitat, or phenological notes which might have served as guides, and the rugged, trackless nature of the terrain in the Georgetown area, it is easy to see why the search for *Phippsia* has been prolonged and unrewarding.

This article, however, is written not as an obituary to the wasted efforts of botanists who over the years have tried and failed. On the contrary, we now are able to report that the mission, at long last, has been successful and that the occurrence of *Phippsia* in the United States is verified. The circumstances of the discovery and the events leading up to it are recorded here in order to aid botanists in future searches elsewhere in the Rocky Mountains, and to bring into sharp focus the importance of careful recording and citation of collection data.

During the past six years I have been keenly interested in the *Phippsia* problem, and have sought *Phippsia* on all of my excursions above timberline. Following Hitchcock's citation, my efforts were concentrated upon the slopes of Gray's Peak, a 14,000-foot spire in east-central Colorado. The summit of Gray's Peak, if the citation is to be taken literally, is hardly a habitat for this grass, for above 13,500 feet the mountain is a barren, dry boulderfield offering hardly a foothold for anything, much less a semi-aquatic grass species such as *Phippsia* seems to be in its arctic habitat.

Unable to discover the grass in numerous trips to the Gray's Peak region, I naturally went to the literature in order to see if there might be any light forthcoming from the citations. Rydberg's Flora of Colorado happened to provide the key to the whole situation, although I didn't realize this at first. Rydberg's citation reads, "Chicago Lake, near Georgetown." It so happens that Chicago Lake is not on Gray's Peak nor even near it, but is a high alpine lake on the slopes of Mount Evans, about ten miles farther east.

This bit of information suggested that an examination of Patterson's original specimens might be in order, because the citations of Hitchcock and Rydberg were obviously contradictory. Dr. Julian Steyermark very kindly provided me with a facsimile label from the specimen in Field Museum. This is one of Patterson's characteristic printed labels, and reads in part as follows: "Colorado Flora—Mts. about the head waters of Clear

Creek—Alt. 11–14,000 feet. High mountains, Gray's Peak and vicinity. H. N. Patterson Sept. 2, 1885." This evidently, was the portion of the label which Hitchcock chose to cite in the Manual of Grasses. However, there is a slight addition to these data, written in Patterson's own hand, as follows: "wet places, alt. 1000 ft. above (s. of) Upper Chicago Lake." This was the portion of the label which Rydberg chose to cite in his Flora of Colorado. As is often the case with the older collections, the printed label contained rather general information and could be used for plants from any locality within a large general area, whereas any additional specific information was written in by hand. Here, apparently, was the specific information we needed. It seemed obvious that our efforts should be withdrawn from Gray's Peak and directed to the Chicago Lake Basin on the north-east slope of Mount Evans.

Hoping to duplicate as closely as possible the collecting date on which Patterson found *Phippsia*, Dr. T. P. Maslin, Dr. Sam Shushan and I drove to Mount Evans on September 4, 1951. We found that the excellent highway to the summit of Mount Evans skirts a high ridge directly east of the Chicago Lakes basin, and at Summit Lake it approaches a saddle from which the lakes may be seen from a point just about "*a thousand feet above (south of) the upper Chicago Lake.*" After descending a short way into the cirque, we were unable to locate any likely sites for *Phippsia*, and were almost ready to chalk up another wasted afternoon. We sat on the rocks along the shore of Summit Lake to eat our lunch and to meditate upon the futility of botanical exploration. After lunch we all felt better about the situation and decided to walk around Summit Lake for one last look. The rest is history. For *Phippsia* was waiting for us in the beds of the small inlet streams feeding Summit Lake. It is hard to describe our consternation. After all the arduous climbs up into inaccessible cirques and couloirs, risking life and limb in a futile search, we now found our plants in full view of the highway and practically on a level with it; in fact, within easy walking distance of the Summit Lake shelter house.

There were certain aspects of the plants and of their habitat that should be noted. These plants form loose tufts in the drying beds of small inlet streams feeding Summit Lake. It is my opinion that the entire plant is probably submerged during most of the year, either covered by snow or by the nearly-freezing water of snow-runoff. When we found the species in early September, the inflorescences were just beginning to emerge from the "boot." Very often, only the distal portions of the leaf-blade are visible because of the sand which is constantly washed over the plants. *Phippsia* is the only vascular plant that grows right in the stream channels.

The extreme rarity of *Phippsia* in the region may be due to the scarcity of relatively level wet areas at the high altitudes at which it grows. High lakes with gently sloping boggy margins are not common. It is probable that at the Summit Lake locality there exists a complex array of climatic and edaphic conditions and seasonal rhythms which are rarely met with elsewhere and which are not easily detected by our present tools of ecological analysis.

It is also possible that future exploration may show that *Phippsia* is more common in the Colorado Rockies than is now assumed. I personally doubt this, but the fact remains that, by and large, the alpine regions of Colorado are still relatively unknown botanically. The discovery of any new areas of relict concentration may change the picture radically.—University of Colorado.

STUDIES IN THE GENUS EUPHRASIA L.—III[1]

E. O. Callen

Euphrasia arctica Lange

In a review of the origin and validity of the name *Euphrasia arctica*, Fernald (1933) pointed out that Linnaeus, and subsequently Willdenow, described *E. latifolia* from southern Europe and northern Africa, but that the plant now belongs to the genus *Parentucellia* as *P. latifolia* (L.) Caruel. In 1814 Pursh identified a Labrador plant (from the Dickson Herbarium) as *E. latifolia*, and for his Flora Americae Septentrionalis he copied Willdenow's description, but added this comment at the end:—"flowers smaller, pale purple." As a result, when identifying Canadian

[1] Previous papers in Journal of Botany 78 (933): 213–218, 1940; and vol. 79 (937): 11–13, 1941.

Rocky Mountain material collected by Drummond, Hooker (1838) attributed the name to Pursh.

In 1870 Rostrup clearly and validly published *E. arctica* Lange in a list of the plants from the Faeroe Islands, and mentioned that Prof. Lange had found the plant to be fairly common in Greenland and Iceland. Later however, in the text of his Flora Danica, Lange (1877) abandoned the name *E. arctica* in favor of *E. officinalis*, var. *latifolia* (Pursh) Lange, after discovering the Hooker record of *E. latifolia* from the Rocky Mountains, though the actual plate for the Flora Danica was obviously made from typical Greenland material. The name *E. arctica* itself he reduced to a synonym.

Fortunately the Drummond material from the Rocky Mountains, called *E. latifolia* Pursh by Hooker, still exists in the Gray Herbarium, and Fernald (1933) determined it to be *E. disjuncta* Fernald & Wiegand. Unfortunately the material from the Dickson Herbarium, on which Pursh based his description, cannot now be traced. However, Fernald (1933) pointed out that the only Labrador species with small purple flowers are:—*E. williamsii*, var. *vestita*, *E. purpurea* and *E. purpurea*, var. *randii*.

In 1896 Wettstein revived the name *E. latifolia* Pursh, giving a very full description of the plant. He had examined a good deal of material from Greenland, as well as from Iceland and Labrador, all apparently belonging to one species, though a variable one. His conception of this species, therefore, is based largely on Greenland material, and as he had seen no material from Labrador referable to any other species, and as no other species had been described from Labrador, he felt that the name *E. latifolia*, by then unoccupied again, should be used in preference to creating a new one and so cause further confusion in the synonymy. Thus *E. latifolia* Pursh ex Wettstein came into general use, and though Wettstein was aware of the existence of the name *E. arctica*, the fact that Lange abandoned it himself in 1877, drew attention away from it. However, under the International Rules of Botanical Nomenclature (1930), *E. latifolia* Pursh ex Wettstein constitutes a homonym, and as such is invalid. This leaves *E. arctica* Lange as the first valid description of the plant from Greenland, Iceland and the Faeroe Islands, and as we now know, from eastern and north-eastern Canada.

In his Revision of the British Euphrasiae, Pugsley (1930) followed Wettstein in the use of the name *E. latifolia* Pursh, but while the paper was in press, the resolution rejecting homonyms was passed by the Fifth International Botanical Congress. He therefore decided to substitute a new name, *E. frigida* (1930), adding it as a footnote during proof correction, without however specifying a type. The late A. J. Wilmott, Curator of the British Herbarium of the British Museum, London, informed the writer in 1940 that he had persuaded Pugsley to designate a lectotype on one of the four sheets of *E. latifolia* from the Wettstein Herbarium that had been borrowed from Vienna for that purpose. Nevertheless it is quite clear that *E. arctica* Lange has priority over *E. frigida* Pugsley, even although there has been no actual type designated.

With *E. frigida* identified as the subglabrous *E. arctica* of Iceland, Greenland and Canada, the question naturally arises, has the more or less pubescent form of *E. arctica*, as originally described by Rostrup, been described from Britain or northern Europe? An examination of exsiccatae leaves no doubt that it has been described as *E. marshallii* Pugsley from Britain, and as *E. latifolia*, var. *subcurta* E. Joerg. from Norway. Pugsley's concept of *E. latifolia* Pursh ex Wettstein was of a glabrous or subglabrous taxon, which he renamed *E. frigida*, narrowing down Wettstein's concept, that included both glabrous and pubescent individuals. Subsequently however, after seeing material from Iceland, Pugsley (1933) incorporated Joergensen's *E. latifolia* var. *subcurta* into his *E. frigida* as var. *subcurta* (E. Joerg.) Pugsley, thus broadening his original conception of *E. frigida* and bringing it into line with Wettstein's interpretation. It is interesting to note that some of Marshall's material, which formed the basis of Pugsley's *E. marshallii*, was submitted to Wettstein at the time of collection, and was identified as *E. latifolia* Pursh.

In contrasting *E. frigida* (as *E. latifolia*) with *E. marshallii*, Pugsley (1930, p. 497) pointed out how the former is "—a lax, much less hairy plant,—." Later (1933) he admitted that what he had described as *E. frigida* from Britain, should really have been described as a variety of the European *E. latifolia* Pursh, which he now wished to call the typical *E. frigida*. Until 1933

Pugsley's concept of *E. frigida*, as we now see from his own admission, was so narrow, that of necessity he had to give specific rank to the very pubescent plants of the Scottish sea cliffs and shores.

This conception of a species with pubescent and glabrous forms was accepted by Pugsley in some other taxa, though mainly after he had published his Monograph (1930), as for example in the case of *E. curta* Fries (pubescent) and its var. *glabrescens* Wettstein (or f. *glabrescens* Wettstein as Pugsley sometimes wrote it, though this form should more correctly be attributed to Pugsley). In *E. brevipila* B. & G. (with some setae, bristles and short-stalked glands), and its f. *subeglandulosa* Bucknall (setae and bristles only) and var. *notata* Pugsley (densely covered with long-stalked glands) there is quite a range of pubescence. Bucknall's f. *subeglandulosa* was only used by Pugsley on herbarium sheets in the post 1930 period.

During the course of correspondence with the late A. J. Wilmott, while he was evolving his scheme for the identification and study of critical groups (Wilmott 1950), it became evident that in British material, the degree of pubescence may vary considerably within specific limits. This had already been noted for some species by Wettstein in his Monograph. In a study of the Kashmir Eyebrights, Pennell (1943) found three species (*E. platyphylla* Pennell, *E. foliosa* Pennell and *E. kashmiriana* Pugsley) where pubescence was quite variable. Among the North American representatives of the genus, Fernald and Wiegand (1915) found the same thing in *E. williamsii* Robinson, *E. purpurea* Reeks and *E. arctica* Lange. Turning to the Scottish material, Pugsley separated *E. marshallii* from *E. latifolia* (*E. frigida*) largely on the basis of the pubescence which, in the light of our knowledge of the genus as a whole, is insufficient grounds for the creation of a new species.

E. arctica is relatively common on the coastal regions of eastern and northern Quebec, Newfoundland, Baffin Island, Greenland, Iceland, the Faeroe Islands, Scotland (including the Orkney and Shetland Islands), Norway, Sweden, Finnland and Lappland. The range is believed to extend into Siberia, but verification of this is virtually impossible. It is a very variable species, as was recognized by Wettstein. Joergensen also found it so variable, that when he published his Die Euphrasia-Arten Norwegens (1919), he created five varieties and one form, all based on Norwegian material alone. He had had an opportunity of examining material from Greenland, Iceland, the Faeroe Islands, Newfoundland and Alaska, lent to him by the Botanical Museum of the University of Copenhagen. Much of it he found was glandular, especially when collected from damp grassy locations, and sometimes the plants were covered with a felt-like mass of long white hairs, without glands. He did not attempt to apply varietal names to any of this material however.

In 1933 Pugsley reviewed this species again, also having had an opportunity of examining material from the Botanical Museum of the University of Copenhagen, much of it from Greenland, Iceland and the Faeroes, and probably the material seen by Joergensen. It was then that he realized the narrowness of his conception of *E. frigida* (*E. latifolia*). The only variety created by Joergensen that he adopted was var. *subcurta*, easily recognizable on account of its pubescence. He created four additional varieties.

In 1940 Polunin added var. *minutissima* from Greenland, which Rousseau (1942) reduced to the status of a form, as he felt sure that it represented a growth form due to exposure only.

Also in 1940, Nordhagen published his Norsk Flora in which the genus *Euphrasia* is largely a summary of Joergensen's paper (1919). However, he incorporated Joergensen's *E. minima* Jacq. and *E. latifolia* Pursh into *E. frigida* Pugsley, and divided it into two "types." The first is the "minima type," small leaved and small flowered, with short, weak, unbranched stems, which corresponds to Pugsley's var. *laxa* and Joergensen's var. *obtusata*, and the "latifolia type," much stouter, with large leaves and flowers, often with considerable pubescence on both surfaces of the leaves, which corresponds with Joergensen's var. *subcurta* and Pugsley's *E. marshallii*, and which represents *E. arctica* Lange, var. *arctica*. Nordhagen recognized two varieties however, as being sufficiently distinct—*E. latifolia*, var. *inundata* E. Joerg. and *E. minima*, var. *palustris* E. Joerg. For this latter variety, no particulars of calyx, flower or capsule are given.

In 1943 Montell recorded *E. frigida* Pugsley, var. *palustris* (E. Joerg.) Nordh. for Finland, and added a new taxon, *E. frigida*, var. vel. f. *purpurea*, based simply on plants with purple flowers. He also mentioned a f. *eglandulosa* Wettst. of *E. frigida*, which it has not been possible to trace in Wettstein's monograph, nor in Pugsley's and Nordhagen's papers on *E. frigida*.

More recently three new species of *Euphrasia* were described by Pugsley (1945) from the Hebridean Islands off the Atlantic coast of northern Scotland. Through the kindness of Dr. George Taylor, Keeper of Botany, British Museum, London, photographs of these Pugsley type specimens have been obtained, and there is no doubt that *E. eurycarpa* Pugsley, with its small flowers and short lower lip, and the deeply emarginate capsules exceeding the calyx teeth, is the northern arctic form described by Joergensen as *E. latifolia*, var. *submollis*, and by other authors under other names to be mentioned presently.

The paper by Joergensen (1919) is well illustrated, while that of Pugsley (1933) contains neither figures nor plates. In the latter case however, for most varieties, illustrations are quoted from other sources. A careful examination of the descriptions, plates and material leads to the conclusion that there is needless duplication of varietal names, and that in reality there are only five varieties of *E. arctica*.

Lange described *E. arctica* as having visco-puberulent foliage, and in North America this is recognized as the typical form of the species. It therefore seems clear that the plant described by Joergensen and Pugsley as var. *subcurta* really is the species proper.

Euphrasia arctica. Lange ex Rostrup 1870

Folia visco-puberula, reniformi- vel cordato-orbicularia, obtusissime crenata, margine revoluta; bractae majusculae, sensim acutis crenatae v. serratae; flores subcapitato-congesti.

The chief points for identification are: branching from the middle of the stem or lower, branches erect, sometimes branching again; plants generally flowering from the 7–10 nodes. Cauline leaves generally caducous. Floral leaves broadly ovate to obtuse, medium to dark green, 5–15 mm. long, with 5–6 subacute to acute (but never acuminate) teeth per side. All more or less densely covered on both surfaces (or only on the margins and nerves of the lower surface) with short or long, strong, whitish bristles, sometimes with an admixture of short-stalked glands. Calyx clothed like the leaves, with rather long, acute teeth, accrescent in the fruit. Corolla small to medium, exceeding the bracts (floral leaves), 4–8 mm. long dorsally, white, with more or less lavender upper lip; lower lip exceeding the upper. Capsule elongate elliptical, 6–8 mm. long, deeply emarginate, equalling to exceeding the calyx teeth, slightly pilose above, as well as ciliate, distinctly pedunculate.

A great deal, though not all, of the material from north of the 60th parallel possesses an admixture of short-stalked glands.

Only the synonymy relevant to the problem discussed here is included. For the complete synonymy the works of Wettstein (1896), Fernald & Wiegand (1915), Joergensen (1919), Pugsley (1930) and Fernald (1933) should be consulted, and Lange (1877), Wettstein (1896), Joergensen (1919) and Pugsley (1930) for figures and plates.

In the following paragraphs the location of the herbarium material mentioned is as follows: "N" in the Herbarium of the National Museum of Canada, Dept. of Mines and Resources, Ottawa; "B" in the Herbarium of the Division of Botany and Plant Pathology, Dept. of Agriculture, Ottawa. The writer is indebted to the officers in charge of these Herbaria for permission to borrow material.

E. arctica, var. **arctica**

E. latifolia Pursh (non Linnaeus) (1814); *E. officinalis,* var. *latifolia* (Pursh) Lange (1877); *E. latifolia,* var. *subcurta* E. Joergensen (1919); *E. marshallii* Pugsley (1929); *E. frigida,* var. *subcurta* (E. Joerg.) Pugsley (1933).

Icon. Lange (1877) tab. mmdccccx.

Exsicc. see Wettstein (1896), Joergensen (1919), Pugsley (1933). Type: **Faeroe Islands,** Sandyford, Stromö, 31 August 1867, E. Rostrup (in Herb. Haun.). **Canada:** Lewis, H. F., Natashquan, Saguenay Co. Que., 5 Aug. 1927 (N); Collins, J. F., Fernald, M. L. & Pease, A. S., 70048, between Baldé and Baie des Chaleurs, Que., 5/8 Aug. 1904 (N); Adams, J., Anticosti. Que., 1933 (B). **Greenland:** Rosenwinge, L. K., Fgaliko, Greenland, 2 Aug. 1888 (ex Herb. Haun.) (N).

Plant more or less stout, branching below the middle of the stem. Floral leaves large, with short or long, strong, white bristles on the margins and on the nerves of the lower surface (sometimes more or less densely covering both surfaces). Calyx clothed like the leaves. Corolla medium, 6–8 mm. long dorsally, white with lavender upper lip, lower lip exceeding the upper. Capsule emarginate, equalling to slightly exceeding the calyx teeth.

Under the International Rules accepted in 1950, this variety delimits more clearly the plant first described by Lange and recognized as the typical *E. arctica*.

E. arctica, var. **obtusata** comb. nov.

E. latifolia, var. *obtusata* E. Joergensen (1919); *E. frigida* Pugsley (1930); *E. frigida*, var. *laxa* Pugsley (1933); *E. frigida* "minima typen" Nordhagen (1940).

Icon. Joergensen (1919) pl. IX, o–r; Pugsley (1930) pl. 27, a–e.

Exsicc. see Joergensen (1919) and Pugsley (1933). Type: **Norway,** Sörkjosen in Nordreisa, Tromsö Amt, 13 Aug. 1908, E. Joergensen. **Canada:** Calder, J. A., No. 2222, Crystal Island, Fort Chimo area, 58° 07′ N–68° 23′ W, Que., 1 Aug. 1948 (B); Rousseau, J. & Boivin, B., No. 32236, Restigouche River, Que., 25/26 Aug. 1929 (N); Fernald, M. L. & Pease, A. S., No. 25273, Seacliffs, W. of Marten River, Gulf of St. Lawrence, Gaspé Co., Que., 25 July 1922 (N); Waghouse, Rev. A., No. 14474, Fox Harbour, Labrador, July 1881 (N). **Greenland:** Sörensen, Th., No. 4699, Terneskaer Island, 73° 55′ N–21° 00′ W, 26 July 1933 (N); Porsild, A. E., No. 304, Warmsprings, Engelskmandel Havn, S. coast of Disko Island, nr. Godhavn, 69° 14′ N, 27/28 July 1937 (N). **Scotland:** Callen, E. O., No. 537 & 541, Stobinian, Perthshire, 5 Aug. 1940 (Herb. Callen).

Graceful, sometimes flexuose, often unbranched stem with very long internodes in the middle of the stem, and very short upper ones, giving imbricate floral leaves. Pubescence generally slight, and confined to the margins of the leaves and the calyx, and the nerves of the underside of the leaf and of the calyx. Calyx broad. Capsule elongate-elliptical, emarginate, often deeply so, and exceeding the calyx teeth. Flowers medium, 6–8 mm. long dorsally.

Pugsley described this as the "Scottish" or mountain form, and mentioned (1933) that it appeared to be common in Norway, and that it was to be found in Sweden and Lapland, as well as Greenland, Iceland and the Faeroes. In his Monograph (1930) he suggested (p. 491) that *E. latifolia*, var. *obtusata* E. Joerg. of Norway might be the same as the British *E. latifolia*, though he did not take this up again in his later paper (1933). Nordhagen's use of the term "minima typen" recalls the fact that Pugsley (1936) placed the British *E. latifolia* (as *E. frigida*) close to *E. minima* Jacq. in his classification of the genus *Euphrasia* section *Semicalcaratae* Benth., and that therefore in interpreting "minima typen," the var. *obtusata* appears to be the one that would most often be intended.

Joergensen never cited types for his plants, so under the International Rules, the first specimen mentioned* by him becomes the type.

*We have not been able to substantiate such an assumption.—Eds.

E. arctica, var. **submollis** comb. nov.

E. latifolia, var. *submollis* E. Joergensen (1919); *E. marshallii*, var. *pygmaea* Pugsley (1930); *E. frigida*, var. *pusilla* Pugsley (1933); *E. arctica*, var. *minutissima* Polunin (1940); *E. arctica*, f. *minutissima* (Polunin) Rousseau (1942); *E. eurycarpa* Pugsley (1945).

ICON. Wettstein (1896) tab. XI, f. 12; Pugsley (1930) pl. 28, h.

EXSICC. see Joergensen (1919), Pugsley (1930, 1933, 1945) and Polunin (1940). TYPE: **Norway,** Insel im Flusse Altenelv, Alten, Finmarken Amt, 20 July 1913, O. D. **Canada:** Wynne-Edwards, V. C., No. 7306, Forbisher Bay, Yorke Island, Baffin Land, 2 Aug. 1937 (N); Malte, M. O., No. 119138, Wakeham Bay, Hudson Strait, 61° 40′ N–72° 05′ W, Que., 29 Aug. 1927 (N); Malte, M. O., No. 120163, Port Burwell, Hudson Strait, 60° 22′ N–64° 50′ W, Que., 25/28 July 1928 (N); Polunin, N., No., 1532, Sugluk West, Que., 31 July 1936 (N).

Plant small, flowering from the second or third node above the cotyledons. Leaves (cauline and floral) pubescent, often (but not always) with an admixture of short-stalked glands. Calyx clothed as the leaves. Flowers small, 3–4 mm. long dorsally, lower lip scarcely developed. Capsule more or less deeply emarginate, exceeding the calyx teeth.

This is the northern arctic variety of the species. Neither Joergensen nor Pugsley have given complete data of their varieties, but there seems to be no doubt that they were dealing with the same taxon in each case. Polunin's material is minute (p. 212), and some of Pugsley's var. *pusilla* is very stout, but these are probably extreme growth forms as suggested by Rousseau (1942), which in the present state of our knowledge of the whole *E. arctica* complex, should remain undesignated till the limits of the varieties are more clearly understood.

This variety is now known from Norway, Scotland, Iceland, Greenland and Canada, and although some of these countries are not arctic, the flora of their higher mountains is of the arctic-alpine type.

E. arctica, var. **inundata** comb. nov.

E. latifolia, var. *inundata* E. Joergensen (1919); *E. frigida*, var. *attenuata* Pugsley (1933); *E. frigida*, var. *inundata* (E. Joerg.) Nordhagen (1940).

ICON. Joergensen (1919) fig. 16; Taf. IX, f, k, l; Taf. XI, a.

EXSICC. see Joergensen (1919) and Pugsley (1933). TYPE: **Norway:** Nahe der Mündung des Flusses Reisenelv, Sörkjosen in Nordreisa, Tromsö Amt, July 1905, Elm, Peters & Selander. **Canada:** Hosie, Losee &

Bannan, No. 2150, Wilson Island, off Rossport, Thunderbay District, Ont., 15 July 1937 (N); Hosie, Losee & Bannan, No. 2149, beach nr. Schreiber, N. shore, Lake Superior, 48° 45′ N–87° 15′ W, Thunderbay District, Ont., 20 July 1937 (N); Baldwin, Hustich, Kucyniak & Tuomikoski, No. 1037, nr. Sandy Point, Great Whale Lake, E. coast, Hudson Bay, Que., 15 August 1947 (N).

Plants with long internodes and small leaves. Flowers small. Calyx teeth acute or less. Capsule narrowly oblong, up to 8 mm. long, narrow above, greatest breadth about the middle, subtruncate or slightly retuse, clearly exceeding the calyx teeth.

This variety is found in moist situations, and even in areas flooded by river water. It has been found in Norway, Iceland and Canada.

E. arctica, var. **stromoensis** comb. nov.

E. frigida, var. *stromoensis* Pugsley (1933).

Icon. none.

Exsicc. Pugsley (1933). Type: **Faeroe Islands:** Havnedal, Stromö, 1903, Ostenfeld (in Herb. Haun.).

Plant small, robust, slightly pilose, lower internodes very short, and branching from the lower nodes. Corolla small, 4–5 mm. long dorsally. Capsule oblong-elliptical, strongly emarginate. Pugsley does not state the relationship of the capsule and the length of calyx teeth.

This plant does not appear to have been described from Norway or Britain, though plants that seem to resemble it have been seen from Perthshire, Scotland. Until the type specimen and the British Museum material from the Pugsley Herbarium can be examined, this cannot be certain however. This variety has not been seen from Canada.

Rejected Varieties

E. latifolia, var. subfoulaensis E. Joerg.—this a curious name to choose for a variety, as *E. foulaensis* is closely related to *E. latifolia,* but it points up the confusion that existed amongst European botanists as to the correct identity of *E. latifolia* Pursh ex Wettstein and *E. foulaensis* Towns., until they were redefined by Pugsley in 1930. Joergensen admitted that this variety is difficult to distinguish from *E. micrantha* Reichenbach, and that it is probably a hybrid with this species. The characters that are given for this variety, suggest that there is more of the *E. micrantha* parentage in its make up, than of the *E. latifolia* parentage. There appears to be no justification for including it as a variety of *E. latifolia,* as the general appearance of the plant suggests *E. micrantha* very strongly. It differs from the latter chiefly in the longer lower internodes, and in the much larger coarser leaves.

E. FRIGIDA, var. PALUSTRIS (E. Joerg.) Nordhagen—these plants bear a close resemblance to *E. scotica* Wettstein, which Nordhagen himself admits (p. 581), and here also it would seem best to place this plant under *E. scotica*, with a note that it might be of hybrid origin.

E. MINIMA, var. PILOSA Hagelund ex E. Joergensen—was ignored by Nordhagen when he amalgamated Joergensen's *E. minima* Jacq. and *E. latifolia* Pursh under *E. frigida* Pugsley. From the description given, this might be *E. arctica*, var. *submollis*, but the description is lacking in a number of details to make this reasonably certain.

E. FRIGIDA, var. vel f. PURPUREA Montell—at most this is a form with purple flowers, that for the present will have to be left in abeyance till the different varieties of *E. arctica* are more clearly understood. This applies also to the forms of *E. latifolia* and *E. frigida* described by other authors.—MACDONALD COLLEGE, MCGILL UNIVERSITY, MONTREAL, QUE.

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NOMENCLATURAL AND OTHER NOTES ON MOSSES—II

Herbert Habeeb

The following notes cover a few interesting things recently encountered in the processing of some New Brunswick specimens of mosses.

Fissidens cristatus Wils., forma **immarginatus,** n.f., differt a species margine pellucida folliorum deficente.—New Brunswick: hanging from ledge in a crevice in canyon at Grand Falls, Victoria County, *Habeeb 279* (type), May 5, 1944.

I see no reason why the form possessing leaves without the hyaline margin should not be recognized.

Myurella Careyana Sull., var. **tenella,** var. nov., plantae parvulae, tennerimae, flagelliferae; folliis lanceolatis, cellulis papillosis; cum habitum *Amblystegiellae.*—Small, thin, flagelliferous plants; leaves lanceolate and serrate, cells strongly papillose; with the habit of *Amblystegiella Sprucei.*—New Brunswick: *Habeeb 821,* on damp rock in deep shade of canyon, July 3, 1947, Grand Falls, Victoria County.

Without the field knowledge of habitat and associated plants, this would have been rather difficult to place.

Hygrohypnum molle (Schimp.) Loeske *Habeeb 951, 952,* York County, New Brunswick; *1641,* Albert County, New Brunswick, this has rather strong costae in its leaves.

Hygrohypnum molle (Schimp.) Loeske, var. **Bestii** (Ren. & Bryhn), stat. nov. *Hypnum (Limnobium) Bestii* Ren. & Bryhn, Rev. Bryol. **28:** 8 (1901). *Hygrohypnum Bestii* (Ren. & Bryhn) Holzinger,[1] The Bryologist **4:** 12 & 22 (1901). *Hygrohypnum Bestii* (Ren. & Bryhn) Broth., Engler & Prantl Musci (Ed. I) **2:** 1040 (1908). *Habeeb 1640,* Albert County, New Brunswick; *1639, 1642, 1643* and *1644* are turgid and possess secondary stems inseparable from the species, Albert County, New Brunswick; *918,* Victoria County, New Brunswick, turgid without secondary shoots.

[1] On looking back into the early files of The Bryologist, one finds that using the exact letter this could be cited as *Hygrohypnum Bestii* (Ren. & Bryhn) Holzinger apud Grout et Smith in Editor's footnote to Holzinger, The Bryologist 4: 22 (1901). In place of this complex citation, Grout in the Moss Flora of North America North of Mexico, Volume III, used that of Brotherus of 1908.

At a spring in the hills near Alma, Albert County, New Brunswick, the writer was very fortunate in being able to collect a series of the plants in question. These go from the large var. *Bestii* with its long stems and rather harsh, twisted, near-secund leaves to a large, shorter stemmed, softer, rather turgid form still var. *Bestii;* but this latter gave off smaller secondary shoots inseparable from the species, *H. molle,* with a strong costa in its leaves. To complete the series one specimen was practically all *H. molle,* i.e. secondary shoots.

Several years ago I collected a tuft of the turgid form of var. *Bestii,* devoid of any secondary branches, sitting in a trickle of water in the canyon at Grand Falls, New Brunswick. From the description and drawings (originally from the pen of Renauld) given in Grout's Moss Flora of North America North of Mexico, the specimen did not seem to fit into *Hygrohypnum Bestii;* but rather into that of *Hypnum turgescens* Schimp. This latter I now know to be something else.

The drawing of the leaf by Renauld is very poor. He seems to have drawn leaves that must have lost their alar regions in the removal from the stem for examination resulting in a lanceolate outline. Grout gives broadly ovate for the leaf outline. To go to the other extreme, I would be tempted to call it subcordate.

It is now easy to see why the name *Hypnum turgescens* T. Jensen is included in the synonymy of *Hypnum Bestii* as given by R. S. Williams in The Bryologist **4:** 21 (1901); and why Dr. Best determined Holzinger's original specimen from Montana as *Hypnum turgescens* Schimp. The var. *Bestii* can be as turgid as *Hypnum turgescens* itself.

It may be worth mentioning that I had authentic specimens of the following for comparison: *Hygrohypnum molle,* Allen's *Mosses of the Cascades 142;* and var. *Bestii,* Allen's *Mosses of the Cascades 141* and *Williams 166* from Montana.

Other noteworthy mosses recently collected by me in New Brunswick are: Albert County *Oncophorus polycarpus* (Hedw.) Brid., *Rhabdoweisia denticulata* (Brid.) Bry. Eur., *Rhacomitrium heterostichum,* var. *sudeticum* (Funck) Jones, *Pohlia longicolla* (Hedw.) Lindb., *Calliergon Richardsoni* (Mitt.) Kindb., and *Hylocomium brevirostre* (Beauv.) Bry. Eur.; York County

Orthotrichum microblepharum Schimp., and *Eurhynchium Stokesii* (Turn.) Bry. Eur.; Victoria County *Camptothecium nitens*, var. *falcifolium* Ren. apud Nichols, and *Drepanocladus revolvens* (C. Muell.) Warnst.—GRAND FALLS, NEW BRUNSWICK.

NOVELTIES IN HERMIDIUM (NYCTAGINACEAE) AND ASTRAGALUS (LEGUMINOSAE) FROM EASTERN UTAH[1]

C. L. PORTER

THE three novelties proposed below, all from the semi-desert area about five to six miles south of Vernal, Uintah County, Utah, were encountered during the favorable spring growing season of 1950. At that time the area was called to my attention by Dr. J. W. Hamilton and Prof. O. A. Beath, both of the Research Chemistry Department of the University of Wyoming, who first noticed the peculiar Astragali growing there and brought back specimens of them for me to examine. Being convinced that both were new, a collecting trip was made to the area and material of both Astragali was collected in quantity; and at the same time the *Hermidium* was discovered growing under the cap-rock of the canyon and likewise collected in quantity.

An attempt was made in the following year to recollect these plants when the area was revisited in June, 1951; but due to a severe drought in the area not a single plant of any of them could be found. Hillsides which had been covered with luxuriant vegetation the year before were now barren.

The type specimens of these proposed novelties are deposited in the Rocky Mountain Herbarium of the University of Wyoming. Duplicates will be distributed to the leading herbaria in the near future.

Hermidium alipes S. Wats.,[2] var. **pallidum** var. nov.

A specie calycibus albis distinguendum.

Distinguished from the species by the white calyx.

TYPE: *C. L. Porter 5308*, on the Wasatch formation, 5 miles south of Vernal, Uintah County, Utah, June 3, 1950. Elevation about 5,200 ft.

[1] Contributions from the Department of Botany and the Rocky Mountain Herbarium, University of Wyoming, no. 220.

[2] S. Watson in King, Geol. Expl. 40th. Par. 5: 286. pl. 32. 1871.

The monotypic genus *Hermidium* has hitherto been known to me only from western Nevada and adjacent California, and from a single station (8 miles northeast of Troutcreek, *Maguire & Becraft 2579*) in western Juab County, Utah. The species regularly produces flowers with a purplish calyx, the color usually becoming accentuated in drying. The proposed variety showed no trace of purple coloration of flowers in the several large plants seen, and it extends the known range of the genus considerably to the eastward.

Astragalus (*Lonchophaca*) **hamiltoni** sp. nov.

Herba perennis, 4–5 dm. alta, cum radice lignosa et caudice breve. Caules erecti, ex eadem basi aliquot, strigosi cum pilis planis, albis, appressis. Stipulae deltaformes, acutae, 2–5 mm. longae et 2–4 mm. latae ad basim. Folia pinnata, 3–7 (plerumque circa 5) cm. longa, pallide viridia et strigosa, foliolis 3–7 (plerumque circa 5), oblongis, plerumque rotundis ad apicem, 3–7 mm. latis et 10–30 mm. longis, ad axem irregulariter insertis, foliolis superioribus plerumque non oppositis et foliolo terminale cum rachide continuo. Pedunculi erecti, terminales et axillares, 3–10 cm. longi; racemi multiflores, 2–6 cm. longi, et racemis et pedunculis productioribus post anthesin; bracteae subulatae, circa 1 mm. longae. Pedicelli mox recurvascentes, 1–3 mm. longi. Calyx campanulatus, pallide viridis, sed demum fuscus, strigosus, cum tubo 5–6 mm. longo et dentibus angustis triangularibus, circa 1 mm. longis. Corolla ochroleuca vel pallide flava, sed exsiccata sulphurea, 16–18 mm. longa, vexillo mediocriter arcuato, alis vexillum fere aequantibus, et petalis carinatis 2–3 mm. brevioribus. Siliquae aliquantulum strigosae, praesertim versus basin et in suturis, cum stipite 10–12 mm. longo calycem excedente, corpore subcylindrico ad basim apicemque acuto, saepissime 25–30 mm. longae, 5–6 mm. crassae, sectione transversa uniloculares. Semina reniformia, numerosa.

Plants perennial, 4–5 dm. high, with a woody root and short caudex. Stems erect, several from the base, strigose with flat, white, appressed hairs. Stipules deltoid, acute, 2–5 mm. long and 2–4 mm. wide at the base. Leaves pinnate, 3–7 (mostly about 5) cm. long, pale green and strigose, the leaflets 3–7 (commonly about 5), oblong, mostly rounded at the apex, 3–7 mm. wide and 10–30 mm. long, irregularly attached to the rachis, the upper leaflets commonly not paired and the terminal one continuous with the rachis. Peduncles erect, terminal and axillary, 3–10 cm. long; racemes several-flowered, 2–6 cm. long, both the racemes and peduncles elongating after anthesis; bracts subulate, about 1 mm. long. Pedicels soon recurved, 1–3 mm. long. Calyx campanulate, pale greenish, turning brown in age, strigose, the tube 5–6 mm. long, the teeth narrowly triangular, about 1 mm. long. Corolla ochroleucous or pale yellowish, drying sulphur-yellow, 16–18 mm. long, the banner moderately arched, the wings nearly equaling the banner, the keel-petals 2–3 mm. shorter. Pods somewhat strigose, especially toward the base and on the sutures, with a stipe 10–12 mm. long and exceeding the calyx, the body subcylindric and pointed at both ends, mostly 25–30 mm. long and 5–6 mm. thick, 1-celled in cross section. Seeds reniform, numerous.

Type: *J. W. Hamilton & O. A. Beath*, s. n., on the Wasatch formation, 5 miles south of Vernal, Uintah County, Utah, May 24, 1950. Elevation about 5,200 ft. paratype: *C. L. Porter 5313*, from the same locality, June 3, 1950.

The proposed species appears to be most closely related to *Astragalus lonchocarpus* Torr., from which it may be distinguished by its much broader leaflets and by its subcylindric and relatively broader and strigose pods. In Rydberg's key to the species of *Lonchophaca* (N. Am. Fl. 24: 312. 1929) this plant would run to his *L. macra* which was based on *Astragalus macer* A. Nels. (type seen) which is a clear synonym of *Astragalus lonchocarpus* Torr. It is a pleasure to name it for Dr. J. W. Hamilton who first noticed it in the field and called it to the attention of the writer. Chemical analyses of the plants have shown them to be non-seleniferous, as is true of other members of the group.

Astragalus (*Homalobus*) **spectabilis** sp. nov.

Herba perennis, viridis, 1–2 dm. alta, e caudice ramoso caespitoso in summitate longae radicis primariae. Caules erecti, in partibus vetustioribus reliquiis persistentibus petiolorum et stipulorum obductis, cum internodis brevissimis. Stipulae ovato-lanceolatae chartaceae, circa 8 mm. longae et 3 mm. latae ad basim. Folia pinnata, plerumque 5–9 cm. longa, strigosa cum pilis gracilibus dolabriformibus, foliolis saepe 5–7, anguste linearibus vel spatulatis variantibus, apice acutissimis, plerumque 15–35 mm. longis, 1–4 mm. latis, foliolis 3 vel 5 terminalibus saepe perpropinquis. Pedunculi erecti et terminales, 6–12 cm. longi, folia vix excedentes; racemi 3–10-flores, 1.5–3 cm. longi, vix elongati post anthesin; bracteae lanceolatae, hyalinae, nervus medius viridis, circa 5 mm. longae. Pedicelli ascendentes, 1–2 mm. longi. Calyx campanulatus, strigosus cum pilis nigris et albis mixtis, cum tubo circa 5 mm. longo et dentibus subulatis circa 4 mm. longis. Corolla puniceo-purpura, sed exsiccata cyaneo-purpura, 15–20 mm. longa, cum vexillo moderate arcuato et praeter alas et petala carinata excedente. Siliquae ascendentes, rectae vel moderate curvatae, cum lateribus complanatis et suturis prominentibus parallelis, ad basim rotundae et sessiles, abrupte ad apicem brevimucronatae, plerumque 2.5–3.5 cm. longae et 4–5 mm. latae (siliquis typi subimmaturis), sparsim strigosae, sectione transversa uniloculares. Semina reniformia, numerosa.

Plants perennial, green, 1–2 dm. high, from a branched caespitose caudex at the summit of a long taproot. Stems erect, the older parts covered with the persistent remains of petioles and stipules, the internodes extremely short. Stipules ovate-lanceolate, papery, about 8 mm. long and 3 mm. wide near the base. Leaves pinnate, mostly 5–9 cm. long, strigose with slender dolabriform hairs, the leaflets mostly 5–7, varying from narrowly linear to spatulate, sharply acute at the apex, mostly 15–35 mm. long and 1–4 mm. wide, the terminal 3 or 5 leaflets often closely approximate. Peduncles erect and terminal, 6–12 cm. long, just surpassing the leaves; racemes 3–10-flowered, 1.5–3 cm. long, not elongating much after anthesis; bracts lanceolate, hyaline except for the green midnerve, about 5 mm. long. Pedicels ascending, 1–2 mm. long. Calyx campanulate, strigose with intermixed black and white hairs, the tube about 5 mm. long, the subulate teeth about 4 mm. long. Corolla pinkish-purple, drying dark blue-purple, 15–20 mm. long, the banner moderately arched and exceeding the wings and keel-petals. Pods ascending, straight or slightly curved outward, laterally flattened, with both sutures prominent and parallel, rounded at the base and sessile, abruptly short-pointed at the apex, mostly 2.5–3.5 cm. long and 4–5 mm. wide (those of the type not quite mature), sparsely strigose, the cross section 1-celled. Seeds reniform, numerous.

Type: *C. L. Porter 5309*, on red sandy slopes of the Wasatch formation, in a canyon about 5 miles south of Vernal, Uintah County, Utah, June 3, 1950. Elevation about 5,200 ft. Paratype: *J. W. Hamilton & O. A. Beath*, s. n., from the same locality, May 24, 1950.

Astragalus spectabilis is readily referred to the subgenus *Homalobus*, and it seems to have affinities with the section *Campestres*, to which it would key in Rydberg's treatment (N. Am. Flora 24: 256. 1929), but it has larger and more brightly-colored flowers than is typical of that complex, and the banner is not so strongly arched. It is a strikingly handsome plant when in bloom, and might well be worth cultivating in rock gardens. It is non-seleniferous.

A Note on Halimolobos.—Each time populations of *Halimolobos virgata* (Nutt.) Schulz have been examined in the high valleys of the main chain of the Rocky Mountains and in the foothills of the Uinta Mountains, I have been impressed by the differences in the plants of these two areas and the habitats in which they occur. In South Park, Colorado, and in the Laramie Range between Laramie and Cheyenne, Wyoming, plants of this species grew erect in open grassy meadows. In the foothills northeast and north of the Uinta Range, in Utah and adjacent

Wyoming, the plants did not occur in the open and seemed to require support from the shrubs among which they grew. Now, with two new collections taken from these areas during the past summer (1951) available, a restudy of the material in the Gray Herbarium shows that there is considerable variation when plants of the entire species range are included.

The specimens of Nuttall's collection, upon which the species was based, are similar to specimens from the meadow valleys and high plains. This phase of the species extends from central Colorado to Saskatchewan and Alberta and apparently has weedy tendencies, for it has been collected in vacant lots in Laramie and along roadsides in the Laramie Range by Dr. C. L. Porter. Toward the southwestern part of Wyoming the variation tends in the direction of longer petioled basal leaves, more remote cauline leaves, and longer siliques, tendencies epitomized in the Uinta foothill phase of the species. Attention is called to these trends in the total variation of *H. virgata* in the hope that other botanists working the area will aid in determining whether they have any real significance.

Previous reference[1] to the similarity between *H. virgata*, once considered to be a *Sisymbrium*, and *H. mollis*, formerly placed in *Arabis* as *A. Hookeri*, has apparently left either no impression or the wrong one on both Hultén[2] and Porsild.[3,4] The latter suggests that both be retained in *Arabis* and that the two are conspecific. I do not agree with him on either of these points but there is more reason to place all the material in one species than to put it in the genus *Arabis*. As formerly pointed out, the cotyledons are incumbent in *H. mollis* and *H. virgata*, and accumbent in *Arabis*, but that is only one point. More importantly, to put these species in *Arabis* ignores their natural relationships with *Halimolobos hispidula*, *H. perplexa*, and *H. Berlandieri*. If one were considering the uniting of these with a better known genus, there are many more reasons for placing them in *Sisymbrium* than in *Arabis*. However, there is no evidence that any species

[1] Contributions from the Dudley Herbarium 3: 241–265. 1943.

[2] Flora of Alaska and Yukon. Lunds. Univ. Arssk. 41: 870. 1945.

[3] Materials for a Flora of the Continental Northwest Territories of Canada. Sargentia 4: 43. 1943.

[4] Botany of Southwestern Yukon Adjacent to the Canol Road. Nat. Mus. Can. Bull. no. 121. 200. 1951.

of this alliance other than *H. mollis* and *H. virgata* were considered by either of the authors mentioned above.

In keeping *Arabidopsis mollis,* Hultén failed to take into account the natural relationships of this species. The implication of such a treatment, in the face of a monographic study showing that its relatives lie in a different direction, is that they too should be placed in *Arabidopsis.* But such a rearrangement, in my opinion, is not warranted on any grounds. Dr. Hultén might argue that he was merely following the Crucifer expert O. E. Schulz[5] in keeping *A. mollis* but it can be pointed out that Schulz also placed *Sisymbrium virgatum* in *Halimolobos.*[6] Both Porsild and I have emphasized the close similarity of *H. virgata* and *H. mollis.* Certainly in this instance Schulz was wrong in putting them in different genera. All the evidence I possess suggests that *H. mollis* and *H. virgata* are distinct species and that they are with their natural relatives in *Halimolobos.*—Reed C. Rollins.

Previously Unreported Plants from Minnesota.—Three of my collections of *Carex* from Curtain Falls, Minnesota-Ontario boundary I have determined as *C. katahdinensis* Fern. These plants represent a fair sample of the species, if an exception can be made to the roughness of the peduncles. In this material from the interior, the peduncles are not consistently scabrous, and some are wholly smooth. The close relationship between this species and *C. conoidea* cannot be altogether ignored, especially as indicated by a microscopic study of the fruiting structures. *C. katahdinensis* is suggestive of stunted individuals of *C. conoidea.* However, the long bracts, the almost sessile staminate spike nestled in an aggregation of pistillate ones are obvious and constant, rendering a different look in the field from that of *C. conoidea.* Moreover, the short style-base of the ripe achenes as seen under magnification is also a differentiating structure. Collection no. 11674, Aug. 23, 1950, was made from the beach vegetation of Iron Lake at the end of the 160-rod portage from Crooked Lake above Curtain Falls. The strip of vegetation in white fine sand was within the zone of wave action. Scattered

[5] Bot. Jahrb. 66: 97. 1933.
[6] Das Pflanzenreich IV. 105: 290. 1924.

among *Oenothera perennis*, and *Eleocharis elliptica* were, though not numerous, the minute plants of *Carex katahdinensis*, in ripe fruit, but somewhat nibbled off by the ever hungry resort horse.

Realizing that the plants were far removed from the previously known geographical area of the species, I returned on June 19, 1951 for additional specimens (coll. no. 12487). Some plants were found again in another locality west of the sandy beach on Iron Lake, near the end, but not on the 116-rod portage from Crooked Lake below Curtain Falls. These plants (coll. no.12562, June 23, 1951) were growing in fissures of granitic ledges along the shore of Iron Lake, at the rocky point overlooking the surging waters of the river below Curtain Falls. Like those from the sandy beach, these plants were luxuriant vegetatively, with immature fruits. Thus, the range of distribution of the species extends into the interior of the continent to Minnesota, from Newfoundland, Maine and Quebec.

Cystopteris Dickieana Sim, Lakela no. 5436, was determined by Mr. C. V. Morton, last September. For years, this fern collected from moss-mats of the shore rocks of Lake Superior at East Beaver Bay, Aug. 23, 1943, remained a problem. Its resemblance to *Cystopteris fragilis* was offset by spore characteristics which were suggestive of *Woodsia* affinities. A later collection, no. 13585, Aug. 12, 1951, also determined by Mr. Morton, was made from mossy ledges of the Great Palisade Head, overlooking Lake Superior on Highway 61, only five miles northeast of East Beaver Bay. Thus, the occurrence of the species on the coast of Lake Superior, Lake Co., Minn. adds another locality to the range of this long overlooked North American Fern.[1] To the adventive flora is herewith recorded *Lepidium campestre* (L.) R. Br. The plant was discovered in a tree plantation of the Quetico-Superior Wilderness Research Center, Basswood Lake, Lake Co., by Clifford Ahlgren, coll. no. 686, June 19, 1950. The plant is obviously an introduction, though it was found in the wilderness, far from its known range.—Olga Lakela, University of Minnesota, Duluth Branch, Duluth, Minnesota.

[1] Ahlston, A. H. G. An overlooked North American Fern. Am. Fern. Journal **41** (3): 76. 1951.

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NOTES ON DISTRIBUTION OF NORTH CAROLINA PLANTS—III

WILLIAM B. FOX, R. K. GODFREY AND H. L. BLOMQUIST

THIS is the third[1] in a series of papers dealing with noteworthy records of plants in North Carolina. As in the earlier papers, examination of herbaria in North Carolina and elsewhere and the literature yielded collections or records by other collectors, some of which are cited herein. The named collections in the Gray Herbarium (G), the U. S. National Herbarium (US), and the National Arboretum Herbarium (NA) and the University of North Carolina (UNC) have been checked for North Carolina specimens of most of the taxa included. Unless otherwise indicated, all specimens cited are in the herbarium of North Carolina State College and/or Duke University.[2]

We are indebted to the officials of the various institutions whose facilities were placed at our disposal and particularly to members of the Department of Botany of the University of North Carolina, whose library and herbarium facilities are a continuous source of help to us.

LYCOPODIUM TRISTACHYUM Pursh. WAKE CO.: north slope of granite hill, near Neuse River at N. C. Rt. 59, December 8, 1950, *Boyce & O'Connell 1615;* WARREN CO.: moist woodland, Ridgeway, April 20, 1938, *Godfrey 3641* (G).

Blomquist (1934) refers to this as a "club-moss which belongs to the mountain flora," and he cites six county records, all from

[1] See Fox and Godfrey, "Notes on Distribution of North Carolina Plants—I," Rhodora **51**: 129–146, 1949, and Fox, Godfrey and Blomquist, "Notes on Distribution of North Carolina Plants—II," Rhodora **52**: 253–271, 1950.

[2] For general references, see the "Literature Cited" at the conclusion of the two previous papers.

mountain counties. Blomquist and Correll (1940) add three other mountain counties. The above station is in the extreme lower piedmont.

Dryopteris celsa (W. Palmer) Small. Pitt Co.: in *Pinus Taeda—Nyssa biflora—Fraxinus* swamp, 0.4 mile n. w. of Shermerdine, highway No. 43, April 13, 1950, *Blomquist 14948*.

This widely distributed and puzzling fern has been found previously in the Dismal Swamp section on the border between Virginia and North Carolina (Small, 1938), and Blomquist and Correll (1940) reported it from the piedmont counties: Orange and Mecklenburg. Apparently it has a spotty distribution but, where found, seems to be thriving.

Dryopteris marginalis (L.) Gray. Harnett Co.: Raven Rock, n. w. of Lillington on Cape Fear River, February 15, 1941, *Radford & Stewart* (UNC); granitic-schist cliffs and beech-maple woodland at Raven Rock on the Cape Fear River above Lillington, November 7, 1950, *Godfrey 51073*.

Reported as occurring sparingly in the outer piedmont, in Orange and Durham Counties, by Blomquist (1934), this fern is abundant at the above locality, which is definitely in the coastal plain.

Athyrium pycnocarpon (Spreng.) Tidestr. Durham Co.: rich, moist woods below bluff, Eno River, Duke's Farm near Catsburg, about 8 miles n. e. of Durham, August 18, 1950, *Blomquist*, *Anderson*, and *Jones 15035*.

This fern was reported by Blomquist and Correll (1940) from 4 counties in the mountains and from Forsyth County in the piedmont, where Schweinitz collected it in "Salem, 1812–1821." The "Forsyth County" record may have come from the vicinity of Hanging Rock, Stokes County, where several montane species occur. The new location in Durham County is a remarkable eastward extension of its range.

Camptosorus rhizophyllus (L.) Link. Wake Co.: on north-facing, porous rocks 30 feet above Neuse River, 2 miles west of Stony Hill Church, March 10, 1951, *L. A. Whitford 218*.

This collection represents the easternmost known locality in North Carolina for this fern, which is primarily restricted to the mountainous part of the state. It has been reported as far east as Durham County by Blomquist (1934).

Asplenium trichomanes L. Wake Co.: on cliffs, Crabtree Park, February 8, 1949, *Wells;* Harnett Co.: Raven Rock, n. w. of Lillington on Cape Fear River, April 16, 1949, *Radford 3071* (UNC).

This fern, which is not very common anywhere in the state, was reported as far east in the piedmont as Orange County by Blomquist (1934). Both of the above collections represent eastward extensions, the latter being in the inner coastal plain.

Adiantum pedatum L. Lee Co.: rich wooded bluff near the junction of the Rocky and Deep Rivers, June 27, 1949, *Godfrey & Fox 49378;* Harnett Co.: abundant in beech-maple woodland, bluff on Cape Fear River at Raven Rock, above Lillington, November 7, 1950, *Godfrey 51072.*

Blomquist (1934) reports this fern only from Durham, Orange and Wake Counties in the outer piedmont, the last being the easternmost known. The Harnett County location extends the range eastward and southward, definitely into the coastal plain province.

Cyperus Grayii Torr. Pamlico Co.: long-leaf pine, scrub-oak sand ridge, 2 miles southwest of Arapahoe, June 28, 1948, *Godfrey 48261;* Greene Co.: dry sandy soil waste ground, Snow Hill, July 8, 1922, *Randolph* and *Randolph 759* (G); Wayne Co.: coarse sandy alluvium in seepage area, bordering sand ridge, 5 miles north of Seven Springs, September 22, 1950, *Godfrey, Fox & Boyce 50656;* Sampson Co.: sand ridge, 5 miles w. of Clinton, June 11, 1938, *Godfrey 4496* (G); Bladen Co.: White Lake, June 21, 1927, *B. W. Wells;* Wake Co.: old field, Raleigh, July 12, 1938, *Godfrey 4946* (G); Harnett Co.: dry, sandy soil, 1 mile n. w. of Erwin, Hwy. No. 55, July 10, 1939, *Blomquist 10850;* Scotland Co.: sand ridge, 5 mi. n. e. of Laurinburg, June 11, 1938, *Godfrey 4575* (G); in Oriente Carolina Septentrionalis, July, 1885, *McCarthy* (US); wet places, eastern North Carolina, August 1884, *McCarthy 82* (US).

Curtis (1867) listed this species as occurring in the "Low. Dist." (coastal plain) of North Carolina, but Small does not include it as occurring within the range of his Manual (1933) stating (p. 152) that records for the Southern States are apparently erroneous. It does not appear in Reed's "The Genus *Cyperus* in North Carolina" (Jour. Elisha Mitchell Sci. Soc. **52:** 295–306. 1936). Fernald, however, in Gray's Manual (1950) has the range, "Mass. to Fla." and the above records indicate a fairly common occurrence in the coastal plain of this state.

Eleocharis acicularis (L.) R. & S. Columbus Co.: sandy alluvium, drainage canal at roadside, bordering swamp forest along Waccamaw River between Ash and Old Dock, June 10, 1951, *Godfrey & Blomquist 51174.*

Fernald (Rhodora **39:** 359 and 389. 1937) reports this plant from southeastern Virginia, saying that it would be hardly worth mentioning from farther north, had not Svenson (Rhodora **31:** 185. 1929) given the southern limit in the East as "Pennsylvania, West Virginia," etc. However, in Gray's Manual (1950), Fernald gives the range of the species as "Lab. to B. C., s. to N. Fla., Tenn." etc. We are not aware of the information which led Fernald, in the latter instance, to include the area of the southeastern states from Virginia to Florida in the range of the plant. We publish this record of its occurrence in southeastern North Carolina so that there will be no question that it extends at least this far south. We are indebted to Dr. H. K. Svenson of the American Museum of Natural History for the determination of this and most of the other *Eleocharis* collections cited in this paper.

Eleocharis albida Torr. Carteret Co.: in edge of Mullet Pond, Shackelford Banks opposite Beaufort, May 20, 1949, *Whitford 136;* New Hanover Co.: *Spartina patens-stricta* [*stricta* in error for *alterniflora*] community, Carolina Beach, May 13, 1937, *Wells* and *Shunk*; marsh, Carolina Beach, June 28, 1938, *Godfrey* and *Wells 4787*. These North Carolina stations are in addition to the two indicated in the second paper of this series (Fox *et al*. 1950).

Eleocharis cellulosa Torr. Dare Co.: standing water in open swale, 3 mi. w. of Old Cape Hatteras Light House, Hatteras Island, e. of Pamlico Sound, October 15, 1950, *Fosberg 17965*.

Svenson (Rhodora **31:** 152. 1929) gives the following range for this plant: "Florida to Texas, West Indies, and Central America." In correspondence, however, Dr. Svenson has told us that there is now a record of its occurrence in Georgia based upon an Eyles specimen.

Eleocharis melanocarpa Torr. New Hanover Co.: sandy upper shores of Silver Lake, Cape Fear Peninsula, near Wilmington, July 5, 1951, *Godfrey 51171*. Fox, et al. (1950) reported two North Carolina stations for this plant thus authenticating its occurrence here. This is the third.

Eleocharis microcarpa Torr. Pender Co.: cart-road in long-leaf pine savanna, 4.8 mi. w. of Hampstead, July 1, 1950, *Fox* and *Boyce 3765*.

This is a second record of the occurrence of the typical variety of this species for North Carolina. Fox, et al. (1950), reporting the first station, indicated that the range was extended northward from South Carolina. However, Fernald, in Gray's

Manual (1950), gives s. e. Virginia as the northernmost extent of its range.

Eleocharis microcarpa Torr., var. filiculmis Torr. Sampson Co.: wet borrow-pit, near N. C. Rt. 102, just east of South River, October 14, 1951, *Fox & Boyce 5645;* Brunswick Co.: large, dense mat all over the bottom of a ditch, in sand and silt, roadsides along N. C. Rt. 303, 3 miles north of Southport, August 17, 1948, *Godfrey 48379;* Columbus Co.: sandy alluvium, drainage canal at roadside, bordering swamp forest along Waccamaw River, between Ash and Old Dock, June 10, 1951, *Godfrey & Blomquist 51173;* Moore Co.: on mud in the edge of Juniper Lake, 3 miles west of Pinehurst, September 10, 1949, *Whitford 152.*

Although this variety is known to occur from Connecticut to Florida, Svenson (Rhodora **39:** 229. 1937) reports it from North Carolina only from the Wilmington area, on the basis of collections of Canby and Curtis.

Eleocharis parvula (R. & S.) Link. Brunswick Co.: peat bog, Smith's Island, July 3, 1940, *Wells.* To the first station reported for North Carolina by Fox, et al. (1950), this citation is added.

Eleocharis Robbinsii Oakes. Bladen Co.: abundant in a shallow, borrow-pit pond, 2.5 miles east of Elizabethtown, along U. S. Rt. 701, July 9, 1949, *Godfrey* and *Fox 49487.*

In his citations from the numerous specimens of this species examined by him, Svenson (Rhodora **31:** 154–155. 1929) has none from between Delaware and Georgia. Fernald, in Gray's Manual (1950), indicates that its distribution south of Delaware is local and as follows: "n. e. N. C.; centr. Ga. to n. Fla." This collection, then, indicates its occurrence in the southeastern portion of North Carolina, as well as in the northeastern.

Eleocharis tenuis Willd., var. pseudoptera (Weatherby) Svenson Hyde Co.: moist roadside, 5 miles w. of Fairfield, May 8, 1938, *Godfrey* and *Kerr 3858.* An outer coastal plain station for a plant the range for which Svenson (Rhodora **41:** 65–66. 1939) and Fernald, in Gray's Manual (1950), give as s. e. New York and New Jersey along the mountains to North Carolina and eastern Tennessee.

Eleocharis tortilis (Link.) Schultes. Wayne Co.: the Cliffs of the Neuse River, July 2, 1946, *B. W. Wells;* New Hanover Co.: wet, burned-over pocosin, along Cape Fear River, June 24, 1938, *Godfrey 4713.*

Svenson (Rhodora **39:** 245–247. 1937) cites two collections of this species from North Carolina, one of Curtis (1834) (presumably from Wilmington) and one of Blankinship (1895) from Southern Pines.

Bulbostylis floridana (Britton) Fern. Robeson Co.: dry, sandy roadside, 7 miles southeast of Lumberton, July 4, 1927, *Wiegand & Manning 657* (G); Durham Co.: in garden, 922 Demerius Street, Durham, October 7, 1950, *Blomquist 15046*. Small (1933) gives the range (as *Stenophyllus barbatus* (Rothb.) Britton) as "Fla. to Ala. and S. C."

Rhynchospora debilis Gale. Bertie Co.: dry pocosin clearing, ½ mile north of Powellsville, July 23, 1949, *Godfrey* and *Fox 49694;* Lenoir Co.: dry pocosin, 8½ miles north of Richlands, July 16, 1949, *Godfrey* and *Fox 49606;* Bladen Co.: savanna, 19 miles northwest of Elizabethtown, along N. C. Rt. 87, July 9, 1949, *Godfrey & Fox 49483;* pineland clearing, 14 miles north of Elizabethtown, on N. C. Rt. 242, July 9, 1949, *Godfrey & Fox 49508*. These additional stations bring the total to six North Carolina coastal plain counties from which the plant is known (see Fox & Godfrey, 1949).

Rhynchospora macrostachya Torr., var. colpophila Fern. & Gale Chowan Co.: river swamp clearing, east end of Chowan River bridge west of Edenton, October 5, 1950, *Godfrey & Fox 50965*. For this variety, this is an extension of range southward from southeastern Virginia.

Rhynchospora mixta Britton. New Hanover Co.: swamp forest, Island Creek, on Hampstead-Castle Hayne Road, July 1, 1950, *Fox & Boyce 3769;* Pender Co.: gum swamp 2½ miles west of Hampstead, July 1, 1950, *Fox & Boyce 3763*.

These collections added to the four previously recorded well-scattered stations in North Carolina (see Fox & Godfrey, 1949), indicate that this species is probably frequent in the swamp forests of the coastal plain of the state.

Rhynchospora pleiantha (Kirk.) Gale. Brunswick Co.: forming extensive mats, sandy peaty pond margin, Marsh Branch, River Road, north of Southport, June 14, 1949, *Godfrey 49348;* abundant on the sandy margin of Pretty Pond, July 27, 1949, *Godfrey 49706*.

Gale (1944) had two collections of this plant from North Carolina, the only ones north of Georgia, and both were from within a few miles of Wilmington and near the stations cited here. She described the plant as caespitose, but at our stations such is distinctly not the case. The plants at these stations had abundant slender stolons, and as a consequence of this habit, formed a thick matted cover along the marginal strands of both ponds where they were encountered.

Carex bromoides Schkuhr. Transylvania Co.: very abundant as large clumps on a seepage bog on a steep slope above Whitewater River, just above Upper Falls, June 7, 1951, *Godfrey 51287a;* Haywood Co.: (presumably): wet places near Waynesville, at elevation of 4,500 feet, June 10, 1897, Biltmore Herbarium 196b (US).

This sedge, the habitat of which is usually given as swamps or swampy woodlands, is primarily a plant of the coastal plain, all of the other specimens from North Carolina which we have seen being from the outer coastal plain. Our collection, from the southern escarpment of the Appalachians at an elevation of about 2600 feet above sea level, and the Biltmore specimen establish its occurrence at relatively high elevations in the state.

Carex Chapmanni Steud. Craven Co.: in swampy woods about 1 mile west of Cherry Point, off Highway No. 70, old road to Morehead City, April 28, 1951, *Blomquist 15106*. According to Small (1933) and Mackenzie (1940), this sedge is known only from "Hammocks and woodlands, Fla."

Carex cristatella Britton. Jackson Co.: in swamp to left of railroad, just west of Balsam Station, June 18, 1934, *Boggess 38;* Swain Co.: grass-sedge ridge, south of Clingman's Dome, Great Smokies, June 27, 1937, *Blomquist & Billings 9642*.

This sedge has not previously been reported for North Carolina, and according to the ranges given by Mackenzie (1940) and in Gray's Manual (1950), these collections represent an extension southward from West Virginia and Virginia.

Carex divisa Huds. New Hanover Co.: in moist sandy soil with *Spartina patens*, etc., west side of monument, Fort Fisher, April 26, 1951, *Blomquist 15064*. This naturalized European sedge is reported in Gray's Manual (1950) only from "coastal sands, local, Calvert Co., Maryland."

Carex Joori Bailey. Cumberland Co.: low, wooded bank of South River, below N. C. Rt. 102, 3 miles south of Falcon, October 14, 1951, *Fox & Boyce 5641*. To the two North Carolina stations for this sedge published by Fox and Godfrey (1949), this third is added.

Carex louisianica Bailey. Martin Co.: abundant in floodplain woodland along the Roanoke River at Hamilton, September 23, 1950, *Godfrey, Fox & Boyce 50694;* Pitt Co.: abundant in floodplain forest, Tar River at Greenville, September 23, 1950, *Godfrey, Fox & Boyce 50670;* Chatham Co.: abundant in floodplain woodland along New Hope Creek, U. S. Rt. 64, east of Pittsboro, May 6, 1951, *Godfrey & Fox 51111*. Mackenzie (1940) gives a range which includes North Carolina, but, apparently, this plant has been rarely collected in the state, our own collections listed above being the only ones we have been able to locate.

Carex sparganioides Muhl. Jackson Co.: rich soil, wood's road through second growth woodland, base of Cedar Cliff Mt., s. e. of Tuckaseegee, June 6, 1951, *Godfrey 51259*.

Curtis (1867) lists this species as occurring in the "Mid. Dist." (piedmont) of North Carolina. However, Small (1933) fails to include it within the range of his manual; Mackenzie (1940) and Fernald in Gray's Manual (1950) regard Virginia as the southeastern limit of its range.

Carex verrucosa Muhl. New Hanover Co.: (presumably) border of pine barren ponds, Wilmington, *Curtis* (G); Brunswick Co.: small cypress pond, to the south of the railroad and church, just south of U. S. Rt. 76 at Maco, May 21, 1949, *Godfrey 49189;* same locality, July 30, 1949, *Fox & Godfrey 2865;* Harnett Co.: Aug. 16, 1932, Blomquist.

In view of the fact that Small (1933) and Mackenzie (1940) give the northern limit of the range as South Carolina, we list these collections to record its occurrence in North Carolina. We are indebted to Dr. F. J. Hermann of the Bureau of Plant Industry for verifying the determinations most of our collections of *Carex*.

Agave virginica L. Clay Co.: rocky bank, on U. S. Rt. 64, 2 miles southeast of Brasstown, August 7, 1951, *Fox & Godfrey 5178;* Cherokee Co.: rocky road bank, on Hiawassee River, on U. S. Rt. 64, 2 miles east of Murphy, July 14, 1950, *Fox 4028;* Cleveland Co.: rocky hillside, north bank of Broad River, above N. C. Rt. 150, 3½ miles south of Boiling Springs, July 12, 1950, *Fox 3928;* Union Co.: abundant along banks of Rocky River near Crooked Creek, July 18, 1949, *Boyce 1096;* Montgomery Co.: thin soil on bluff, lower power dam below Badin, August 9, 1938, *H. J. Oosting 1891;* Orange Co.: rocky bluff, north side of Morgan's Creek, about ½ mile east of Pittsboro Road, Chapel Hill, September 8, 1933, *W. C. Coker* (UNC); Cumberland Co.: on sandy rocky hillside, about 6 miles southeast of Fayetteville, just west of Mineral Spring Swamp, October 3, 1938, *H. A. Rankin* (UNC).

Although the ranges given by Small (1933)—(as *Manfreda virginica* (L.) Salisb.)—and by Fernald in Gray's Manual (1950) extend into or across North Carolina, there seem to be so few collections of this uncommon species from this state that it is deemed worthwhile to list here all that we have seen.

Cardamine Douglasii (Torr.) Britt. Wake Co.: wooded floodplain of Neuse River, 2½ miles west of Stony Hill Church, March 25, 1951, *Wells;* Durham Co.: floodplain woods, Eno River north of Durham, old Oxford Road, March 8, 1946, *Oosting* 2219; moist wood soil, side of ravine, Perry's Cabin, Wake Forest Road, March 15, 1946, *A. Davison*. According to the range given in Gray's Manual (1950) these collections extend the range southward from Virginia.

Prunus mitis Beadle. Cleveland Co.: woods border, sandy clearing on Broad River, 3½ miles south of Boiling Springs, July 12, 1950, *Fox 3939*.

While not qualified to pass judgment on the validity of this segregate species, we can report that plants which fit the key and description in Small's Manual (1933) occur at the above locality. The range given by Small (*loc. cit.*) is in Georgia and Alabama.

PRUNUS INJUCUNDA Small. CABARRUS Co.: upland, road border, near Rocky River on N. C. Rt. 151, July 7, 1950, *Fox & Whitford 3841;* CLEVELAND Co.: alluvial, wooded bank of Broad River, 3½ miles south of Boiling Springs, July 12, 1950, *Fox 3914.*

With the same qualification as that under *P. mitis* above, we report this taxon as occurring in North Carolina, the range in Small's Manual (1933) being: "Piedmont, Ga. and Alabama."

PRUNUS PUMILA L. DURHAM Co.: shrubby ground, edge of pine woods, 200 ft. south of r. r. tracks near Old Oxford Road, May 10, 1950, *Blomquist 14945.*

Memminger (Jour. Elisha Mitchell Sci. Soc. **30:** 136. 1915) reported *P. cuneata* Raf. from Henderson County, N. C., and the range in Small's Manual (1933) indicates its occurrence in this state. However, Fernald in Gray's Manual (1950), where *P. cuneata* Raf. is regarded as synonymous with *P. susquehanae* Willd. and where *P. pumila* L. is kept separate, has not reported any of the species of this complex ranging as far south as North Carolina. Without going into the problem of specific concepts, we can report here that *P. pumila* L. (*sensu lat.*) occurs in the outer edge of the piedmont province in this state. Dr. Rogers McVaugh has seen our specimen and verifies the determination in the sense of the previous sentence.

CNIDOSCOLUS STIMULOSUS (Michx.) Gray. CLEVELAND Co.: sandy, open, disturbed area, south bank of Broad River, 3½ miles south of Boiling Springs, July 12, 1950, *Fox 3932.*

Although Small (1933) gives the distribution of this plant (as *Bivonea* Raf.) as "coastal plain and adjacent provinces" and Blomquist and Oosting (1948) in their treatment of the N. C. Piedmont flora state (under the name, *Jatropha* Michx.) that it is "occasional along the margin of the Coastal Plain," we have seen no specimens or records from the upper piedmont region. This appears to be a considerable extension inland of a plant primarily confined to coarse sandy soil in the coastal plain.

Tragia linearifolia Ell. Cumberland Co.: turkey-oak sandhills, near U. S. Rt. 301, 5 miles south of Fayetteville, July 8, 1949, *Fox & Godfrey 2618;* Hoke Co.: dry, weedy soil along Drowning Creek, near Wagram, June 18, 1935, *Correll 1149.* Small (1933) gives the range for this species as "Coastal Plain, Fla. to Ala."; thus, this appears to be a considerable northward extension of range.

Hibiscus militaris Cav. Perquimans Co.: creek swamp on U. S. Rt. 17, 5 miles south of Hertford, August 5, 1950, *Fox 4176;* Nash Co.: alluvial plain, Swift Creek, on N. C. Rt. 301, 2 miles north of Battleboro, July 22, 1949, *Fox & Godfrey 2738;* Cumberland Co.: wet ditch, about 1 mile northeast of Godwin, on U. S. Rt. 301, July 24, 1948, *Fox & Whitford* 1768; "Carolina," *Curtis* (no other data given—in Gray Herbarium).

Curtis (1867) gives "Low. Dist." and Wood & McCarthy (1886) report this species for Wilmington. It is in the list for Church's Island by McAtee (1919). The ranges given by Small (1933) and Fernald in Gray's Manual (1950) extend across North Carolina. However, the above-listed collections are all that we have seen, and it seems worthwhile to record them here for it has been rarely collected in North Carolina.

Hibiscus palustris L. (sensu Fernald in Rhodora **44:** 269. 1942) Jones Co.: ditch by U. S. Rt. 70, 2.9 miles west of Dover, July 14, 1949, *Fox & Godfrey 2667.* To the four county records previously published by us for this species, this one is added.

Lechea villosa Ell. Cleveland Co.: sandy, open disturbed area, south bank of Broad River, 3½ miles south of Boiling Springs, July 12, 1950, *Fox 3934;* Cherokee Co.: sandy old field, bank of Hiawassee River at U. S. Rt. 64, Aug. 7, 1951, *Fox & Godfrey 5177.*

Hodgdon (Rhodora **40:** 55. 1938) maps the range of the species showing that it is principally confined to the coastal plain in North Carolina. The locality of the first of the above stations is well within the upper piedmont. There are no collections of this species in the several eastern herbaria from outside of the coastal plain and extreme lower piedmont, and these represent a considerable extension inland, the Cherokee County locality being west of the Blue Ridge. Dr. Hodgdon has verified our determination of these specimens.

Viola floridana Brainerd. Wilson Co.: wet woodland, vicinity of marl pits, A. Corbett Farm, near Wilson, April 10, 1949, *Godfrey 49024;* Carteret Co.: edge of woodside ditch between Atlantic and Salter Path, Bogue Bank, May 27, 1951, *Blomquist 15093.*

Small (1933) gives the range for this violet as central and northern Florida, but Brainerd (Vermont Agri. Expt. Sta. Bull.

224: 32, 1921) cites a specimen from Beaufort, South Carolina. Blomquist and Oosting (1948) have included it as a part of the piedmont flora of North Carolina.

LUDWIGIA BREVIPES (Long) E. H. Eames. CURRITUCK Co.: bog on Knott's Island, July 6, 1950, *Radford 5445;* DARE Co.: sandy margin of freshwater pond, Kill Devil Hills, October 7, 1950, *Fox & Godfrey 4445;* HYDE Co.: mudflat near causeway on n. side of Lake Mattamuskeet, July 4, 1950, *Radford 5397* (UNC); JOHNSTON Co.: in the shallows of Holt's Lake, 4 miles south of Smithfield, June 24, 1951, *Whitford 256;* ROBESON Co.: wet mud of partially dried-up pond, near N. C. Rt. 72, Lumber River, 3 miles northwest of Lumberton, October 6, 1951, *Fox 5573.*

We list these collections here because Munz (Bull. Torr. Bot. Club **71:** 156. 1944) cited only one specimen from North Carolina (Pasquotank County). These collections indicate at least a scattered distribution across the coastal plain of this state.

ARALIA RACEMOSA L. DURHAM Co.: rich soil under hardwoods, base of river bluff, Eno River about 1 mile above its confluence with Flat River, August 18, 1950, *Blomquist, Anderson & Jones 15033.* This plant, primarily confined to the mountains of the state, is hitherto unknown to us from the outer piedmont.

PANAX QUINQUEFOLIUS L. DURHAM Co.: rich soil under hardwoods, base of river bluff, Eno River, about 1 mile above its confluence with Flat River, August 8, 1950, *Blomquist, Anderson & Jones 15032;* ORANGE Co.: upper Laurel Hill, October 3, 1909, *Coker* (UNC); several other specimens from same locality by other collectors (UNC). Ginseng, which is not any longer common anywhere in the state, is apparently rare in the piedmont province. It is not included by Blomquist and Oosting (1948).

ERYNGIUM MARITIMUM L. DARE Co.: abundant locally on beach dunes, opposite Owens' Tourist Court, Nag's Head, Aug. 4, 1950, *Fox 4133.*

We are informed by Dr. Lincoln Constance, who determined this collection for us, that this European species is known elsewhere in North America only from Ellis Island, N. Y. It is well established on the beach dunes at Nag's Head over an area several hundred yards in extent.

ERYNGIUM PROSTRATUM Nutt. PITT Co.: in abandoned lumber road across floodplain woodland, Tar River at Greenville, Sept. 23, 1950, *Godfrey, Fox & Boyce 50670a.*

Rodgers (Jour. Elisha Mitch. Sci. Soc. **66:** 217, 218. 1950), in discussing the range of this plant, indicates that it is unknown from North Carolina although its occurrence in both South Carolina and Virginia has been recorded. In a footnote he mentions Godfrey's having written him about a prostrate *Eryngium* collected on the Tar River. The above collection, which he had not seen at that time, is the one to which he referred, and it proved to be *E. prostratum.*

Leiophyllum buxifolium (Berg.) Ell., var. Hugeri (Small) C. K. Schneider. Gaston Co.: crevices in cliff below pinnacle of King's Mountain, elev. about 1700 ft., June 15, 1951, *Fox 4831.*

Camp (Bull. Torr. Bot. Club **65:** 99–104. 1938) discusses the remarkable distribution of this genus. He cites collections from the coastal plain and from the extreme upper piedmont and mountains of North and South Carolina but none within fifty miles of King's Mountain. Since he postulates (ibid., p. 100) that the piedmont was the "home of the basic species," it is felt that a record from this conspicuous granitic prominence, located approximately in the center of the piedmont in North Carolina, is significant. Camp's citation of a specimen from Cumberland County (in the upper coastal plain) is based on cultivated material "taken from plants said to be 'plentiful' near Fayetteville." We can state that it is abundant in several localities in the turkey-oak sandhills region south of Fayetteville in Cumberland County, particularly near Rockfish Creek; specimens from the area are now in several herbaria.

Swertia carolinensis (Walt.) Ktze. (*Frasera carolinensis* Walt.). Clay Co.: roadside clearing, edge of upland woods, on U. S. Rt. 64, 2.7 miles west of Glade Gap, July 14, 1950, *Fox 4017;* Macon Co.: maple-birch-magnolia (cove) association, Olivine Deposit No. 9, ½ mile southwest of Ellijay, June 19, 1946, *Radford* (UNC); "Mountains of North Carolina," 1878, *Vasey* (US, NY).

Curtis' (1867) statement of range for this plant apparently quite rare in North Carolina is: "vallies of Macon and Cherokee." The range given by Small (1933) crosses the state as does that given by Fernald in Gray's Manual (1950). Radford (Jour. Elisha Mitch. Sci. Soc. **64:** 95. 1948) lists it as occurring on olivine deposits in Macon County, but we have seen no other records or collections for the state than these cited here.

Asclepias pedicellata Walt. (*Podostigma pedicellata* (Walt.) Vail) Pender Co.: Rowe's Bridge, Burgaw, May 28, 1938, *B. W. Wells;* New Hanover Co.: sand ridge, Carolina Beach, June 18, 1938, *Godfrey* 4658; between Wilmington and Scott's Hill (presumably in New Hanover County), July 25, 1923, *E. J. Alexander* (UNC); Brunswick Co.: wire-grass savanna, near N. C. Rt. 303, 6 miles north of Southport, July 12, 1947, *Fox 496;* Bladen Co.: long-leaf pine savanna, on N. C. Rt. 41, 4 miles east of White Lake, July 2, 1950, *Fox 3782;* scrub-oak sand area, dirt road, south of Ingold on road to White Lake, July 18, 1940, *Oosting 2155.*

Small (1933) gives the range of this plant as extending into North Carolina. Curtis (1833) listed a *Podostigma pubescens* Ell. for Wilmington; his later catalogue (1867) lists it for the "Low. Dist;" Wood and McCarthy (1886) list the same for the Wilmington region. These may be regarded as based on this species, according to Dr. R. E. Woodson, Jr. (in correspondence). Dr. Woodson informs us that he has seen no specimens north of Beaufort, S. C., and it seems, therefore, worthwhile to list all of the North Carolina collections of which we are aware.

Jacquemontia tamnifolia (L.) Griseb. Bertie Co.: in field of *Crotalaria,* seed of which came from Alabama, Windsor, November 1, 1938, *B. E. Grant;* Brunswick Co.: along the bank of a road-fill, Bell Swamp Bridge, near Winnabow, October 27, 1950, *Godfrey* and *Boyce 50959.*

These are the first North Carolina records of which we know for this adventive from the tropics. Fernald in Gray's Manual (1950) gives the range: "Fields, local, s. e. Va. and southwest." Small (1933), apparently, had not seen it from north of South Carolina.

Salvia azurea Lam. Richmond Co.: turkey-oak sandhills on N. C. Rt. 77, 5½ miles south of Hamlet, September 16, 1950, *Fox & Godfrey 4268;* sandy soil near Hamlet, October 6, 1897, *Biltmore Herbarium 3424a* (US, G); New Hanover Co.: Wilmington, September, 1888, *McCarthy* (UNC). Small (1933) gives the range as "Fla. to Tex. and S. C." We have seen neither reports nor other specimens from North Carolina.

Scrophularia lanceolata Pursh. Craven Co.: sandy oak-hickory woods near Neuse River, 2 miles n. of Ft. Barnwell, May 27, 1951, *Radford 5711* (UNC) Durham Co.: ¾ mile below Michie Dam, on bluff near road, May 20, 1950, *Batson;* Burke Co.: near lake west of Morganton, June 4, 1926, *Freeman* (NA); damp field, Jonas Ridge, July 22, 1933, *Hunnewell 12947* (G): Avery Co.: field, Linville, July 5, 1924, *Hunnewell 9231* (G); damp gravelly roadside, Pineola, July 20, 1936, *Hunnewell 14246* (G).

This species is not included by Small (1933) nor Blomquist & Oosting (1948), but in Gray's Manual (1950) the range indicates the plant's occurrence as far south as western South Carolina. The collections cited here are from localities scattered from the outer coastal plain to the mountains.

Buchnera floridana Gandoger.

In our previous paper in this series (Rhodora **52:** 269. 1950) this species was reported from the piedmont in Wake County; we indicated that this was an extension of range within the state from the coastal plain into the piedmont and thus into the area covered by Blomquist and Oosting (1948). Since that time, the late Dr. Francis W. Pennell examined the specimen upon which the report was based; he identified it as *B. americana* L. We, therefore, withdraw the report, yet wish to indicate that the species was previously reported by Pennell (1935) from Norlina, Warren County, which is within the range of the Blomquist and Oosting Guide (1948), and neither species is included by them.

Buchnera americana L. Wake Co.: railroad savanna, just east of Durham-Wake County line, north of Morrisville, along U. S. Rt. 70A, July 13, 1949, *Godfrey 49516;* Johnston Co.: savanna-like clearing near Mingo Swamp, on N. C. Rt. 421, July 2, 1950, *Fox* and *Boyce 3803.*

The first of the above collections we erroneously reported as *Buchnera floridana* Gandoger. We cite it again because neither species was included by Blomquist and Oosting (1948) as a part of the spring and early summer flora of the piedmont of North Carolina. Pennell (1935) had cited several piedmont stations for *B. americana* L. but he did not give the collection dates. Apparently they do begin to bloom in early July and the inclusion of both of them could now be justified.

Valerianella intermedia Dyal Stokes Co.: moist, narrow flood plain, 1 mile south of Walnut Cove, April 23, 1950, *Blomquist, Godfrey* and *Fox 14870;* Randolph Co.: moist, open woods, above stream bluff, Carraway Creek, west side of highway No. 49, May 5, 1950, *Blomquist, Anderson* and *Batson 14888;* Swain Co.: Biltmore Herbarium 4755 (in part) (UNC).

This species was reported from North Carolina by Dyal (Rhodora **40:** 203. 1938), as follows: "Hyam's Garden, Statesville, June 6, 1879, *Redfield No. 11736;*" in her note on general distribution of this species, she said: "Specimen from North Carolina without doubt cultivated."

Valerianella olitoria (L.) Poll. (*V. Locusta* Betcke). Wake Co.: roadside, Dix Hill near Raleigh, April 24, 1937, *Godfrey;* margin of pond, Pullen Park, Raleigh, April 28, 1951, *Fox 4579;* Warren Co.: alluvium in moist woodland, Ridgway, April 20, 1938, *Godfrey 3640* (G).

This introduced species was reported by Dyal (*ibid.*, 191) only from Chapel Hill, Orange County: Chapel Hill, April 1891, F. B.

Maxwell. It was included by Blomquist and Oosting (1948) as *V. Locusta* (L.) Betcke.

VALERIANELLA PATELLARIA (Sulliv.) Wood RANDOLPH Co.: meadow, south side of Uwharrie Creek, west of highway No. 49, May 5, 1950, *Blomquist, Anderson* and *Batson 14898;* abundant in a bottomland field, along the Deep River, U. S. Rt. 64, near Franklinville, May 6, 1950, *Godfrey & Fox 50339.* This species was reported by Dyal (*ibid.*, 194) from Swain County: *Biltmore Herbarium 4755* (in part).

VALERIANELLA RADIATA (L.) Dufr. var. FERNALDII Dyal CRAVEN Co.: roadside, 1 mile west of Vanceboro, highway No. 43, April 13, 1950, *Blomquist 14954;* ONSLOW Co.: roadside, main weather station, Hofmann Forest, April 12, 1948, *Boyce & Woods;* WAKE Co.: old field, Raleigh, April 20, 1938, *Godfrey 3557;* ORANGE Co.: U. N. C. campus, May 4, *Coker* (UNC). This taxon was reported from North Carolina by Dyal (*ibid.*, 207) only from Buncombe County: *Biltmore Herbarium 4755a* (in part).

LOBELIA BOYKINII T. & G. BLADEN Co.: in about 15 inches of water, borrow pit pool, 2.5 miles east of Elizabethtown, July 9, 1949, *Godfrey* and *Fox 49493.*

McVaugh (RHODORA **38:** 327. 1936) cites no stations from between Delaware and South Carolina, and the range in Gray's Manual (1950) indicates the same disjunction. We are indebted to Dr. McVaugh for the determination of our collection.

EUPATORIUM CUNEIFOLIUM Willd. DARE Co.: scattered in woodland on old stabilized dunes, vicinity of Kill Devil Hill, October 6, 1950, *Godfrey* and *Fox 51026.*

Two North Carolina records have previously been reported for this species (Fox and Godfrey, 1949; Godfrey, Journ. Elisha Mitch. Sci. Soc. **66:** 187. 1950). This, the third, is approximately 200 airline miles northeastward from the other coastal station in Brunswick County. Fernald (RHODORA **37:** 446. 1935) reported this plant from southeastern Virginia as, "apparently an extension north from South Carolina." Godfrey has examined Fernald's specimen and in his opinion Fernald misidentified the plant. His specimen, which is immature, is thought to be *Eupatorium Mohrii* Greene.

EUPATORIUM RESINOSUM Torr. CUMBERLAND Co.: sphagnous shrub bog, 13 miles n. of Fayetteville, October 27, 1950, *Godfrey & Boyce 50948;* cartroad, just east of dam, at Thode's Pond, 1.5 miles n. e. of Godwin, October 7, 1951, *Fox 5620.*

This is previously unreported for the range of Small's Manual (1933) and heretofore known only from bogs in pine barrens of New Jersey and Delaware, with a described variety in Kentucky.

Chrysopsis pinifolia Ell. Wayne Co.: old field, sterile sandy ridge, on N. C. Rt. 111 s. of Goldsboro, 2 miles n. of Neuse River, September 22, 1950, *Godfrey, Fox & Boyce 50634*.

Until recently (Fox and Godfrey, 1949; Godfrey *ibid.*, 188), this plant was unknown except from the type locality in Taylor County, Georgia. This, the third North Carolina station, extends the range eastward approximately 50 miles.

Solidago rigida L. Durham Co.: mixed pine-deciduous flatwoods, near Eno River, north of Durham, September 22, 1951, *Godfrey 51196*.

We have seen neither specimens nor records of the occurrence of this goldenrod outside of the mountain region of the state and feel it worthwhile to record this outer piedmont station.

Solidago sciaphila Steele. Brunswick Co.: in live-oak scrub thickets on sand dunes, Long Beach, October 28, 1950, *Godfrey & Boyce 50963*.

The distribution of this species is given by Fernald in Gray's Manual (1950) as: "ledges, cliffs, and sands, w. Ont. and Mich. to Minn., s. to Ill. and n. e. Ia." The above collection was identified by Dr. Arthur Cronquist and it was rechecked by him after several duplicate specimens were sent to him. Godfrey also checked specimens of the collection against material of the species at the Gray Herbarium, and he concurs with Dr. Cronquist in his determination. We are at a complete loss to account for the occurrence of this goldenrod so far from the hitherto known range of its distribution. This North Carolina Station is on the coast in the extreme southeastern corner of the state, in a remote locality only now being encroached upon by the "beach population." The plant was fairly abundant there and had all the appearances of a "native."

Solidago uliginosa Nutt. (*S. neglecta* T. & G.). Moore Co.: sphagnous shrub-bog, just west of Eastwood, October 12, 1950, *Godfrey 50724;* Cumberland Co.: sphagnous shrub-bog, 13 miles north of Fayetteville, October 27, 1950, *Godfrey & Boyce 50950*.

According to Gray's Manual (1950), this goldenrod, which has a wide distribution in the northeast, is known south of Delaware and Maryland only in the upland of North Carolina. These two stations are in the inner coastal plain.

Aster mirabilis T. & G. Union Co.: bank of Lane's Creek, 1.2 miles n. of Sturtevant, July 8, 1950, *Fox* and *Whitford 3886*.

A second North Carolina station for this plant, which until reported by Godfrey (*ibid.* 188) for Anson County, had been unknown from other than the type locality near Columbia, South Carolina.

Gnaphalium falcatum Lam. New Hanover Co.: Carolina Beach, May 13, 1937, *Wells & Shunk;* abundant in grass-weed border, roadside, Greenfield Park, Wilmington, May 13, 1950, *Godfrey & Wiebe 50358.*

This is an extension of range northward from South Carolina, Weatherby and Griscom (Rhodora **36:** 51. 1934) having reported it from Myrtle Beach, Horry County. Until then, it had been unknown north of Florida.

Ambrosia psilostachya DC. Richmond Co.: wire-grass, turkey oak sandhills, 5.5 miles s. w. of Hamlet, along N. C. Rt. 77, September 16, 1950, *Godfrey & Fox 50568.* An adventive previously unreported for the range of Small's Manual (1933), it is well established at this locality.

Xanthium echinatum Murr. Dare Co.: sand dunes, Nag's Head, October 6, 1950, *Godfrey & Fox 51037.*

Although Small (1933) gives the range of this plant as, "various provinces, N. C. to Nebraska, N. D., and Me.," Fernald in Gray's Manual (1950) says that it occurs "along the coast, N. S. to Va." This record establishes its occurrence in coastal North Carolina.

Santolina chamaecyparissus L. Lee Co.: edge of road clearing, on high turkey-oak sand ridge, 8 miles south of Sanford on U. S. Rt. 1, May 20, 1951, *Fox 4659;* Buncombe Co.: road bank, on Beucatcher Road, 2 miles north of center of Asheville, June 14, 1951, *Fox & Beaman 4791.*

This European introduction is obviously adventitious and very well established at these two widely separated localities. These collections are listed here because the plant is not included by Small (1933).

Prenanthes trifoliata (Cass.) Fern. Currituck Co.: burned-over loblolly pine flatwood, 2.3 miles w. of Barco, October 5, 1950, *Godfrey & Fox 51000.*

A careful check of the large eastern herbaria, as well as the local herbaria, failed to reveal any specimens of this species from the coastal plain province in North Carolina. It was abundant and conspicuous at this station on the outer coastal plain. We have never encountered it elsewhere in eastern North Carolina. Interestingly, it has not been found in adjacent southeastern Virginia.—Division of Biological Sciences: Botany, North Carolina State College, Raleigh, North Carolina and Department of Botany, Duke University, Durham, North Carolina.

SOME CRUCIFERAE OF THE NASHVILLE BASIN, TENNESSEE

Reed C. Rollins

The affinity of many representatives of the Cruciferae for limestone and gypseous areas is well known. Evidently the highly calcareous soils of the Nashville Basin (Fenneman, 1938) have provided particularly suitable habitats for the extensive development of two genera of the Cruciferae. All four species of the unique genus *Leavenworthia* are found in this relatively small area and two of them are largely confined to it (Baldwin, 1945). Plants of *L. aurea, L. stylosa, L. torulosa,* and *L. uniflora* are extremely abundant in the open glades, pastures and old fields at particular locations, often covering several to many acres of land. The opportunity for hybridization between the species of *Leavenworthia* is certainly present, for they occur together in some places. In my own experience, *L. stylosa* and *L. uniflora* were found together at two locations, but mostly the species were in pure stands. In some instances these were not separated by more than a few hundred yards. Gattinger in a letter to Gray (cf. Baldwin, l. c.) claims to have found three species in one square yard of ground near Nashville. Certainly the types of habitats in which all species occur in the Nashville Basin are very similar. I noticed a tendency for *L. uniflora* to invade old cornfields where the plants often covered a field of a dozen acres or more. This species tends to flower earlier than the other three and is the most distinctive, but all species can be found flowering at the same time and growing in close proximity, if not together, in a number of locations. Many plants in several such localities were carefully examined for traces of introgressive hybridization. However, no evidence that natural hybridization occurs between any combination of the species could be found. It seems safe to conclude that hybridization is not a major factor in producing the variability that does occur in the species in central Tennessee.

Though the Nashville Basin is certainly today the center of variability and the area of perhaps the highest concentration of numbers of individuals of *Leavenworthia*, it cannot be assumed that the genus originated there nor that the primary speciation took place within its bounds. The possibility of a southwestern origin (e. g. in the Texas area), in view of the facts with regard to *Lesquerella*, should receive attention.

LESQUERELLA

There is a striking parallel between *Leavenworthia* and *Lesquerella* with respect to their distribution in Tennessee. Four species of each genus are to be found in the Nashville Basin. Members of the two genera are usually not found growing together but each species tends to be abundant where it is found. The species of both genera have weedy tendencies, quickly invading fields and pastures. The one exception is *Lesquerella globosa*. To one accustomed to whole fields of Cruciferae only when members of old world weeds such as *Brassica, Sisymbrium, Thlaspi, Isatis* or *Cardaria* were rampant, it was indeed strange to see *Lesquerella* and *Leavenworthia* playing the same role in middle Tennessee. Even more disturbing was the realization, while viewing these fields, that two of the species of *Lesquerella* were undescribed and unknown to botanists generally.

Lesquerella, with numerous representatives in the intermountain area of western North America, has its largest concentration of species in Texas and northeastern Mexico. With this in mind, Payson (1922) found it difficult to understand the isolation and very limited range of *L. Lescurii* then known only from the vicinity of Nashville. Now a slightly enlarged area of distribution for this species is known, as the data below show, but even this is a decidedly restricted area for a species that is exceedingly abundant when it is found and shows weedy tendencies by invading sites disturbed by man. *L. globosa*, a wholly unrelated species, is found not far from Nashville and its range extends into Kentucky, with a single known station in southeastern Ohio.[1] The isolation of these two species from the main body of the genus, their lack of relatedness to each other, and the fact that they occurred more or less in the same area was a hard combination to explain. Payson was puzzled as to the relationships of *L. globosa* and our knowledge of this species is not sig-

[1] The single Ohio collection reported by Jones (1940) has not been seen.

nificantly improved from that known by him. Its true relationships may ultimately become evident from further studies of other species of the genus. Of one thing we can be sure, *L. globosa* is not a close relative of the other species of *Lesquerella* found in the same area.

We now know that *L. Lescurii* is but one of three related species, all localized and well within the boundaries of the Nashville Basin. Some help in understanding the problem of isolation from the main body of the genus may be drawn from a consideration of these newly discovered species of *Lesquerella*. The new species, *L. densipila* and *L. perforata* are related to each other and to *L. auriculata* and *L. grandiflora*, species of Texas and Oklahoma. They also have some characteristics in common with *L. Lescurii*, a fact that strengthens the position of this somewhat anomalous species as a true member of *Lesquerella*. *L. Lescurii* now appears to tie in with the main body of the genus through *L. densipila* and *L. perforata*.

One of the two new plants, *L. perforata*, is of considerable morphological interest. The interior surfaces of the valves are densely covered with small dendritic trichomes. The presence of trichomes on the interior of the silique is not known in any other species of *Lesquerella*, and this is a fairly rare phenomenon in the Cruciferae. In certain species of *Cibotarium* such as *C. divaricatum*, *C. macropetalum* and *C. macrum*, trichomes are found on the inner surfaces of the valves. Similarly, they occur in *Farsetia triquetra*, but I have not seen them in any other member of the Cruciferae. A second peculiarity in *L. perforata* is the absence of a complete septum. In some siliques, the septum appears to be lacking entirely, while in others there is only a narrow band of septum tissue attached to the inner margin of the replum. In the majority of *Lesquerella* species, the septum is entire. Exceptions are found in such species as *L. arctica*, *L. condensata*, *L. utahensis* and *L. occidentalis* but the perforations in all instances where I have observed them are not nearly so large as in *L. perforata*. The significance of the presence of an indument on the inner surface of the siliques of *L. perforata* is not at present assessable in terms of the genus as a whole. Certainly this is worthy of further study as a problem apart from a taxonomic treatment of the genus.

All three species of *Lesquerella* that are confined to the Nashville Basin, i. e. *L. densipila*, *L. Lescurii* and *L. perforata*, show considerable variation. There is some indication that variants are becoming established as populations, as indicated by the fact that *L. densipila*, var. *maxima* is separable, and it may be supposed that new variations are constantly arising. It is my distinct impression from initial field studies that these species are favorably situated for relatively rapid evolutionary differentiation. The solution to the phytogeographic problem posed by *Leavenworthia* and these isolated species of *Lesquerella* needs considerably more field study. However, I find it tempting to offer as an explanation the assumption that representatives of both genera migrated from the southwest into the Nashville Basin area. Once in such a favorable locality for evolutionary differentiation, each has produced a number of distinct species. The fact that interspecific hybridization does not appear to be a factor in producing present-day variation in *Leavenworthia* suggests that genetic barriers have paralleled the morphological distinctions that have evolved in that genus. I am less confident that interspecific hybridization has not played a part in producing some of the variant populations of *Lesquerella* in the Nashville Basin. On the other hand, I do not have any positive evidence that the different species hybridize naturally.

Following is a synoptic treatment of *Lesquerella* for the State of Tennessee:

Key to the Species

Siliques strongly flattened parallel to septum, valves hirsute with bulbous-based trichomes. . . . . 1. *L. Lescurii.*

Siliques globose to pyriform, inflated, not flattened, valves finely pubescent to sparingly hirsute with nonbulbous-based trichomes.

- Cauline leaves auriculate, clasping the stem; stems and leaves with spreading simple or branched trichomes; style shorter than the silique.
  - Siliques glabrous within, globose to subglobose, densely pubescent with short erect trichomes on the exterior; septum present; petals yellow or white, obovate.
    - Trichomes of siliques minute, visible only with magnification; petals yellowish orange. . . . . 2a. *L. densipila,* var. *densipila.*
    - Trichomes of siliques comparatively large and prominent, visible without magnification; petals white with a yellow claw, occasionally yellowish. . . . . 2b. *L. densipila,* var. *maxima.*
  - Siliques densely pubescent within, pyriform to depressed-pyriform, glabrous to sparsely pubescent with large trichomes on the exterior; septum absent; petals white, spatulate. . . . . 3. *L. perforata.*
- Cauline leaves narrowed at base, nonauriculate, not clasping the stem; stems and leaves covered with appressed stellate trichomes; style about twice the length of the silique. . . . . 4. *L. globosa.*

1. **Lesquerella Lescurii** (Gray) S. Wats. Proc. Amer. Acad. 23: 250. 1888.

Vesicaria ? Lescurii Gray, Manual, ed. 2, 38. 1856.
Alyssum Lescurii Gray, Manual, ed. 5, 72. 1867.

Known only from Tennessee and restricted to the central counties as follows: Cheatham Co.—roadside, state highway No. 12, 11 miles northwest of Bordeaux, March 31, 1952, *Reed C. and Diane Rollins 5212* (G[2]); Davidson Co.—dry hills near Nashville, April, *L. Lesquereux* (G, type); Nashville, 1878, *Dr. A. Gattinger* (G); same locality, May, 1906, *Albert Ruth 360* (G); same locality, 1896, *S. O. Barnes s. n.* (G); same locality, March 30, 1952, *Reed C. and Diane Rollins 5209* (G); same locality, April 1914, *W. H. Manning s. n.* (G); same locality, April, 1936, *H. K. Svenson 7525* (G); Peabody Campus, Nashville, April, 1940, *Jesse M. Shaver 6574* (G, P); thin soil in abandoned field, Nashville, April 20, 1940, *A. J. Sharp and R. E. Shanks 454, Plantae Exsiccatae Grayanae no. 1053* (G, UT); same locality, May, 1941, *A. J. Sharp 1529* (UT); Williamson Co.—two miles north of Nolensville, March 31, 1952, *Reed C. and Diane Rollins 5214* (G); Rutherford Co.—open field near Smyrna, March 30, 1934, *Harold Bold and A. J. Sharp 41* (UT); open field, nine miles northwest of Murfreesboro, April 1, 1952, *Reed C. and Diane Rollins 5224* (G), Wilson Co.—between Nashville and Lebanon, April 1, 1934, *A. J. Sharp 78* (UT).

2. **Lesquerella densipila** Rollins, sp. nov.

Annual; stems several to numerous, erect or the outer decumbent at base, simple or branched, purplish below, 1–4 dm. high, hirsute below with spreading simple trichomes, rachis of inflorescence and upper portion of stems hirsute with smaller less-spreading and frequently branched trichomes; basal leaves petiolate, lyrately pinnatifid to pinnately lobed, obtuse, 4–8 cm. long, 1–1.8 cm. wide, terminal lobe comparatively large, lateral lobes decurrent on rachis, hirsute on upper surface with mostly simple trichomes, lower surface with a mixture of large simple and smaller branched trichomes; cauline leaves sessile, auriculate, broadly ovate to oblong, 1–3 cm. long, 0.5–1.5 cm. broad, lower broadly obtuse, upper smaller and tending toward acuteness, dentate to nearly lobed, hirsute on both surfaces with mostly simple spreading trichomes; inflorescence racemose, 1–2 dm. long; fruiting pedicels divaricately ascending, straight, expanded at summit, 1–2 cm. long, pubescent with a mixture of simple and branched trichomes; sepals non-saccate, sparsely to generally covered with appressed branched trichomes, oblong, alternating members flat and boat-shaped, narrowed toward apex but remaining rounded, 2.5–4.5 mm. long, 1.5–2 mm. wide; petals yellow to white, broadly obovate, not markedly differentiated into blade and claw, 6–8 mm. long, 4–5 mm. wide; filaments strongly dilated at base, attached to anthers just below middle,

[2] Citations of specimens are as follows: Gray Herbarium (G); Herbarium of Jesse M. Shaver, Peabody College, Nashville (P); Herbarium of Vanderbilt University, Nashville (V); Herbarium of the University of Tennessee (UT).

anthers nearly versatile, ca. 1.5 mm. long; glandular tissue in a thin continuous mold beneath stamens, forming projections between single and paired stamens and an abbreviated ring around the base of the filament of the single stamens; siliques subglobose to slightly broader than long, uncompressed, 3–4.5 mm. in diameter, densely pubescent with minute to longer simple or branched spreading trichomes; styles 2–3 mm. long, pubescent below, glabrous above, slightly expanded into a capitate stigma; ovules 4–5 in each loculus, funiculi free except at their very base; replum nearly orbicular; seeds immature, flattened, orbicular.

Herba annua; caulibus erectis hirsutis 2–4 dm. altis; foliis radicalibus lyratis vel runcinatis hirsutis 4–8 cm. longis, 1–1.8 cm. latis; foliis caulinis sessilibus auriculatis dentatis hirsutis 1–3 cm. longis, 0.5–1.5 cm. latis; pedicellis divaricatis 1–2 cm. longis; sepalis oblongis pubescentibus; petalis obovatis flavis vel albis 6–8 mm. longis; siliquis subglobosis sessilibus 3–4.5 mm. diametro pubescentibus; stylis 2–3 mm. longis; loculis 4–5 ovulatis; seminibus immaturis orbiculatis immarginatis.

2a. **L. densipila,** var. **densipila**

Flowers yellowish orange; siliques densely covered with minute simple or branched trichomes (Fig. 1). Type in the Gray Herbarium collected in the Duck River bottom, north of Verona, Marshall County, Tennessee, April 10, 1949, *A. J. Sharp, C. J. Felix and Wm. Adams 11187.* Other collections:—near Duck River, three miles south of Chapel Hill, Marshall County, March 31, 1952, *Reed C. and Diane Rollins 5217* (G); abundant annual in open glade, one mile north of College Grove, Williamson County, March 31, 1952, *Reed C. and Diane Rollins 5215* (G).

2b. **L. densipila,** var. **maxima** Rollins, var. nov.

Flowers white or occasionally yellowish; siliques densely covered with much longer trichomes than in var. *densipila.*

Herba annua; petalis albis vel luteis; siliquis dense pilosis.

Type in the Gray Herbarium, collected in an open field, 12 miles southeast of Nashville on the Lavergne-Couchville Pike, Davidson County, Tenn., April 1, 1952, *Reed C. Rollins, Diane Rollins, and Elsie Quarterman 5223.* Also collected near roadside, 10 miles southeast of Nashville, Lavergne-Couchville Pike, April 1, 1952, *Reed C. Rollins, Diane Rollins, and Elsie Quarterman 5222* (G); roadside in cedar glade area, 15 miles southeast of Nashville, April 4, 1949, *Elsie Quarterman 4081* (V).

The most singular characteristic of *L. densipila* is the presence of a dense pilose pubescence on the exterior surface of the siliques. There is no suggestion of the presence of trichomes on the inner face of the valves as in *L. perforata.* The trichomes of the siliques are most frequently simple or forked, but an occasional one can be found with a third branch. This pubescence is not detectable

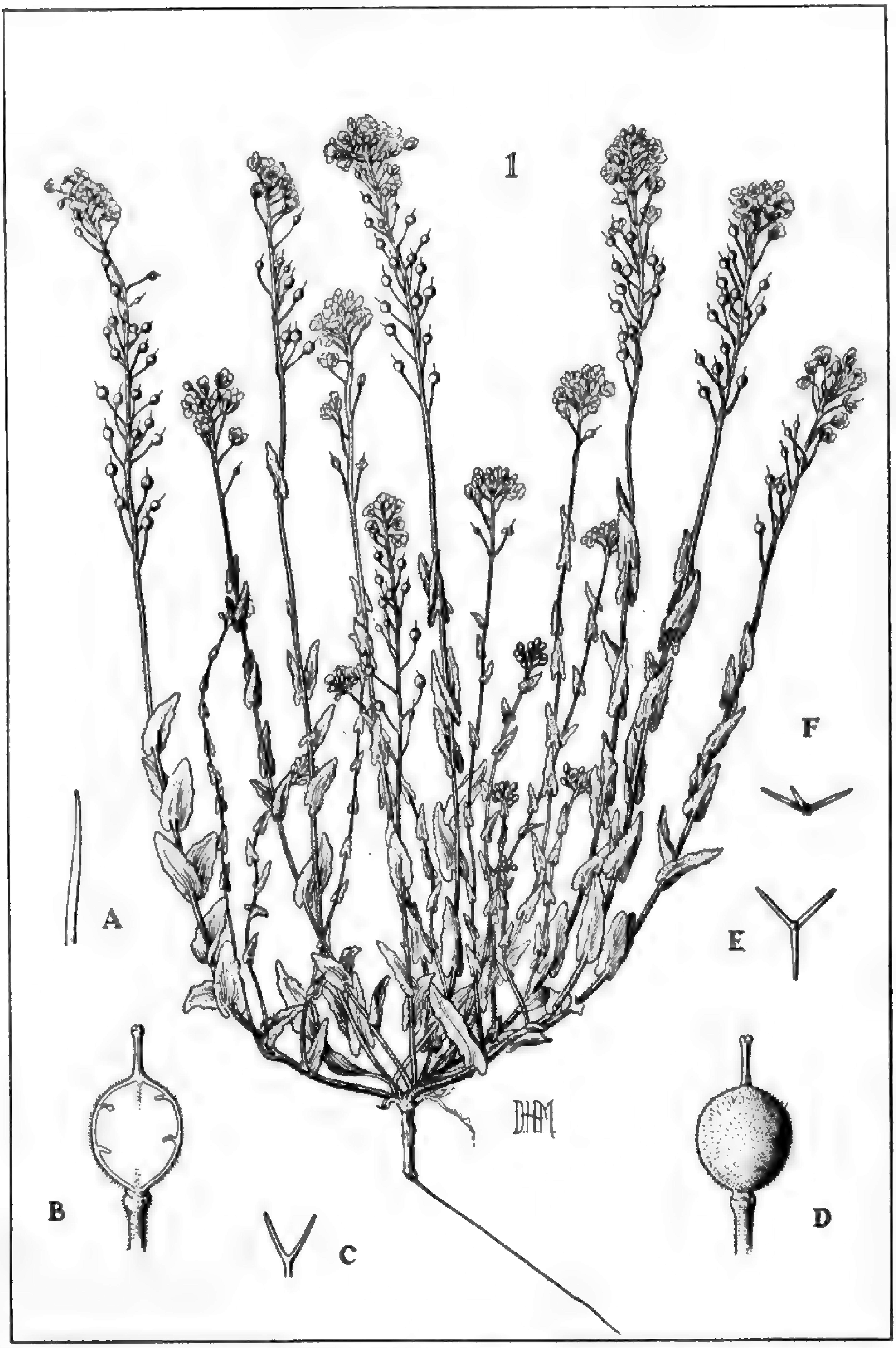

Fig. 1. *Lesquerella densipila*, var. *densipila*. Drawings by Dorothy H. Marsh from Sharp, Felix and Adams no. 11187. Habit × ⅜. A, C, E and F, trichomes × 25. B, replum × 3. D, silique × 3.

with the naked eye in var. *densipila*, and a close inspection with a hand lens is required to see it. Young fruits naturally have a denser covering and the pubescence is more readily seen with low magnification than upon the older siliques. The trichomes are found well up the style, often extending nearly to the middle. This is somewhat unusual in *Lesquerella* for the styles are most often completely glabrous even though the adjacent valves may be densely covered with trichomes. Other features of significance are the auriculate cauline leaves and the stamens with dilated bases. These features are shared by *L. auriculata* and *L. perforata* but they are not general in the genus *Lesquerella*.

Unfortunately the drawing (Fig. 1) does not show the basal leaves, which are definitely petioled. In general outline they vary from lyrately lobed toward runcinate. In most of the twelve specimens in the type series, the basal leaves have been shed.

The two collections from near Duck River do not differ from each other significantly, but specimens taken from the population in Williamson County can be distinguished from the others on trichome size and form. In the latter collection, the trichomes of the siliques average 100μ and are most frequently single. In the Duck River collections the trichomes average 81μ and are most often forked. I could not detect any other correlated differences that seemed significant. The fact that the trichome-size differed in these two populations provided the basis for including in *L. densipila* (as var. *maxima*) a more divergent population with comparatively much longer and larger trichomes and white instead of yellow flowers. This latter population differed so strikingly from *L. densipila* in the field that it was at first thought to represent an undescribed species. However, once it became clear that trichome size was not a reliable distinguishing characteristic, the flower color seemed to represent a less significant difference. However, there is still room for doubt and further field studies may upset the conclusions that now seem valid. The trichomes of the siliques of var. *maxima* differ considerably from plant to plant. In the plants checked, the one with the longest averaged 413μ while that with the shortest showed an average length of 151μ.

3. **Lesquerella perforata** Rollins, sp. nov.

Annual; stems several to many, outer usually decumbent at base, inner erect, simple or branched, 1–2.5 dm. high, densely hirsute below with large spreading mostly simple trichomes, pubescent above with less-spreading mostly branched trichomes; basal leaves lyrately lobed, petiolate, 2–5 cm. long, 5–15 mm. wide, lobes variable, terminal lobe orbicular to ovate, entire or dentate, obtuse to more pointed, lateral lobes broadly oblong, entire or shallowly toothed, becoming remote toward petiole; hirsute on both surfaces, with mostly simple trichomes, marginal trichomes smaller and branched; cauline leaves sessile, auriculate, broadly oblong to nearly ovate, sagittate, dentate, 8–20 mm. long, 4–8 mm. wide, hirsute above with simple trichomes, below with a mixture of simple and branched trichomes; pedicels straight, divaricately ascending, scarcely swollen at apex, 6–12 mm. long, uniformly pubescent with branched trichomes or with a mixture of simple and branched trichomes; sepals oblong, pubescent with a mixture of large and small branched trichomes, 3.5–5 mm. long, 1.5–2 mm. wide; petals white to pale lavender with a yellowish claw, sometimes tinged with light purple when dry, unguiculate, obovate to very broadly spatulate, emarginate to nearly entire, 7–9 mm. long, 5–6 mm. wide; filaments dilated at base, those of paired stamens 4–4.5 mm. long, anthers ca. 1.3–1.5 mm. long; glandular tissue subtending all filaments and nearly surrounding those of the single stamens, with projections between single and paired stamens; siliques inflated, broadly obovoid to subpyriform, very slightly stipitate, sparsely hirsute with large simple or forked trichomes to nearly glabrous on the exterior, densely pubescent with small dendritically branched trichomes on the interior, 4–6 mm. long, widest above the middle, 4–6 mm. wide; septum nearly obsolete, represented by only a narrow band of tissue around the inner margin of the replum; styles 1.5–2.5 mm. long, unexpanded or only very slightly expanded at apex; ovules 4–8 in each silique, funiculi free; immature seeds usually four per silique, flattened, probably with a narrow wing; cotyledons accumbent.

Herba annua; caulibus decumbentibus vel erectis hirsutis 1–2.5 dm. altis; foliis radicalibus petiolatis lyratis hirsutis 2–5 cm. longis, 5–15 mm. latis; foliis caulinis sessilibus auriculatis dentatis hirsutis 8–20 mm. longis, 4–8 mm. latis; pedicellis divaricatis pubescentibus 6–12 mm. longis; sepalis hirsutis; petalis albis obovatis vel late spathulatis 7–9 mm. longis; 5–6 mm. latis; siliquis obovoidis exteriore sparse hirsutis vel glabris, interiore pubescentibus, septis nullis, stylis 1.5–2.5 mm. longis, siliquis 4–8 ovulatis; seminibus immaturis marginatis; cotyledonibus accumbentibus.

Type in the Gray Herbarium, collected in an open field, 5 miles north of Lebanon, Wilson County, Tennessee, March 30, 1952, *Reed C. and Diane Rollins 5207*. Two other collections are known from near Lebanon: April 1, 1934, *A. J. Sharp 83* (UT); March 30, 1952, *Reed C. and Diane Rollins 5208* (G).

The uniqueness of an indument on the interior of the siliques and the absence or near-absence of a septum in this species have been indicated above. It should be further pointed out that the trichomes on the interior of the siliques are smaller and more highly branched than the few scattered ones on the exterior surface. The latter trichomes tend to resemble some of those of the sepals, pedicels and stems, which are much coarser and less branched. It might be assumed by some that because these characteristics are so different from those of other species of *Lesquerella*, *L. perforata* may not belong to that genus. However, with the exception of the interior pubescence and the virtual lack of a septum, *L. perforata* fits the pattern for *Lesquerella* as a whole very well. It is obviously related to *L. densipila* and *L. auriculata* so that there is every reason to associate it with them.

4. **Lesquerella globosa** (Desv.) S. Wats. Proc. Amer. Acad. **23:** 252. 1888.

Vesicaria globosa Desv. Journ. Bot. **3:** 184. 1814.
Vesicaria Shortii T. & G. Syn. Fl. N. Am. **1:** 102. 1838 (suppl. 668).
Alyssum Shortii Kuntze. Rev. Gen. Pl. **2:** 931. 1891.

Known from localized places in Tennessee, Kentucky, and Ohio. The following Tennessee specimens are representative: Rising Sun Bluff, Cumberland River, on the Devonian Shale, 14 miles below Nashville, April and Sept., 1886, *A. Gattinger s. n.* (G); same locality, May, 1886, *Gattinger s. n.* (UT); Bull Run Fishing Camp, Davidson Co., March 31, 1952, *Reed C. and Diane Rollins 5213* (G); open talus slopes on bluff, Bull Run section, Davidson Co., April 27, 1940, *Jesse M. Shaver 6561* (G, P); King and Queens Bluff, Cumberland River, Montgomery Co., April 27, 1946, *A. & E. Clebach s. n.* (UT).

Preserved in the Gray Herbarium is a fragment, presumably of the type, and a note in the hand of Asa Gray as follows: "Herb. Desv. Vesicaria globulosa Desv.! (no source. Am. Bor. in . . .) = my *V. Shortii.* Probably from Raf. Very small fruits with slender spreading pedicels. Hab. V." Though undated, it is safe to assume that the note was prepared by Gray while consulting the Desveaux Herbarium and that the fragments were obtained at that time. The fragments are unquestionably of the same species as the material cited above. This evidence, plus that adduced independently by Payson (1922) through Dr. Gagnepain, certainly removes all doubt about the proper application of Desveaux's name. It is interesting to note that Gray copied "globulosa," which Gagnepain says is present on the label of the type sheet, instead of "globosa," as published by Desveaux.

The study of a large series of specimens with mature fruits and seeds collected by Jesse M. Shaver permits me to present accurate information upon these structures. In all cases observed there were two funiculi near the apex of the replum in each loculus. These are definitely attached to the septum for one-third to one-half their lengths. Beyond this point a fold of the septum adheres to the funiculus forming a wing of tissue for nearly its entire length. The septum is not tightly stretched across the replum, as in most species of *Lesquerella*, but has the capacity to stretch fully into one loculus or the other if asymmetrical pressure is brought about by seed development in one loculus and not the other. The septum normally forms a partial pouch around the seed or seeds by enfolding them. I have not seen this feature in any other species of *Lesquerella* and it seems reasonable to infer from it that the siliques of this species or at least its progenitors were at one time considerably larger than at present. The large size of the seeds compared to the locule size lends support to this supposition. When but a single seed develops in a silique, it pushes the septum into the opposite loculus and being nearly round, fills the entire space. If one seed develops in each loculus, these take on a hemispherical shape on the outer side conforming to the inner surface of the valve, and a flattened surface toward the septum, presumably due to the compression tension exerted by the two seeds on opposite sides of the septum. The development of one seed in each loculus is most frequent but quite often two seeds mature in one loculus or the other or occasionally in both. When this happens, the seeds are reduced in size and there are two beveled surfaces on the inner side as described by Murley (1951), one toward the septum and one toward the adjacent seed. The cotyledons are normally accumbent, but the radicle may be pushed to one side due to the effects of crowding.

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NOTES CONCERNING JUNCUS CORIACEUS.—In Gray's Manual, both the 7th and 8th editions, *J. coriaceus* Mackenzie (*J. setaceus* Rostkovius) is said to have long-stipitate seeds. The illustration, in both editions, shows a stipe about three-fourths as long as the seed, with an appendage, presumably the "beak," displayed quite prominently at the opposite end. Buchenau[1] also refers to the seeds of this species as being stipitate.

In examining our material of *J. coriaceus*, I could find no long-stipitate seeds and accordingly borrowed material from the Gray Herbarium for comparison. In studying selected specimens from Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Mississippi, Louisiana and Texas none was found having long-stipitate seeds, although there is a short point, perhaps one-tenth the length of the seed, on one end. The seeds appear to be covered with a thin, almost transparent membrane, or secretion. This may cover the seeds uniformly at maturity, in which case it is hardly noticeable, or it may appear as a point or beak on one end, or as one or more ridges, or wings, on the sides of the seeds. Probably it assumes these various forms in response to pressure that may be exerted on the crowded seeds as they grow and mature. In any event the presence of either a long stipe, or of a "beak," cannot be used as taxonomic characteristics in this species.

In Oklahoma this species is found only in the southeastern part of the state. Representative sheets from four counties are: MCCURTAIN CO., *Waterfall 8471*, along creek south of Tom, Aug. 7, 1948; *Waterfall 9887*, edge of pond in oak-pine woods, two miles southeast of Bethel; LEFLORE CO., *Stevens* 2693, in rocky bed of dried-up mountain creek near Page, Sept. 8, 1913 (Gray Herbarium and Oklahoma A. & M.); CHOCTAW CO., *Houghton* 3983, pond banks near Ft. Towson, May 31, 1916 (Gray); PUSHMATAHA CO., *Waterfall* 349, sandy soil, five miles west and 0.7 miles north of Albion, Aug. 10, 1932.

The author is grateful to Dr. Reed C. Rollins, Director of the Gray Herbarium, for the loan of material for study.—U. T. WATERFALL, DEPT. OF BOTANY, OKLAHOMA A & M COLLEGE, STILLWATER, OKLAHOMA.

[1] Buchenau. Fr. *Juncaceae*, Das Pflanzenreich, Heft 25 (14: 36): 123. 1906.

Canada's Centenarian Botanist.—In his delightfully puckish rejoinder "Long life to Alexander W. Evans" published in Rhodora (vol. 52, pp. 49–51, 1950) shortly before his death, Professor Fernald (I cannot call him *late*, he is so clearly with us in spirit and memory) gave an interesting list of temperate North American botanists (so far as I am aware, none was an avowed toper, though it may well be that some, like the proverbial aged Scot, enjoyed their nips or even noggins) whose life-span approached the century. The longest lived in this list were Edo Claassen and John Donnell Smith, who had each lived to 99. Fernald stated that "Rather strikingly, the century-mark seems to be rarely attained." Indeed he appears to have been unable to produce any botanical centenarian for this occasion, having to content himself with remarking that "As notable a near-centenarian as any is Hermann Christ (99 years, 11 months), the great Swiss pteridologist."

Fernald also listed (*op. cit.* p. 51) "An even more inspiring group, . . . that bevy of active workers now with us," which was ended (in point of seniority, headed) by "Alice Eastwood (91), L. H. Bailey (92), Charles F. Batchelder (94), John Dearness (98)." That was more than two years ago, and happily these four are still very much alive, contributing to our subject and in one case making a trip from California to Sweden and back alone, while very recently, on 13 May 1952, Dr. Dearness delighted his many friends and admirers by celebrating his one-hundredth birthday—apparently to become our first centenarian botanical colleague. Another hopeful aspirant is the Englishman H. N. Ridley, who Dr. E. D. Merrill reported was in excellent health and spirits on his 96th birthday last December.

John Dearness was born in Hamilton, Ontario, on May 13th, 1852, to John and Jean (*née* Linklater) Dearness, who had emigrated from the Orkney Islands. Educated at the Provincial Normal School, Toronto, and the University of Western Ontario, he obtained the B.A. and, in 1903, the M.A. of the latter institution which later on (1926) awarded him the honorary degree of LL.D. For some years he was a public school teacher and inspector in the County of Middlesex, Ontario, before becoming Vice-Principal and ultimately Principal of the Provincial Normal School in London, Ontario (where he still resides). He also lectured for many years at the University of Western Ontario, at which he held the post of Professor of Biology, and acted as nature study teacher and director of various summer schools in Nova Scotia and Ontario.

A Fellow of the Royal Society of Canada and of the American Association for the Advancement of Science, Dr. Dearness is a past president (1937) of the Mycological Society of America, of the Canadian Division of the American Phytopathological Society, of the Ontario Historical Association (1912–14), of the Ontario Educational Association (1896), and of the Ontario Entomological Society (1897–98). He also acted for some time as Associate Editor of "Mycologia" and of "Nature Study Review." Among his more important botanical papers have been his "New or noteworthy North American Fungi" (1917) and his "Fungi" (1923) in the "Report of the Canadian Arctic Expedition 1913–18," and among his best known publications prepared jointly with other mycologists are the books "The Fungi of Manitoba" (1929) and "The Fungi of Manitoba and Saskatchewan" (1938), and the series "New species of Canadian Fungi" (1893–99) and "New or noteworthy species of Fungi" (1918–40); also notable was his "Report on fleshy Fungi collected in August, 1926" in J. D. Soper's "A faunal investigation of southern Baffin Island" (1928), which was the first authoritative report of any substantial number of Fungi from that largest island of the Canadian Arctic Archipelago.

As zoological and other scientific friends seem unable to produce a precedent from among their ranks, it is a pleasure again to hail our gentle science as a particularly good preserver, and a matter of pride and satisfaction to say "long life to John Dearness, centenarian botanist."—NICHOLAS POLUNIN. GRAY HERBARIUM, HARVARD UNIVERSITY.

NEW NAMES FOR WYOMING WHEATGRASSES.[1]—During preparation of a Wyoming Agricultural Experiment Station bulletin entitled "The Wheatgrasses of Wyoming" (Bulletin 312, Wyoming Agric. Expt. Station, in press) it has been found necessary

[1] Published with approval of the director, Wyoming Agricultural Experiment Station, as Journal Paper No. 13.

to treat a few of the entities below specific rank whose distributions are primarily in Wyoming, somewhat differently from previous treatments. Since the policy of prior appearance of new names in an experiment station bulletin has been criticized, the entries are being published as new in this taxonomic journal, but readers are referred to the experiment station bulletin for a more complete understanding of the name changes.

Agropyron albicans var. **griffithsii** (Scribn. & Smith) comb. nov. *A. griffithsii* Scribn. & Smith; Piper, Biol. Soc. Wash. Proc. **18:** 148. 1905.

Differing from typical *A. albicans* Scribn. & Smith only in having glabrous lemmas and broader (up to 3.5 mm.) leaf blades.

A. trachycaulum (Link) Malte var. majus (Vasey) Fernald f. **pseudorepens** (Scribn. & Smith) comb. nov.
A. pseudorepens Scribn. & Smith, U.S.D.A. Div. Agrostology Bull. **4:** 34. 1897.

All of the wheatgrasses that are characteristically bunchgrasses occasionally produce stolons (cf. Nevski, 1934. Hordeae. Flora U.S.S.R. **2:** 590–728, illus.; and Daubenmire, R.F. 1939, The Taxonomy and Ecology of *A. spicatum* and *A. inerme.* Bull. Torr. Bot. Club **66:** 327–329).

A. trachycaulum var. unilaterale (Cassidy) Malte f. **andinum** comb. nov.
A. violaceum var. *andinum* Scribn. & Smith, U.S.D.A. Div. Agrostology Bull. **4:** 30. 1897.

Similar to var. *unilaterale* but the culms less than 5 dm. tall, geniculate at the base and the awns noticeably divergent.

A. trachycaulum var. **latiglume** (Scribn. & Smith) comb. nov.
A. violaceum var. *latiglume* Scribn. & Smith, U.S.D.A. Div. Agrostology Bull. **4:** 30. 1897.

Mainly differing because of the pubescent lemmas.

It is perhaps of interest to note that the forthcoming bulletin is a revision of an earlier bulletin with the same title (Bul. **59:** 1904) part of which was written by Elias Nelson, who also preferred to publish new names in a taxonomic journal (cf. Some western species of *Agropyron.* Botanical Gazette **38:** 378. 1904).—Alan A. Beetle. Wyoming Agric. Exper. Sta., Laramie, Wyoming.

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THE GENUS TORREYOCHLOA

George L. Church

In a recent issue of Rhodora, Clausen (1952) has agreed with the author's removal (Church, 1949) of the open-sheathed *Torreyochloa pallida* (Torr.) Church [*Glyceria pallida* (Torr.) Trin.] from its anomalous position in *Glyceria*, a genus which is unusual in its character of closed sheaths. Rather than recognize the distinct generic status of the species, however, Clausen has transferred it to a new section of *Puccinellia*.

The taxonomic vicissitudes of *Puccinellia*, including its confusion with *Glyceria*, were reviewed by Fernald and Weatherby (1916). The genus is readily separated from *Glyceria* on the basis of the faint nervation of the lemmas, together with the usual caespitose habit, the inrolling of the leaf margins, the stiff (rather than strongly flexuous) panicle branches and the alkaline habitat. Furthermore, an examination of both Old and New World collections will reveal the fact that all three above mentioned genera may be separated not only by the spikelet characters but those of the caryopses as well, according to the following key:

Leaf sheaths connate; upper glumes uni-nerved; styles present; caryopsis narrowly or broadly ovoid (occasionally obovoid), dark castanaceous, and bearing a long, linear hilum and apical, remnant styles . . . . *Glyceria.*

Leaf sheaths free and overlapping; upper glume trinerved; styles absent.

- Lemma nerves prominent; caryopsis broadly ovoid, dark honey colored, and bearing a reddish brown, oblong hilum—one third the length of the grain, the apex crowned with stiff, rather connate bristles in addition to remnant stigmas . . . . *Torreyochloa.*
- Lemma nerves obscure; caryopsis fusiform, medium to olive-brown, and bearing a chestnut-brown, oval, subbasal hilum, the apex covered with matted, remnant stigmas only . . . . *Puccinellia.*

Again, the three genera may be distinguished on the basis of the cell patterns in the leaf epidermis, which are revealed in easily prepared, microscope slide mounts. These characters have been employed successfully by Prat (1936) in interpreting taxonomic relationships in the Gramineae. With respect to *Glyceria*, members of the sections *Euglyceria* and *Hydropoa* have epidermal cells with smooth walls and papillae (silicified projections) while the section *Striatae* is typified by smooth walls of cells lacking papillae. In *Torreyochloa* the cells have rippled walls and lack papillae while those of *Puccinellia* have rippled walls and abundant papillae.

Finally, cytological studies reveal the fact that the chromosomes of all three genera are distinct with respect to structural characters of width and length (Church, 1949). The chromosomes of *Glyceria* are small (medium in *Hydropoa*), while in *Puccinellia* they are narrow and long. *Torreyochloa*, however, has chromosomes that are large in all dimensions. The similarity of the basic chromosome number of seven in the latter two genera does not necessarily indicate close affinity, especially when the aforementioned structural differences are considered.

As further evidence of the relationship between *Torreyochloa* and *Puccinellia*, Clausen cites the similarity of open sheaths, triple-nerved upper glumes and branching stigmas. On the basis of these characters, as well as the additional ones of faint lemma nervation and alkaline habitat, the *Nevadensis* section of *Poa* might be united with *Puccinellia*. Again, in this case, however, the leaf epidermis, caryopses and chromosome morphology all present differences sufficient for the maintenance of distinct genera. With regard to this same group of characters, *Torreyochloa* remains equally distinct.

The fact noted by Clausen that *Torreyochloa pallida* and *Puccinellia distans* (L.) Parl. grow under identical conditions in the Montezuma marshes in central New York is an illustration of the wide range of adaptability of the latter species which is a European introduction. According to Hegi (1935), *P. distans* shows much less of a preference for alkaline habitats than the other well known Puccinellias of the littoral zone. One European variety of *P. distans*, grows even in essentially fresh habitats. *P. grandis* Swallen of the Pacific coast will thrive in practically neutral soil under greenhouse conditions. The approximation of habitat preference in the apparently rare cases of species in the two genera would hardly seem to be a reason for their merger into one genus, however.

Although *Torreyochloa* has not been accepted by either Fernald (1950) in the eighth edition of Gray's Manual or Chase (1950) in the revised edition of the Manual of Grasses, one cannot assume that these authors would have departed from a conservative point of view and concurred with Clausen's expanded concept of *Puccinellia.* On the other hand, Swallen (1951) has accepted *Torreyochloa* in his treatment of the Gramineae in the Arizona Flora of Kearney and Peebles.

For the present, Clausen has made a transfer to *Puccinellia* only of *T. pallida*, since he considers the taxonomic status of the other species of *Torreyochloa* uncertain. It is very difficult, however, to concede this point of view with respect to the well known *T. pauciflora* (Presl.) Church. Undoubtedly, it may be considered a vicarious species (Cain, 1944) in the sense that it is the western counterpart of the eastern *T. pallida*, from which it is distinct, nevertheless, in being commonly one meter tall, thick-stemmed and wide-leaved. In contrast, *T. pallida* is typified by short, weak, decumbent stems and narrow leaves. *T. erecta* (Hitch.) Church and *T. fernaldii* (Hitch.) Church are extremes that probably do not merit specific rank. *T. otisii* (Hitch.) Church is a rare species of the Olympic Peninsula, but an examination of the few specimens available reveals all of the distinct characters clearly noted in the Manual of Grasses. *T. natans* (Kom.) Church and *T. viridis* (Honda) Church of eastern Asia may require further study as to range, but they both show the characteristic caryopsis and leaf epidermis features of the genus.

Since *Torreyochloa* may be distinguished from *Puccinellia* on morphological grounds, even without the cytological evidence, Clausen's suggested merger of the two genera introduces an unnatural element into *Puccinellia*, which otherwise remains as a very uniformly composed genus.—DEPT. OF BOTANY, BROWN UNIVERSITY, PROVIDENCE, R. I.

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THE DISTRIBUTION OF ARNICA WILSONII RYDBERG AND ITS SIGNIFICANCE[1]

Bernard Boivin

Arnica wilsonii Rydb. belongs to the *A. lonchophylla* Greene group and was long known only by the type collection made in 1902 about 140 miles up the Kapiscow River in northern Ontario. It was collected anew in 1946 by Dutilly and Lepage in northern Ontario, about 50 miles up the Attawapiskat, and again in 1950 by Schofield in northern Manitoba, on the Limestone River, about 50 miles west of Hudson Bay. This type of distribution, inland from the Hudson Bay and along a line roughly parallel with the present shoreline, is rather unexpected.

It has long been known that a number of entities presenting a disjunct range occur along the southern edge of Hudson and James Bays. The intervening area of northern Ontario and adjacent Quebec and Manitoba was very little known botanically, but it was expected that, when better known, it would show that many of those disjunct species really have a continuous range. As new collections continue to be made in this area, relatively few intervening localities for these disjunct species are turning up, but instead a new series of disjunct ranges is being discovered. These disjunct ranges seem to fall into four types:

1—Prairie outliers, such as *Linum lepagei* Boivin, a vicariant of *L. lewisii* Pursh, a common species in the Canadian Prairie.

[1] Contribution No. 1184, from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

These occur around Hudson Bay mostly on sand dunes and other relatively dry habitats. They may occasionally occur inland in similar habitats.

2—Shoreline outliers, species that were presumably widespread around the Champlain Sea and along the shores of the larger glacial lakes bordering the continental ice-sheet during its last retreat, species that now exist around the Gulf of Saint Lawrence, Hudson Bay and around some of the larger inland fresh water lakes, relicts of still larger glacial lakes. These are strictly strand species, but may sometimes occur inland along former shorelines of the Champlain Sea and of late glacial lakes.

3—Cliff outliers, such as *Clematis verticillaris* DC.[2] whose detailed distribution will be given elsewhere. These occur on cliffs, mainly on present shore cliffs, but are frequently found inland on former shore cliffs of the Champlain Sea and of the glacial lakes.

4—Lowland outliers, such as *Cypripedium calceolus* L., which reaches north to the lowlands of the Saint Lawrence Valley and reappears northward around James Bay.

The distribution of *Arnica wilsonii* Rydberg, a species now found part of the way down the rivers draining into Hudson Bay, and a close segregate of *A. lonchophylla* Greene and *A. chionopappa* Fern. found near Lake Superior, seems to indicate the probable path of those northward migrations, namely the numerous north-flowing rivers with their headwaters near the Great Lakes or in the Canadian Prairie and also perhaps the glacial rivers that drained the glacial lakes southward into the Saint Lawrence and Mississippi basins.

Presumably these species first established themselves around the temporary lakes fronting the glacier after the edge of the ice cap had retreated beyond the Atlantic-Hudson Bay divide. As the ice front retreated, the glacial lakes gradually lowered their levels and successive shorelines were established and abandoned, each one farther north than the preceding shoreline, until the glacial lakes finally merged into the present Hudson and James Bays. Some species, such as *Tanacetum huronense* Nutt., *Thalictrum confine* Fern., etc., were apparently able to migrate from shoreline to shoreline and still exist around the modern

[2] See also: Boivin B., Les variations canadiennes du *Clematis verticillaris* DeCandolle et leur distribution (*in press*).

coast. Others, such as *Arnica wilsonii* Rydb., *Clematis verticillaris* DC., etc., were either unable to migrate that far north or to cope with such rapid changes of shorelines, but once established were able to persist inland until today and long after the disappearance of the conditions which originally favored their migration northward.

Another group of Hudson Bay disjuncts, the halophytes,[3] was discussed by D. Potter, Botanical Evidence of a Post-Pleistocene Marine Connection between Hudson Bay and the St. Lawrence Basin, RHODORA **34:** 69–89, 101–112. 1932. On the basis of phytogeographic data, Potter postulated the existence of a marine connection, or near connection, in the vicinity of the headwaters of the Ottawa River, between the Champlain Sea at its highest level and Hudson Bay at a former higher level. Potter's hypothesis and the above hypothesis are not mutually exclusive as most of the species concerned could have migrated northward along the coast of a large body of water regardless of whether the water was fresh or salty. We may consider that some of the species listed by Potter to support his theory, such as *Potentilla anserina* L., are really strand species and are in no way salt-water obligates. We may also consider that many other species, though being primarily halophytes, have turned out to be capable of persisting or establishing themselves away from the sea coast, such as:

JUNCUS GERARDII Lois. Former shores of the Champlain Sea (Ottawa); weed along railway embankments, etc. (Cochrane, Hope, Brandon).

ZANNICHELLIA PALUSTRIS L., var. MAJOR (Boenn.) Koch. Known to occur in fresh water marshes near the sea coast; sometimes persistent inland (Varennes).

CAREX MARITIMA L. and SCIRPUS RUFUS (Hudson) Schrad. The distribution maps given by Potter include some inland stations.

CAREX MACKENZIEI Krecz. (*C. norvegica* sensu Potter). This species is a good halophyte along the Atlantic seaboard but its Hudson Bay phase seems to be indifferent to fresh water if we judge by the collector's data on the three Hudson Bay specimens in our herbarium. These are as follows: 1—in dense mat on creek bank; 2—abundant in dense mats on willow flats; 3—very damp mossy ground.

POA EMINENS J. S. Presl. This is primarily a halophyte, but our collectors in Alaska report that it may sometimes be found a short distance

[3] See also: Boivin B., La Florule du mont Blanc, Gaspésie (*in press*).

away from the coast. At Seward, in particular, it may occur as a weed in town or as a pioneer species in vacant lots.

Carex bipartita Bell., var. amphigena (Fern.) Pol. (*C. glareosa* var.), Arenaria peploides L., Mertensia maritima (L.) S. F. Gray. These are now known to occur all the way around the Labrador Peninsula and could very well have reached the James Bay region by following the outer sea coast.

Plantago juncoides Lam., Triglochin palustris L., Triglochin maritima L., Lathyrus japonicus W. (*L. maritimus* (L.) Big.). These begin to appear along the lower Saint Lawrence at least 50 miles inland from the western limit of the brackish water.

Potamogeton filiformis Pers. This is a fresh water species occurring sometimes in slightly brackish situations.

Scirpus americanus Pers., Myriophyllum exalbescens Fern. These species occur indifferently in fresh water and brackish water habitats.

Juncus balticus W., var. littoralis Eng. Known to occur around Lake Saint John as a relict of the Champlain submergence and is therefore susceptible of adapting itself to fresh water conditions.

Bidens hyperborea Greene. Not a halophyte, but an estuarian species.

Zostera marina L. A strict halophyte, not known to occur in the Hudson Strait (62° 30′) region, but it is not confined to the James Bay region. It is known to occur in West Greenland as far north as 64° 23′ and in the northern part of Hudson Bay, as far north as 61° 5′, only about 90 miles farther south than Hudson Strait, and could very well have entered the Bay from the north.

Glaux maritima L., var. obtusifolia Fern. This variety occurs on the Saint Lawrence as far west as the contact zone between the fresh and the salt water where it is apparently submitted to alternating tides of slightly brackish water and almost fresh water.

Thus it would seem that some of the species used by Potter to support his theory could very well have reached the James Bay region by following the outer sea coast around the Labrador Peninsula, while all the others are sufficiently tolerant of inland and fresh water situations that their presence in that area could be explained away by the hypothesis outlined above. They could have first reached the upper Ottawa region via the Champlain Sea coast. They could then have colonized the coast and shores of the glacial lake a few miles away to the north. As the shoreline was displaced gradually to the north, first with the successively lower levels of the glacial lake, then with the progressively lower Hudson Bay waters, these plants were presumably able to colonize each successive shoreline until they reached their present location.

The chief weakness of Potter's hypothesis is that it postulates a maritime connection or near connection between Hudson Bay and the Champlain Sea at their higher levels. Geological evidence of such a connection or near connection has not been forthcoming.

On the other hand there is a very large clay belt extending over a wide area of northern Ontario and adjacent Quebec. This clay belt was deposited in a glacial lake that has been named Lake Ojibway. It extends north of the Hudson Bay-Saint Lawrence divide as far as about two-thirds of the way to James Bay. It also extends a short distance south of the present divide. There is some evidence to indicate that at its earliest stage and highest level Lake Ojibway was cut in two by an ice lobe extending across the Upper Ottawa Valley near the present continental (i. e. Arctic-Atlantic) divide. The southern half of the lake was located approximately where one now finds Lake Timiskaming. This latter half was called Lake Barlow. It is supposed to have discharged its waters via the Ottawa Valley. Lake Ojibway on the other hand is supposed to have had a series of successive outlets and shorelines that have not been yet worked out in detail.

As far as I am aware the exact relation between the south shore of Lake Ojibway or Lake Barlow and the north shore of the Champlain Sea has not yet been worked out in detail either, but in any event the two could very well have been no more than a few miles apart since the Ottawa arm of the Champlain Sea nearly reached the present divide while Lake Barlow extended some distance south of the same divide. Furthermore the two were undoubtedly connected by a very large glacial river.

This glacial river was probably very short, perhaps only 10 or 20 miles long, and if we consider that Lake Saint Peter, about 100 miles from brackish water and only 9 feet above sea level, is regularly submitted to a tide of about one foot in amplitude, it would appear quite possible that Lake Barlow may also have been subjected to small fresh water tides during its early stages, thus facilitating the invasion of its shores by plants of halophytic preferences.

It is not known whether those two bodies of water were ever actually in such close proximity. At any rate, all presently known evidence indicates that, if there ever was any large body of water near the upper end of the Ottawa arm of the Champlain Sea, it was a glacial lake, and not a southern extension of Hudson Bay. Thus the presence of a series of halophytes in the James Bay area has to be explained either by a migration around the Labrador Peninsula, as seems to be the case for some of the species concerned, or else one has to accept the possibility of a migration via the shores of large bodies of fresh water in the manner outlined above. The species concerned do not seem to be essentially antipathetic to the presence of fresh water.

WHAT IS HYPERICUM PROLIFICUM?

H. K. Svenson

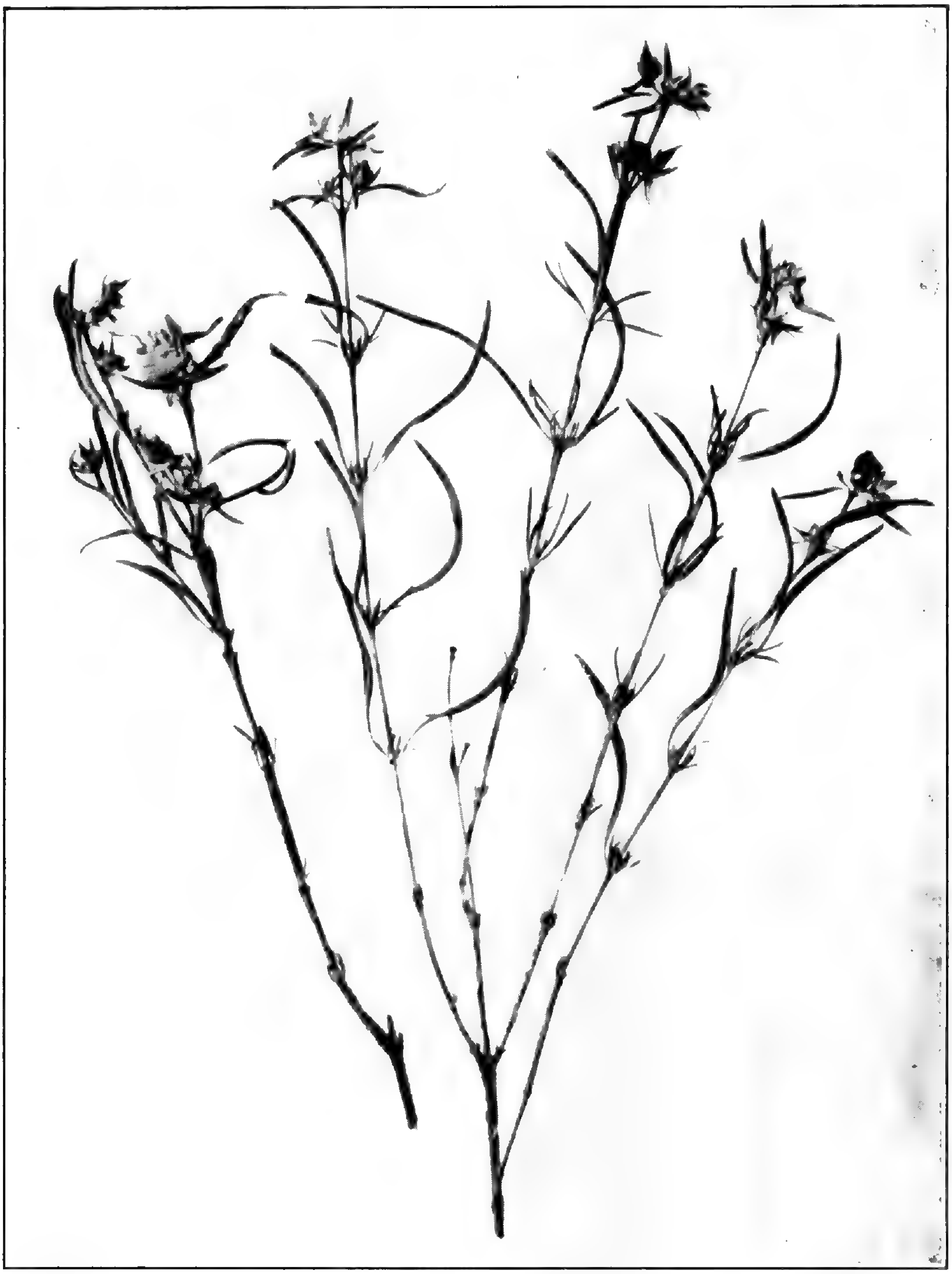
In Rhodora **42**: 9–10. 1940, before I really understood the method by which Linnaeus had treated his species, and when designating a type sheet seemed somewhat mandatory, I selected from among the five specimens representing *H. prolificum* in the Linnaean Herbarium, the sheet no. 20, which consisted of flowering branches with mostly linear leaves. A photograph of this material is provided by Fernald & Schubert in Rhodora **50**: 167. 1948. Linnaeus appended to his bibliographic treatment, among other descriptive notes, the words, "*Folia saepius revoluta, unde angusta Rosmarini*" (the leaves more often revolute, whence the narrow ones resemble those of rosemary). The other four sheets have broader-leaved specimens conforming in general to the ordinary accepted idea of *H. prolificum*. Therefore I considered sheet no. 20 as representing aberrant or unusual material of *H. prolificum*, and noted that Linneaus had realized the underlying situation in his differentia "lineari-lanceolati" in the polynomial specific name, and in the similar annotation at the bottom of sheet no. 20.

But Fernald & Schubert (loc. cit.) felt that the cited sheet no. 20 is specifically distinct from the remainder of the material, since (p. 168), "In the vast amount of herbarium material available, we have not been able to find anything which can be identified unquestionably with the Linnean sheet no. 20." I, on the contrary, remain of the opinion that sheet no. 20 represents merely an aberrant condition, perhaps ecological, of the generally accepted *H. prolificum.* A similar collection with many inrolled leaves was made by *Mattoon* at Long Pond, 1 mi. south of Dead Run, Wayne County, Illinois, on September 6, 1919 (specimen in herb. Arnold Arboretum) and in August 1951, I found the same type of plant abundant on open limestone along highway 19 east of Dickensonville, Russell County, southwestern Virginia (see illustration).

It is possible, but highly improbable, that this remote locality could have been the source of the Linnaean material described in 1767. The first journey to Cumberland Gap (so named by Dr. Thomas Walker's party in 1749) was by way of Sneedsville in northern Tennessee (cf. L. P. Summers, History of Southwest Virginia, 1903, p. 50). The area to the north was explored later, and the Clinch River remained as the bastion against Indian attacks. By 1774 a series of forts had been built along the east bank of the Clinch in southwestern Virginia. One of these was at Elk Gardens, 6 miles east of Lebanon on the north fork of Cedar Creek, not very far from the locality where I obtained the *Hypericum.* This fort occupied an eminence in the open cedar glade country, which extends for miles in a north to south direction.

When Spach's account of *Myriandra prolificum* (Hist. Nat. Veg. **5**: 440. 1880) is carefully examined, it appears that he made about the same analysis of the situation that Linnaeus did, i. e. he included plants with leaves ranging from lanceolate to linear or linear-spatulate. The spatulate extreme was treated as *Myriandra spathulata,* based on "*Hypericum prolificum* Leconte!" from material collected in southern United States in the Paris Herbarium. Illustrations by Watson, Dendr. Britt. pl. 88, and of *H. foliosum* Jacq., Hort. Schoenbrunn. pl. 299, both of which were included by Spach under *M. prolificum,* are of broader-leaved plants (incidentally, I believe the writing on no. 22 in the Linnaean Herbarium is "canariense" rather than "canadense," as I stated in my previous paper).

A number of additional names were set up under *Myriandra* by Spach, those revolving about *Hypericum aspalathoides* and *H. fasciculatum* being specially interesting in this connection. *H. aspalathoides* Elliott (excluding the description) received the



Hypericum prolificum. Specimen from Russell County, Virginia (*H. K. Svenson* no. 13,000, August 16, 1951) (Gray Herbarium).

new name *Myriandra brachyphylla* Spach, and a *Drummond* specimen from Florida was cited. *H. aspalathoides* Willd. (*H. fasciculatum* Lam.) appears now as *Myriandra Brathydis* Spach; whereas Elliott's *H. fasciculatum* comes to rest under *Myriandra galioides* (Lam.) Spach. *H. fasciculatum* Michx. (not Lamarck) is treated under *Myriandra Michauxii* (Desrous.) Spach. Dr. L. B. Smith caught the incorrect varietal transfer which I had made of *H. fasciculatum* and, as he has written me, it should read *Hypericum galioides* Lam. var. *aspalathoides* (Willd.) Torr. & Gray, Fl. N. Am. **1**: 672. 1840 (*H. galioides* var. *fasciculatum* (Lam.) Svenson, RHODORA **42**: 12. 1940). It is interesting to note that Spach came to the same conclusion to which I arrived, in identifying the Willdenow specimen of *Hypericum aspalathoides* with that of *H. fasciculatum* Lam., rather than with the plant with the very short leaf fascicles of Torrey and Gray, for which I gave the name *H. galioides* var. *reductum.*

There is still one problem for which I did not give an adequate solution. R. M. Harper in Monograph 9 of the Geological Survey of Alabama (Woody Plants of Alabama, p. 272. 1928) mentioned a specimen sent in to him by Dr. A. J. Lloyd from dry rocky hills near Walnut Creek in Chilton County, Alabama, in the summer of 1921. Dr Harper and I later visited this locality and found plants locally abundant on micaceous rock in a recumbent or even creeping state with fasciculate leaves somewhat similar to those of the taller erect *H. fasciculatum* Lam. A number of similar collections appear toward the outer geographical range of *H. galioides*, and one of these I illustrated in RHODORA **42**: pl. 587, fig. 1940, but without description. In order to clear the record this variation should be described: *H. galioides* var. **Lloydii** n. var. A planta typica differt caule procumbente, foliis fasciculatis filiformibus. Type from Graniteville, Aiken Co., South Carolina, *Eggert* in 1898 (herb. N. Y. Bot. Garden).—THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK, N. Y.

PLANTS NEW TO ILLINOIS AND TO THE CHICAGO REGION

Julian A. Steyermark

and

Floyd A. Swink

The following collections represent additions to the known flora of Illinois and/or the flora of the Chicago area of Illinois and Indiana. Since the publication of our earlier paper (Rhodora **51**: 147–149. 1949), the authors have either collected or have found these new records in the herbarium of the Chicago Natural History Museum. All specimens collected have been deposited in the herbarium of that institution.

Additions to the Flora of Illinois

Lycopodium inundatum L. According to Jones (Amer. Midl. Nat. **38**: 79. 1947). the only known station in Illinois ("Evanston, Sept. 20, 1890, L. N. Johnson") has since been destroyed. The present station, discovered in Cook County, is validated by the following collection: sphagnum-covered swale along Thornton-Lansing Road east of Thornton, Sept. 14, 1947, *Steyermark 65010*. The plant has been observed in the same locality by Mr. Swink as recently as September, 1951.

Elymus arenarius L. According to the 8th edition of Gray's Manual of Botany, "Typical *E. arenarius*, with culm glabrous at summit, rachis glabrous except for ciliate angles, and firm glumes 1–3-nerved, is Eurasian." Several years ago Mr. O. C. Durham of Abbott Laboratories, North Chicago, Illinois, collected specimens at Waukegan, Lake Co., Ill., of an *Elymus* which the senior author identified as typical *E. arenarius*. Since then the junior author has made a collection which can be referred definitely to typical *E. arenarius*. The data for this collection is: on open dunes just north of the pumping station at Glencoe, Cook Co., June 25, 1951, *Swink 76*. So far as records indicate, these are the only collections of the typical form of the species reported for the United States.

Scirpus paludosus Nels. This species recently collected by the junior author has not been previously reported from Illinois. This collection was made in a ditch along the west side of Halsted Street at 144th Street, at Kickapoo Grove in Riverdale, Cook Co., August 12, 1951, *Swink 329*. The colony is more than 100 yards in length and markedly dominates the vegetation in the ditch.

Convallaria majalis L. While botanizing a decadent tamarack bog on the outskirts of the south part of the town of Wauconda, Lake County, the senior author was surprised to encounter a small stand of the European Lily-of-the-valley, which apparently was introduced or bird-disseminated many years ago in the heart of this primitive wild spot. Collections were made both in anthesis and in fruit. The colony has apparently persisted for many years and is growing on a moist hummock associated with such species as *Cypripedium reginae, Maianthemum canadense* var. *interius, Aralia racemosa,* and *Dryopteris thelypteris* var. *pubescens,* giving every appearance of being part of the native vegetation. The data for these collections is: in dense woods, next to meadow bordering north end of tamarack swamp on south side of Wauconda, east of highway 12, Lake Co., August 28, 1949, *Steyermark 69026;* same locality, May 31, 1950, *Steyermark 69934.*

Populus × Jackii Sarg. Some of the material previously collected and named either *P. balsamifera* or *P. candicans* in northern Illinois, such as *Huron Smith 6041* from Waukegan, Lake Co., *Frank C. Gates 3155* from the same locality, and *Sherff s. n.* from Washington Park, Chicago, the present authors would refer to this hybrid. Also, a specimen collected by Charles S. Sargent (*Sargent 28*) from Waukegan in 1917, and questioned by him as being referable to *P.* × *Jackii,* is in our opinion this same hybrid. These specimens show the lower surfaces of the leaves and the petioles entirely glabrous and the shape of the leaf broadly cordate-ovate. Recent collections made by the junior author are: near Lake Michigan on the McCormick Blair property north of Lake Bluff, Lake Co., June 25, 1951, *Swink 56,* and, in sandy soil near Lake Michigan south of the main parking lot of the Illinois Beach State Park, north of Waukegan, Lake Co., August 31, 1951, *Swink 566.*

Polygonum cuspidatum Sieb. & Zucc. This species was found established in waste ground near Torrence Avenue at about the 12000 block in Chicago, Cook Co., September 19, 1951, *Swink 768.* So far as our records indicate, this is the first collection for Illinois.

Geum rivale L. This species was not reported either in the first or second edition of Jones' Flora of Illinois, but was reported as occurring in northern Illinois in the 8th edition of Gray's Manual. We have both collected this species near Elgin in Kane County. The collection in the herbarium of the Chicago Natural History Museum is: local in Thuja swamp, Trout Park (Elgin Botanical Garden), just north of Elgin, Kane Co., June 29, 1949, *Steyermark 68331.* The plant was growing associated with typical indigenous species of the Arbor Vitae swamp.

Trifolium pratense L., f. leucochraceum Aschers. & Prantl. The white-flowered form of this species was found, in an open meadow along highway 66 just southwest of McLean, McLean Co., July 4, 1946, *Steyermark 63780.*

Vicia dasycarpa Ten. The authors found this species occurring with *Vicia villosa* where it had been introduced along highway 66. The data for this collection is: open ground along highway 66 near Thomasville, Montgomery Co., June 14, 1951, *Steyermark & Swink 71730.*

Ptelea trifoliata L., f. pubescens (Pursh) Voss. The pubescent form has been found in at least two separate areas in northern Illinois. These collections are: sandy ridge bordering woods, Camp Harrison, 1¼ miles west of Calumet City, Cook Co., June 22, 1949, *Steyermark 68307;* in woods near Lake Michigan on the McCormick Blair property north of Lake Bluff, Lake Co., June 25, 1951, *Swink 55.*

Gaylussacia baccata (Wang.) K. Koch, f. glaucocarpa (Robins.) Mackenz. The data for this collection is: in open acid ground about ¼ mile south of route 113 S and about 2 miles southeast of Custer Park, Will Co., September 3, 1951, *Swink 573.*

Asclepias incarnata L., f. albiflora Heller. The data for this collection is: along route 54 just north of junction with route 30, Olympia Fields, Cook Co., July 27, 1949, *Steyermark 68624,* "hood white, petals white throughout or with pale pink at ends."

Anchusa officinalis L. The data for this collection is: near C. & N. W. railroad, not near any habitation, Elgin, Kane Co., November 10, 1916, *H. C. Benke 1361.*

Lappula Redowskii (Hornem.) Greene, var. occidentalis (Wats.) Rydb. The data for these collections is: Huntley, McHenry Co., June 16, 1916, *H. C. Benke 1804;* Port Byron, Rock Island Co., without date, herb. *E. T. Harper s. n.*

Salvia sylvestris L. An extensive stand of this was found in bloom in a field on the west side of highway 59 just north of junction with highway 19, between West Chicago and Barrington, two miles north of Bartlett, Cook Co., July 9, 1951, *Steyermark 72138.*

Lonicera xylosteum L. A specimen in the herbarium of the Chicago Natural History Museum bears the following data: woods, West Pullman, Cook Co., May 21, 1898, *L. M. Umbach s. n.*

Lonicera morrowi Gray. This species has been found in at least two localities in northern Illinois and is represented as established in the wild state by the following collections: Waukegan dunes, north of Waukegan, Lake Co., June 13, 1940, *Standley & Steyermark 28129;* on a slope facing Lake Michigan, just north of the pumping station at Glencoe, Cook Co., June 25, 1951, *Swink 72.*

Eupatorium perfoliatum L., var. cuneatum Engelm. Recently found growing in the proximity of *E. perfoliatum* and *E. serotinum* in partly shaded ground about ¼ mile south of route 113 S and about 2 miles southeast of Custer Park, Will Co., September 3, 1951, *Swink 586.*

Solidago sempervirens L., var. mexicana (L.) Fern. For several years we have been puzzled by a peculiar goldenrod which occurs in several places in and near downtown Chicago. It was first seen in 1933 near the Century of Progress grounds south of the Chicago Natural History Museum and its marked similarity to the seaside goldenrod (*S. sempervirens*) was then observed. Subsequent study of the material proves without doubt that it is the variety of this species, although some of the material could be referred almost as well to typical *S. sempervirens.* So far as is known, this is the only inland station recorded for the species or its variety. The senior author has transplanted a couple of clumps of this plant to his wild flower garden. In its various Chicago habitats as well as in its transplanted state the plants have retained a fleshiness of the leaves, a characteristic of both the species and variety, perhaps more so of the species. The data for this collection is: along Outer Drive, just west of Chicago Natural History Museum, Chicago, Cook Co., October 20, 1947, *Steyermark 65308*. In addition, this variety has been found by both of us to be abundant along railroad tracks and in vacant lots around Clark Street between Roosevelt Road and Cermak Road in Chicago.

Additions to the Flora of the Chicago Region

Ophioglossum vulgatum L., var. pseudopodum (Blake) Farw. According to Jones (Amer. Midl. Nat. **38:** 92. 1947), the only stations known in Illinois for this species and included varieties are from Jackson, Union, and Wabash counties, all in southern Illinois. While the present authors were on a futile search for *Thismia americana* N. E. Pfeiff. at its type locality, hundreds of plants of this *Ophioglossum* were found in a low moist sedge prairie. Although the same variety has been found in adjacent Indiana, this is the first station recorded for northern Illinois. The data for this collection is: bottom prairie swale, on east side of Calumet Lake, between Torrence Avenue and Nickel Plate railroad at about 11900 South, between Ford plant and Solvay Coke plant, Chicago, Cook Co., Illinois, June 2, 1949, *Steyermark & Swink 68222*.

Bromus purgans L., f. laevivaginatus Wieg. Deam, in his Flora of Indiana, page 98, does not show the distribution of this form in the state. It was collected along Hart Ditch in Wicker Park in Highland, Lake Co., Indiana, Sept. 15, 1951, *Swink 731*.

Agropyron repens (L.) Beauv., f. aristatum (Schum.) Holm. This form was collected along railroad tracks near Clark Road north of the old village of Clarke in Gary, Lake Co., Indiana, June 23, 1951, *Swink 18*.

Liparis lilifolia Richard. During the summer of 1950, Mrs. Cora Steyermark discovered a single plant of this species, occurring within a few feet of the vegetable garden on the property of the senior author near Barrington, Illinois. An investigation of the known records in the herbarium of the Chicago Natural History Museum failed to reveal any specimens from northern Illinois. Inquiry about the distribution of this plant from Dr. G. N. Jones, of the University of Illinois, brought forth the fact that the species had been reported from Cook County in northern Illinois in the American Botanist **18:** 79. 1912 by Mr. Edwin Hull, but had been collected much earlier in Cook County from moist woods, Forest Hill, June 12, 1878, by E. J. Hill. What has been a puzzle was the occurrence of this single plant growing so far removed from its nearest known extant locality in the Indiana dunes, since the 1878 station from Cook County has been exterminated. Deam, in his Flora of Indiana, page 350, cites the occurrence of a stand in Putnam County, Indiana, about 3 miles northwest of Greencastle, where on June 3, 1910, he "found it in a 19-year old Catalpa planting that had been first cultivated to strawberries and later abandoned. Here the plant was growing by the hundreds." In the present instance, it seemed improbable that the location of the single plant discovered by Mrs. Steyermark owed its origin to cultivation or introduction.

A subsequent thorough investigation of some of the natural woodland area in the vicinity resulted, quite accidentally, in the discovery of nearly 250 plants in one locality and half a dozen in another, and showed that the species had been overlooked by previous exploration. The data for these collections is: upland oak-hickory knoll, in grassy-*Carex pensylvanica-Hepatica americana* association on north side of creek, south of Eton Drive and west of Kimberley Road, Biltmore Estates Subdivision, 5 miles north of Barrington, Lake Co., Ill., August 13, 1950, *Steyermark 69960;* same locality, June 20, 1951, *Steyermark 71738.* Dr. Jones states (in correspondence) that this Lake County collection "certainly constitutes a new county record."

Populus × jackii Sarg. This species has been discussed above under records new to Illinois. The following Indiana specimens are also to be referred to this hybrid: along the edge of the old Grand Calumet River (now filled in) at Marquette Park in Gary, Lake Co., Indiana (not planted), July 29, 1951, *Swink 239;* near the Lake Michigan shore at the east end of the Indiana Dunes State Park near Tremont, Porter Co., Indiana, July 29, 1951, *Swink 254.*

Quercus × runcinata (A. DC.) Engelm. This is apparently the first Chicago area record for this hybrid oak. It was found by the junior author, along a gravel road just west of a small bridge crossing Marley Creek about ½ mile south of Marley, Will Co., Illinois, August 12, 1951, *Swink 325.*

Trautvetteria carolinensis (Walt.) Vail. In going over the herbarium of Northwestern University, now on permanent loan at the Chicago Natural History Museum, a specimen of this species was observed with the following data: low prairies, Benton County, Indiana, August 3, 1876, collected by E. F. Shipman. While Benton County is not strictly in the Chicago region, it is near enough to it to warrant inclusion of this interesting collection in the present report. Deam, in his Flora of Indiana, page 465, states regarding this rare plant: "There is a specimen in the herbarium of De Pauw University collected by Blatchley which was in bud June 8, 1889, and was collected in the Heckland prairie about 10 miles northeast of Terre Haute, Vigo County, and one in the Gray Herbarium bearing the following label: 'Low prairies, w. Ind. E. F. Shipman, 1876'." The present discovery not only clears up the indefinite data concerning the Gray Herbarium specimen, but also proves that its range extends northward to Benton County.

Apios americana Medic., f. pilosa Steyerm. So far as known, this is the first record in the Chicago area. The data for this collection is: along Hart Ditch in Wicker Park in Highland, Lake Co., Indiana, September 15, 1951, *Swink 723.*

Vaccinium corymbosum L., var. glabrum Gray. So far as known, this is the first record in the Chicago area. The data for this collection is:

in moist shaded ground about one mile west of Baileytown, Porter Co., Indiana, July 29, 1951, *Swink 230.*

Ruellia strepens L. The data for this collection is: 3 miles below Sugar Island, east bank Iroquois River, Kankakee Co., Illinois, June 22, 1913, *Judge Arthur De Selm 176.* This appears to be the first Chicago area record.

Viburnum recognitum Fern. At the time the large colony of *Liparis lilifolia* referred to above was found, two shrubs of a *Viburnum* growing along a creek in a wooded valley below the *Liparis* stand were observed. An examination of this material showed it to be *V. recognitum*, having glabrous peduncles and rays of the inflorescence. It has not been previously known from northern Illinois. If this species is found eventually not to be distinct from *V. dentatum* L., the record for the occurrence of *V. dentatum* would still constitute a new one for the Chicago area. The data for this collection is: along north side of stream in low woods south of Eton Drive and west of Kimberley Road, Biltmore Estates Subdivision, 5 miles north of Barrington, Lake Co., Illinois, August 13, 1950, *Steyermark 69961.*

Vernonia altissima Nutt., var. taeniotricha Blake. This has been found in northern Indiana. The data for the collection is: in open ground near Hansen Road about one mile north of U. S. highway 20, west of Springville, La Porte Co., Indiana, August 25, 1951, *Swink 430.*

Bidens connata Muhl., var. anomala Farw. Apparently the first record of the variety for the Chicago area. The data upon which it is based is: in sandy soil along the Grand Calumet River west of Lake Street in Gary, Lake Co., Indiana, September 15, 1951, *Swink 703.*

All of the additions to the flora of Illinois listed above are also new to the Chicago area with the exception of *Lycopodium inundatum*, *Vicia dasycarpa*, and *Trifolium pratense* f. *leucochraceum.*—Chicago Natural History Museum and University of Illinois College of Pharmacy, Chicago, Illinois.

PERLUSTRATIONES PLANTARUM ARCTICARUM III: 'Parry Plants' in the Possession of the Royal Geographical Society, London

Nicholas Polunin

These specimens belonging to the Royal Geographical Society were made available to me some years ago through the kindness of the then Secretary, the late A. R. Hinks, C.B.E., F.R.S. They comprise a single small collection which, surprisingly enough, is said to be the only plant collection in the possession of the Society. Of its main features of general interest I have already given a brief account (Geog. Journ., vol. 102, pp. 27–29, 1943);

here it will suffice to summarize the more pertinent of these and some other features by way of introduction to a more detailed statement of the significance of this collection and finally of its composition.

The collection consists of seventeen well preserved specimens, each mounted on a sheet of rather thin paper about 18.5 cm. long and 11.5 cm. wide, and all enclosed in a home-made folder of stiff green paper. On an eighteenth sheet is written the following note: "Arctic Flowers—Latitude 69°. 20′. 40″ N. Longitude 83. 10. 00 W. June & July 1823. Collected on Captn. Parry's expedition by Lieut. Richards." The eighteen sheets of paper appear to have come from one source, all being of similar weight and texture and several being watermarked with an elaborate symbol, 'fancy' letters, and the date "1822"; they include the one bearing the detailed note. Probably this note was written not immediately, but still not many years, after the events to which it refers; probably (but by no means certainly) it refers at least in some degree to all of the specimens in the collection.

The donation of the collection to the Society by Mr. J. Foster Stackhouse in 1910 is recorded in the R.G.S. Museum Catalogue, p. 28; the only other notes accompanying the specimens are attempted identifications pencilled, apparently much later, on many of the sheets. In the absence, thus, of contemporary or near-contemporary 'individual' notes as to locality, etc., it would be unsafe to found new records on any of these specimens (cf. Perl.[1] I and II), however likely it may seem that the one 'general' label refers to all of them. This label indicates collection during Parry's 'second' voyage (1821–23), professedly on the mainland of Melville Peninsula a few miles south of Quilliam Creek, which was much visited, by parties from both his ships, during the summer of 1823—*see* W. E. Parry, "Journal of a Second Voyage for the Discovery of a North-West Passage from the Atlantic to the Pacific . . .", *London*, 1824, pp. 434 *et seq.*

This expedition was the first to explore most of the Melville Peninsula region, which has moreover been comparatively little visited since. The collector, "Lieut. Richards," appears to have been the Charles Richards mentioned by Parry (*op. cit.*) as one

[1] Refers to previous contributions in this series of "Perlustrationes Plantarum Arcticarum," published in *Journ. Bot.*, vol. 80, pp. 81–94, "1942," and Rhodora.

of the Midshipmen on board the *Hecla* during this and also his next voyage (*see* W. E. Parry, "Journal of a Third Voyage . . .", *London*, 1826); as in the case of Bushnan (Perl. I) I have been unable to find out the date of Richards's promotion to Lieutenant, if indeed he ever held that rank, but meanwhile the use of the title suggests that the label was not written until some years after the plants were collected.

Considering the above circumstances it is gratifying to find that, although it seems very unlikely that W. J. Hooker consulted the present collection when preparing his "Botanical Appendix"[2] to Parry's account of the voyage, all of the specimens represented in the collection are reported by Hooker from Melville Peninsula or the adjacent islands, while most of them are now known to be so widespread and plentiful in the region as to require little further comment here (cf. my Botany of the Canadian Eastern Arctic, Part I).[3]

In the introduction to his appendix,[2] Hooker explains that "The principal herbarium, from which . . . notes were made, was sent to me by Captain Parry," though "Mr. Edwards allowed me the free use of his ample collection," while another small set "deposited in the Hunterian Museum in the University of Glasgow" was "also of some service." (Hooker made "from Captain Parry's Herbarium . . . an ample collection of specimens, which is deposited in the British Museum, and another which is placed in the Museum of the University of Edinburgh.") Apart from his specific mention of the above three original collections and of occasional single specimens contributed by others, Hooker (*op. cit.* p. 410) implies that further collections which he did not see were made during this expedition; these last appear to include the present set as, moreover, Hooker does not mention Quilliam Creek or its vicinity. However, even if the components of this R.G.S. collection could be accepted as having come from the point in northeastern Melville Peninsula indicated by the above-quoted label, they would have little of importance to add to our phytogeographical knowledge, as every one of the species represented is well known to occur on the island of Igloolik less than fifty miles to the east.

[2] Pp. 381–430 of the "Appendix to Captain Parry's Journal of a Second Voyage . . .". *London*, 1825.

[3] Canada: Department of Mines and Resources, *National Museum Bulletin* No. 92, pp. vi + 408, 1940.

The different plants in the R.G.S. collection number sixteen in all, one being represented by two specimens; treated and arranged as in previous contributions in this series (except that the pencilled attempts at identifications are often so wild as to seem best ignored), these plants are as follows, the synonyms given being merely those needed for direct reference to Hooker's appendix.[4]

Alopecurus alpinus Sm.

Lychnis apetala L.

Cerastium alpinum L., *s. l.*

Ranunculus sulphureus Soland. in Phipps (Hooker's "*R. nivalis*. . . . β"). Hitherto known on Melville Peninsula and the adjacent islands only from Barrow River and Igloolik, in both of which localities gatherings were made during Perry's 'second' voyage (*see* Bot. Can. E. Arctic, I, p. 217).[3] Possibly not uncommon.

Papaver radicatum Rottb. (*P. nudicaule* of some authors, not L.).

Eutrema edwardsii R. Br. Known so far from seven localities almost throughout the length of Melville Peninsula and its adjacent islands; probably plentiful (*see* Bot. Can. E. Arctic, I, p. 228, and W. J. Cody in Can. Field-Nat. **64**: 92, 1950).

Lesquerella arctica (Wormskj.) S. Watson (*Vesicaria arctica* (Wormskj.) Richardson). Not yet confirmed from the mainland portions of Melville Peninsula, but known from the time of Parry's 'second' expedition from two of the adjacent islands, and recently found on a third (*see* Bot. Can. E. Arctic, I, p. 232). Probably confined to calcareous regions and accordingly local.

Draba alpina L., *s.l.* Two specimens belonging to this variable complex.

Draba fladnizensis Wulfen, *s.l.* (probably Hooker's "*D. hirta*. . . . var. 4"). Known so far from eight localities in the general region; probably plentiful (*see* Bot. Can. E. Arctic, I, p. 238).

Saxifraga cernua L.

Saxifraga caespitosa f. *uniflora* (R. Br.) Engler & Irmscher

Saxifraga tricuspidata Rottb.

Saxifraga hirculus var. *propinqua* (R. Br.) Simmons. This specimen, unlike many that I have seen previously from Melville Peninsula, appears to be referable to this usually separable northern variety while still somewhat reminiscent of the typical form into which gradation is complete farther south.

Saxifraga oppositifolia L.

Dryas integrifolia M. Vahl

Pedicularis capitata Adams (*P. nelsonii* R. Br.). Known hitherto from six localities on Melville Peninsula or its adjacent islands, ranging from the northeast to the extreme south; probably fairly plentiful (*see* Bot. Can. E. Arctic, I, p. 338).—Gray Herbarium of Harvard University.

[4] While this paper was in press, there appeared J. A. Calder's useful "Vascular flora of Melville Peninsula, Franklin District, N. W. T." (Canadian Field-Naturalist, **65**: 180–184. 1951) which, with the forthcoming paper which he cites by W. J. Cody, may demand revision of the numbers of localities from which four of the species mentioned here are stated to be known, though this cannot be determined without more details than are given in Calder's florula.

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A TECHNIQUE FOR MORPHOLOGICAL ANALYSIS IN POPULATION STUDIES

John W. Voigt

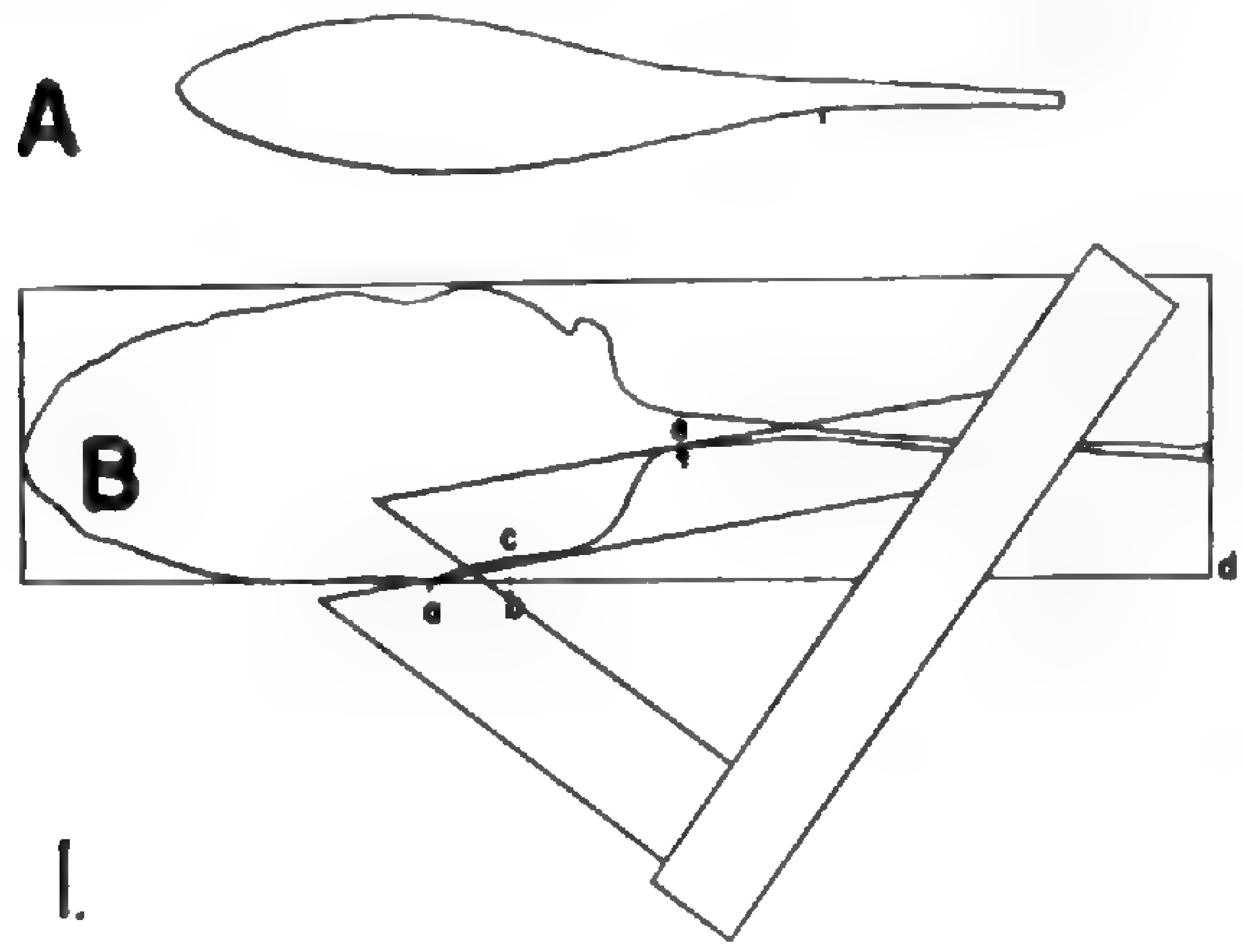
In the analysis of a population, the taxonomist is generally concerned with the determination of whether the population contains two or more segregates or only one variable (Davidson, 1947). In such analysis whether the results are shown by graphs, curves, or polygonal projection, the "keying" characteristics are used. In most infraspecific categories the number of such keying characteristics is not often reduced to less than the minimum of three required for polygonal graphing which is considered to be the best type of graph for portrayal of results of such analysis.

In some specific and subspecific taxa there are two distinct leaf shapes and two distinct habitats. Leaf shape may be environmentally induced or genetically fixed (ecotype or ecospecies). Complete biosystematic methods of study are necessary for this determination and subsequent settlement of taxonomic status. If the morphology of the plant is environmentally controlled the two plants have a common morphology when both are grown under uniform culture conditions. This is well established by the researches of Turesson (1922) and by Clausen, Keck, and Hiesey (1940). The main factor for the change in leaf shape may be determined by ecological study. Often light is the factor. In some studies traced outlines of leaves have been presented as evidence of morphological change without an outline of what the leaf looked like to start with or statement of whether it was a mature leaf or an immature one.

A method of determining the degree of morphological change is suggested which eliminates more of the subjective interpretation of the degree of leaf shape change than to compare the outlines. Measurements may be obtained which could be used for polygonal graphing or straight numerical comparisons. Examples of measurements that could be used are blade length/petiole length, blade length/blade width, the angle at which the blade contracts to the petiole, and scape length/leaf length. Many measurements should be made from random samples obtained in mass collection within the population for determination of the variation within the population. Usually floral characters will be used, but in some taxa the vegetative characters are more useful. Only older and mature leaves should be used as it has been reported (Brown, 1944) that greater variation in shape is to be found in immature leaves. Where it is desired to show the amount of morphological change with changed habitat conditions, the plants should be cloned, or, if this is impossible, the leaves should be measured as the individuals are planted and preserved on herbarium sheets when vegetative growth is complete. After a season, or two seasons, of growth the leaves can be compared with those of the same order at the start of the experiment.

In a leaf that tapers to join the petiole (Fig. 1. A), it is difficult to determine just where the blade ends and the petiole begins. This determination is not so difficult in leaf B, fig. 1, because of the abruptly contracted blade at the juncture of blade and petiole. To eliminate subjective impressions of such a point the curve made by the taper or contraction of the blade to the petiole is used in the following manner. Ten per cent of the distance *a–d* is marked at *c* (Fig. 1). A right triangle is laid so that the edge passes through the point *a–c*. By laying a ruler or straight edge along the right hand margin of the triangle and sliding the triangle upward the top edge of the triangle strikes a tangent to the curve at point *e*. Point *e* is considered the lowermost extent of the blade. This method has been adapted from the plant sociological method of determining an adequate sample known as the species-area curve (Cain, 1938). The ten per cent values are those which Cain states in his experience give the best results.

The worth of the method, regardless of using the ten per cent value or another arbitrarily selected, is in making the analysis more objective. As an added criterion of change in leaf shape the angle of contraction of blade to the petiole may be measured (angle *a–e*) with a protractor.



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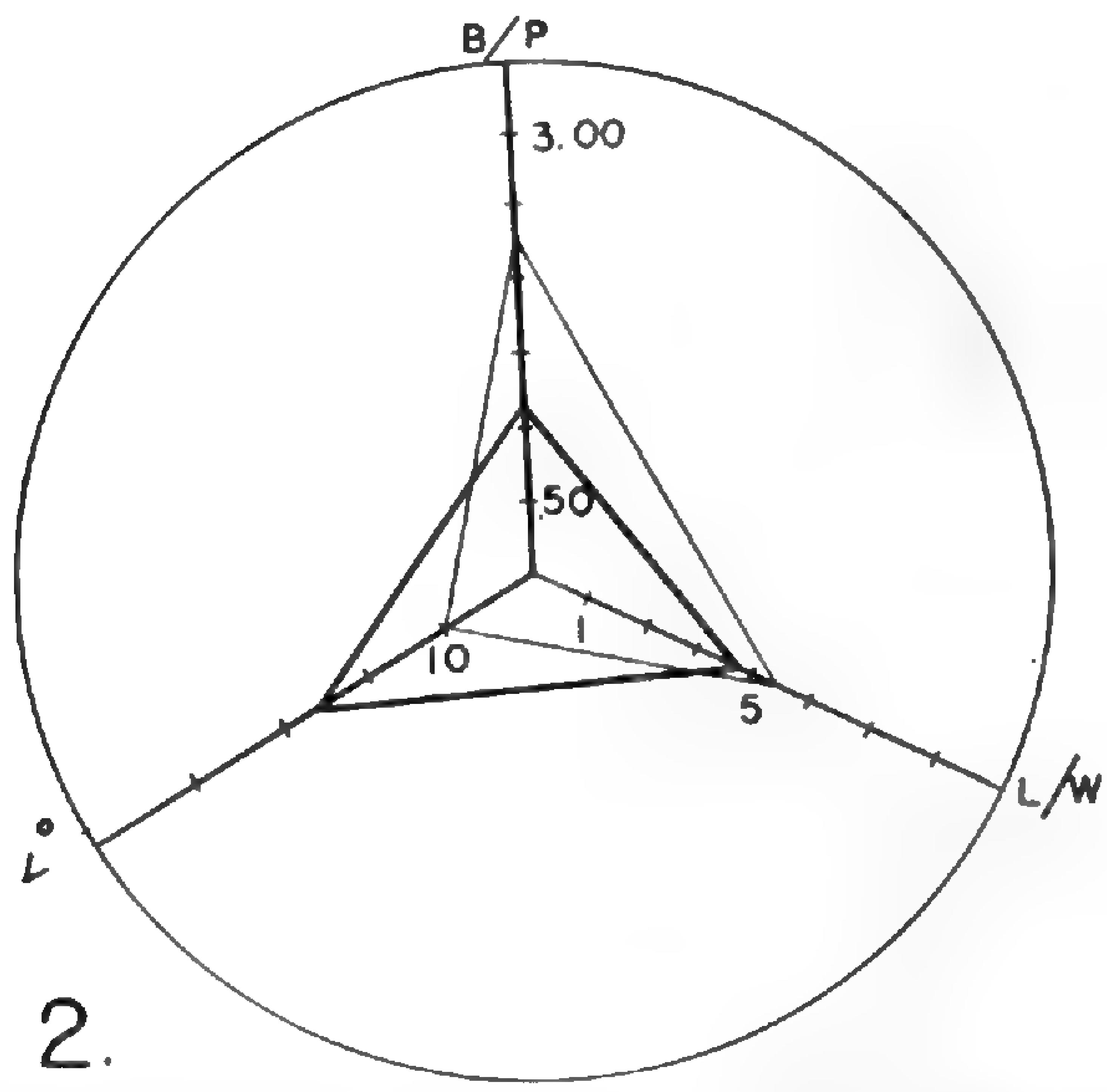

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Fig. 1. (top) Leaves of a species (A), and a leaf from one of its infraspecific taxa (B). The method of determining blade length of leaves which have blades tapering to the petiole is shown. Ten per cent of the distance *a–d* is marked at *b*, and ten per cent of one-half the width of the leaf (the approximate height of the curve *a–c–e*) is marked at the point *c*. A right triangle is laid across the points *a–c*, and by sliding the triangle along a straight edge held at the right, the triangle strikes a tangent to the curve at point *e*. This point is considered to be the lowermost extent of the blade.

Fig. 2. (bottom) A polygonal graph showing the blade-petiole index (B/P), the angle of contraction of the blade to the petiole (<) and the length / width ratio (L/W) for leaf A (light line) and for leaf B (heavy line). Leaves A and B referred to are from Fig. 1, and are tracings of actual leaves. The angle of contraction of the blade to the petiole for each has been figured by the method shown and described by Fig. 1.

A polygonal graph for simultaneous portrayal of three variables found in the two leaves (Fig. 1 A & B) is given in Fig. 2. Where the lines cross each other more than once, there is an indication of more remote relation than where the lines are chiefly parallel (Davidson, 1947). When plants are reciprocally transplanted or where the plants of the taxa are grown in the same environment and are graphed and there is a high degree of parallelism to the lines, then the change may be safely assumed to have been environmentally induced. Straight numerical measurement comparisons would also be objective.—Dept. of Botany, Southern Illinois University.

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CONTRIBUTIONS TO THE FLORA OF NOVA SCOTIA

E. C. Smith and W. B. Schofield

Northern Cape Breton Island has been noted by various botanists to contain a relatively rich "isolated flora." Few recent discoveries have been made there due, no doubt, to the relatively inaccessible nature of the interior of the northern plateau. The following lists of plants collected mainly in this area add a number of arctic-montane species to the provincial flora and indicate the desirability of an extended study of this element in Nova Scotia. With this in mind, various phytogeographical comments have been omitted from the present paper.

The annotated lists below are mainly the result of exploration in Cape Breton Island during the summer of 1951. This exploration was carried out as part of a detailed ecological survey of the forests of the area, a survey sponsored by the Nova Scotia Research Foundation. Some of the taxonomic results of earlier surveys for the Foundation have been reported by D. S. Erskine (1951).

Grateful acknowledgement is made to the following persons: to W. G. Dore of the Central Experimental Farm, Ottawa, for critical determination of the *Gramineae;* to B. Boivin of the Cen-

tral Experimental Farm, H. J. Scoggan of the National Herbarium, Ottawa, and to D. S. Erskine for aid in the determination of various specimens.

Throughout the paper various abbreviations are used. 1. The forest ecology parties (a) SSSB; E. C. Smith, W. B. Schofield, D. R. Sampson, F. C. Bent in 1951; (b) SCBS: E. C. Smith, E. H. Collins, J. M. Bruce, D. R. Sampson in 1949; (c) SCBSB: E. C. Smith, E. H. Collins, J. M. Bruce, D. R. Sampson, F. C. Bent in 1950; (d) SECS: E. C. Smith, D. S. Erskine, E. H. Collins, W. B. Schofield in 1948; (e) SESB: E. C. Smith, D. S. Erskine, D. R. Sampson, F. C. Bent in the spring of 1951. 2. DAO: Department of Agriculture, Ottawa.

1. Records of Plants Previously Unreported from the Province

Of the investigated areas in Northern Cape Breton, that of the Big Southwest Brook, Inverness County, yielded the greatest number of new and rare species. The cool, moist limestone cliff walls of this brook added a habitat to those known in the province.

Woodsia alpina (Bolton) S. F. Gray (*W. Belli* (Lawson) A. E. Porsild) Although reported for Nova Scotia by Roland (1947), the species there referred to is probably *W. glabella* R. Br. (Roland, 1941.) Abundant on dry cliff of brook, North Aspy River near Cabot Trail, *SSSB 4522.*

Typha latifolia L., forma ambigua (Sonder) Kronf. This form is undoubtedly more common than the following records suggest. Colchester County: shallow pool in excavated area, roadside near Kemptown, *SSSB 4807;* Inverness County: swamp, Big Intervale, Margaree, *SCBS 2791;* Hants County: roadside ditch, Walton, *J. S. Erskine 51.113.*

Festuca prolifera (Piper) Fern. Inverness County: very rare on wet slope near large waterfall, Big Southwest Brook, south-west branch, *SSSB 4545.*

Festuca prolifera (Piper) Fern., var. lasiolepis Fern. Victoria County: very abundant in cliff crevices near waterfall, Gray Glen Brook, north branch, *SSSB 4441.*

Poa glauca Vahl. Another range gap is closed by the following collection, Inverness County: occasional on limestone cliffs in moist shaded situations, Big Southwest Brook, *SSSB 4583;* "not exactly like the *P. glauca* of arctic regions" (Dore, *in litt.*)

Scirpus cespitosus L., var. delicatulus Fern. The variety *callosus* Bigel. is widely distributed in Nova Scotia, being particularly conspicuous near the Atlantic coast and forming a major element of the vegetation in bogs (e. g. Brier Island, Digby County and Northern Cape Breton Island). The variety *delicatulus* is locally abundant, festooning dripping limestone cliffs, Big Southwest Brook, Inverness County, *SSSB 4578*.

Rhynchospora capillacea Torr., forma leviseta (E. J. Hill) Fern. Inverness County: growing abundantly in alkaline bog in association with *Eleocharis pauciflora* var. *Fernaldii*, Black River, *SSSB 4969*. This should be sought elsewhere in similar habitats.

Betula glandulosa Michx. This species, which superficially resembles *B. pumila* L., may be commoner than the following collection suggests. Victoria County: near margin of Twin Island Lake, Ingonish Barrens at an elevation of 1300 feet, *SSSB 4623*. Here it was luxuriant in a colony of considerable extent.

Oxyria digyna (L.) Hill. This interesting plant, of wide distribution in the arctic, was a surprising addition to the flora of the province. Inverness County: locally abundant on shelves of dripping cliffs, Big Southwest Brook, *SSSB 4550*. The plants were very vigorous and differed from much arctic material in that they were almost devoid of red coloring and the leaves were relatively flaccid.

Saxifraga aizoides L. Inverness County: luxuriant on dripping limestone cliffs, Big Southwest Brook, *SSSB 4555*.

Vaccinium ovalifolium Sm. (*V. chamissonis* Bong.) Victoria County: shaded banks of Glasgow Brook, near falls, *SSSB 4289*. A single but very vigorous colony was seen in ascending Glasgow Brook to its source. This was growing in a sheltered moist location near the brook and was in young fruit at the time of collection on July 2. The scraggly bushes reached a height of about one meter.

Solidago uliginosa Nutt., var. terrae-novae (T. & G.) Fern. Victoria County: abundant in bog, Ingonish Barrens at an elevation of 1400 feet, *SSSB 4632*; common in bog above Gray Glen Brook, *SSSB 4426*.

Achillea borealis Bong. (*A. Millefolium* L., ssp. *atrotegula* Boivin, var. *atrotegula*). The genus *Achillea* in Nova Scotia is extremely variable. The following specimens, however, are referable to *A. borealis*. The usual weedy character of this genus was not evident in these collections. The plants were confined to specialized habitats and seemed to offer no severe competition to associated species, in one case *Draba norvegica*. Inverness County: small colony on dry exposed cliff shelf, Big Southwest Brook, *SSSB 4563*. Victoria County: rare colonies on exposed cliff of lookoff near bog above Gray Glen Brook, *SSSB 4429;* abundant colonies on exposed headland, White Point, *SSSB 4395* and *SSSB 4397*.

Arnica chionopappa Fern. Inverness County: growing on a nearly perpendicular cliff, locally abundant though not conspicuous, south branch of Grand Anse River near first waterfall, *SSSB 4681*.

II. Records of Plants Rare in the Province

Woodsia glabella R. Br. Reported once previously by Robinson (1904) from near Cheticamp, Inverness County, the following are the only recent collections of this fern. Inverness County: occasional in shaded crevices of limestone cliffs, Big Southwest Brook, *SSSB 4574;* occasional on cliff, Grand Anse River, south branch, *SSSB 4682.*

Botrychium dissectum Spreng. Previously known from the western part of the province, the following two records represent its known occurrence in Eastern Nova Scotia, the latter being the first report from Cape Breton Island. Pictou County: mixed forest, Lorne, *SCBS 2929.* Inverness County: rare in shaded intervale, spruce-fir woods, Cheticamp River, *SSSB 4754A.* The forma *obliquum* (Muhl.) Fern. was found in both locations.

Botrychium simplex E. Hitchc. This species, although reported at various times from the province, is very rare. It strongly resembles *B. matricariaefolium* A. Br., and its specific identity from this is not marked. The following collections, both of weak individuals, were made in wet habitats. Inverness County: very rare in wet moss, margin of waterfall, tributary of North Aspy River, *SSSB 4584.* Victoria County: small colony in wet mossy shaded bank of Clyburne Brook, *SSSB 4380.*

Schizaea pusilla Pursh. Well known from its local stations in the province, this species was noted to be frequent in the bogs of the interior of the northern Cape Breton plateau. The following two stations record this species from the southeastern part of the province. Halifax County: boggy edge of road to Spruce Hill Lake, *E. Gorham, D. Livingston, J. Lewis, L. Decker, 137.* Cape Breton County: very rare in bog, Belfrey Barren, *SSSB 5113.* The species seems not to persist under severe competition and is therefore found most commonly on recently denuded, damp, usually boggy, areas or associated with mosses, notably *Sphagnum.*

Sparganium minimum (Hartm.) Fries. The following collections satisfactorily reinstate this rare species in the flora of the province. It had previously been known from one collection made by G. E. Nichols in Cape Breton. Inverness County: floating in marginal water of alkaline pool, N. E. Mabou, *SSSB 4861.* Cape Breton County: abundant in water at edge of pond, Bateson, *SSSB 5216.* Victoria County: bog pools, New Haven, *SCBSB 3483.*

Sparganium hyperboreum Laestad. Previously known only from Louisbourg where it was collected by Macoun, it was recollected there in 1951. Cape Breton County: abundant in bog ditch, occasionally fruiting, Fort Louisbourg, SSSB 5391; abundant in bog pool, N. W. Cove, Scatari Island, *SSSB 5241.* Inverness County: fairly abundant in bog pools, French Mountain, *SSSB 4719.*

Potamogeton filiformis Pers., var. borealis (Raf.) St. John. Discovered by Fernald at Baddeck Bay and not seen elsewhere in the province until the following collections were made. Inverness County: abundant in shallow water of Lake Ainslie, Kenloch, *SSSB 4919;* in water of pond, Cape St. Lawrence, *SCBSB 3526;* in pond Hillsborough, *SCBSB 3922.*

Potamogeton Spirillus Tuckerm. Known from the southwestern counties, the following collections show the distribution in the northern part of the province. Cumberland County: underwater, Halfway River, *J. S. Erskine 51.239.* Colchester County: submerged in sluggish stream, Brookfield, *W. G. Dore and A. E. Roland 994* (DAO). Pictou County: sandy shores of Black Brook Lake, *Eville Gorham*, August 3, 1946 (DAO). Antigonish County: shallow water, Cooper Lake, *Eville Gorham*, July 25, 1946 (DAO). Guysborough County: in river four miles north of Sherbrooke, *J. S. Erskine 51.576*. Richmond County: occasional in marginal shallows of Grand Lake, Isle Madame, *SSSB 5074;* in shallows, Ferguson Lake, *SSSB 5162*. Inverness County: abundant in small brook draining pond, Monk's Head, *SSSB 4761*.

Najas flexilis (Willd.) Rostk. & Schmidt. This species has been rarely collected in the province. The collections of the past summer, however, show it to be relatively common. Richmond County: in water of Grand Lake, Isle Madame, *SSSB 5067*. Cape Breton County: abundant in muddy shallows of pond behind beach, Catalogne Beach, *SSSB 5164*. Inverness County: marginal shallows of Lake Ainslie, Kenloch, *SSSB 4910*. Other collections of interest are from Kings County: Tannery Pond, Wolfville, *D. S. Erskine, 751*. Colchester County: in river above Shubenacadie, *J. S. Erskine 51.747*.

Glyceria fluitans (L.) R. Br. Reported only from swales, ditches, and wet meadows near Truro, Colchester County (Dore and Roland, 1942), the following collection represents the second from the province, and the first from Cape Breton Island. Inverness County: dry sand of lake shore, Kenloch, *SSSB 4942*.

Poa alsodes Gray. Previous to these collections, only one collection was known to exist, although it was reported from Dartmouth in Lindsay's Catalogue (1877). Colchester County: river bank and thickets, St. Andrew River, *SESB 4094;* thickets along Salmon River, Kemptown, *SESB 4077*. Inverness County: banks above MacIntosh Brook, in shaded locations, *SSSB 4228*.

Cynosurus cristatus L. Already known from two locations in the province, this introduced grass was discovered abundant in field, Glendyer, Inverness County, *SSSB 4799, SECS 1203*.

Trisetum spicatum (L.) Richter. The exact range of this species, which occurs in Nova Scotia only as the following varieties, has not been satisfactorily known (Dore and Roland, 1942). The following material in the Acadia University Herbarium is therefore of interest. *T. spicatum* var. *molle* (Michx.) Beal—Victoria County: on gypsum near Cape North Village, *SCBSB 3749*. Inverness County: abundant on banks of Cheticamp River, six miles from mouth, *SSSB 4756*. Dore had collected it previously from this general area. *T. spicatum* var. *pilosiglume* Fern.—Inverness County: rare on rocky banks of Cheticamp River, six miles from mouth, *SSSB 4755*, near where Dore had collected it; occasional in rock crevices, Big Southwest Brook, *SSSB 4544*. Victoria County: rare in moist rock crevices, Slaty Point, Clyburne Brook, *SSSB 4374;* occasional in rock crevices, Salmon River, SSSB 4478, *SCBS 2647*.

Eleocharis pauciflora (Lightf.) Link. var. Fernaldii Svenson. Reported from Baddeck Bay (Fernald, 1921) where it grew on the springy border of a salt marsh, a collection made by Macoun at Grand Narrows, Cape Breton County, July 27, 1898, antedates the above by twenty-two years. Cape Breton County: locally abundant in very wet sludge-bottomed hollows of quaking bog, one mile north of McAdam Lake, *SSSB 5480.* Inverness County: occasional in quaking mat of calcareous bog, Black River, *SSSB 4969A.*

Eleocharis nitida Fern. This small spike rush, known previously from Belle Isle, Annapolis County (Fernald, 1922), is represented in the Acadia University Herbarium by two sheets from Kings County: Wolfville, *H. G. Perry,* June 15, 1912. Material from Scot's Bay, though immature, seems to fall within the limits of this species, *A. E. Roland 2575.*

Carex spicata Huds. Occasional on margin of pool, Louisbourg Park, Cape Breton County, *SSSB 5392.* This is the first record for Cape Breton Island.

Carex deflexa Hornem. Although not considered rare, the distribution of this species in the province is not well known. The following records may be added to those reported by Roland (1947). Kings County: dryish sandy woods, Church Street, *D. S. Erskine 920.* Queens County: coniferous woods, Lowe's Landing, SECS 271. Victoria County: abundant in rock crevices, tributary of the North Aspy River, *SSSB 4520;* sandy alluvium in woods at edge of Roper Brook, *SSSB 4362.* Halifax County: on path, Musquodoboit Harbour, *W. G. Dore 1437* (DAO).

Carex tonsa (Fern.) Bickn. Queens County: field near camp, Lowe's Landing, *SECS 204.* Lunenburg County: dry sandy roadside, East River, *SECS 345.* Victoria County: locally abundant on gravelly road embankment, near mouth of Warren Brook, *SSSB 4595.* The latter record represents the first collection for Cape Breton Island; the others, first collections from the south shore of the mainland.

Carex conoidea Schkuhr. Roland (1947) reports that this sedge had not yet been collected from Cape Breton. The following collections indicate its presence there. Inverness County: abundant in meadow, Strathlorne, *SSSB 4211.* Victoria County: wet meadow, Iona, *W. G. Dore 1471* (DAO).

Carex atratiformis Britt. First reported by D. S. Erskine (1951), this species has now been found to be fairly common in Northern Cape Breton in rock crevices of brook and river banks. Inverness County: abundant on wet dripping cliff near upper waterfall, Big Southwest Brook, southwest branch, *SSSB 4538;* locally abundant in clumps in rock crevices, Cheticamp River, *SSSB 4722.* Victoria County: very rare in wet rock crevices, Slaty Point, Clyburne Brook, *SSSB 4378.*

Carex castanea Wahl. To the two previous records may be added the following collection. Inverness County: swamp at pond edge, Cape St. Lawrence, *SCBSB 3520.*

Carex capillaris L., var. major Blytt. Although reported once previously from Northern Cape Breton (Erskine, 1951), the past summer's collecting showed this sedge to be characteristic of calcareous rocks, in cool shaded locations on the upper reaches of the northern brooks. Victoria County: abundant on damp mud and wet ledge of calcareous cliff, Gray Glen Brook, north branch, *SSSB 4443*. Inverness County: abundant in rock crevices of limestone cliff, Big Southwest Brook, *SSSB 4558*.

Calla palustris L. Previously thought to be rare or absent in Cape Breton, the following collections indicate its wide distribution there. Cape Breton County: Caribou Marsh near Mira, *G. C. Warren*, July 25, 1948. Victoria County: muddy brook at Baddeck, *John Macoun*, 1898; boggy pond, Big Baddeck, *SECS 1057*. Inverness County: bog, west Lake Ainslie, *SECS 1186*.

Juncus stygius L., var. americanus Bucheneau. To the two known collections of this rare species may be added the following. Inverness County: very abundant at edge of bog pools, French Mountain, *SSSB 4717*. Cape Breton County: shallow trickles through bog near Fort Louisbourg, *SSSB 5390*. Richmond County: occasional in damp hummocks and hollows of bog, Gracieville, *SSSB 5138*.

Smilacina stellata (L.) Desf., var. crassa Victorin. This interesting plant, reported twice from the province (Fernald, 1948), was discovered in Victoria County: rich colony in dry margin of field near coast, Bay St. Lawrence, *SSSB 4480;* grassy slope, east face of Cape North, *SCBSB 3697*. Cape Breton County: rare on exposed headland with the typical variety, near N. E. Cove, Scatari Island, *SSSB 5273*.

Comandra Richardsoniana Fern. Previously collected by Macoun in 1883 from damp sandy soil, Sydney Mines, Cape Breton County, the following collection reinstates the species in our known flora. Victoria County: abundant among grasses and *Empetrum nigrum* L. on exposed headland, Black Point, *SSSB 4339*.

Ranunculus sceleratus L. Reported from the mainland by D. S. Erskine (1951), the following collection represents its discovery in Cape Breton Island. Cape Breton County: abundant in water of swamp hole, Main-a-Dieu, *SSSB 5201*.

Draba norvegica Gunner. This is another species previously collected only by John Macoun (no. 18987), crevices of rock, Big Intervale, Inverness County. A second station for Inverness County: locally abundant on dry exposed shelves of limestone cliffs, Big Southwest Brook, *SSSB 4562*.

Sarracenia purpurea L., forma heterophylla (Eaton) Fern. (var. *terrae-novae* Pylaie, forma *heterophylla* (Eaton) Boivin). This form had previously been reported from Belle Isle, Annapolis County. It has been found to be a frequent form in Northern Cape Breton, occasionally outnumbering the typical form in some of the bogs of the plateau. Inverness County: bog, four miles south of Cabot Trail, North Mountain, *SCBS 2667;* bog, French Mountain, *SCBS 2864*. Victoria County: bog, between Lake of Islands and Sunday Lake, *SCBSB 3598;* common in bog northwest of Cheticamp Lake, *SCBSB 3342*. The following two collections represent single plants found among the typical form. Queens County: swamp, Shelburne River near Lake Rossignol, *SECS 158;* bog, Long Lake, *SCBSB 3293.* Occasional intermediate forms were seen in populous colonies of the species.

Tillaea aquatica L. First reported from Cape Breton Island by D. S. Erskine (1951), the following collections were taken from extensive colonies. Richmond County: abundant on flat area near brackish pond, Point Michaud, *SSSB 5135.* Cape Breton County: sandy edge of pond, N. W. Cove, Scatari Island, *SSSB 5355.*

Saxifraga Aizoon Jacq., var. neogaea Butters. Two additional stations of this rare species were found in Northern Cape Breton. Victoria County: very rare on shelf of cliff, Gray Glen Brook, *SSSB 4444.* Inverness County: abundant on dry, sheltered shelves of limestone cliff, Big Southwest Brook, *SSSB 4565.*

Elatine minima (Nutt.) Fisch. & Meyer. Hitherto unknown in the province east of Halifax County, the following collections are of interest. Cape Breton County: occasional in marginal water of Gabarus Lake, *SSSB 5107;* abundant in mucky shallows of pool, Catalogne, *SSSB 5166.* Inverness County: wet sand of pond edge behind beach, West Mabou, *SSSB 5000.* Richmond County: shallow water of second lake west of Loch Lomond, *J. S. Erskine 51.1280.*

Angelica atropurpurea L. Formerly thought to be rare and restricted to coastal areas, this species has been found to be abundant along the upper reaches of the brooks of Northern Cape Breton. Inverness County: bog-meadow, headwaters of the South Blair River, *SCBSB 3802;* gravel beach, mouth of Red River, *SECS 3802;* headwaters of MacKenzie and Red Rivers, very abundant but not collected. Victoria County: seen but not collected, brookside at headwaters of Gray Glen Brook.

Cornus suecica L. Known from two stations, this plant was discovered during the past summer in Cape Breton County: abundant colonies on dry exposed headland, south-east of N. W. Cove, Scatari Island, *SSSB 5354;* very abundant on dry exposed sea-cliff, two miles north of N. W. Cove, Scatari Island, *SSSB 5279.* Although growing in abundance and in association with *C. canadensis* L., × *C. unalaschkensis* Ledeb. was not found.

Vaccinium cespitosum Michx. Reported by D. S. Erskine (1951) as new to the province, the following collection represents its discovery on Cape Breton Island. Inverness County: locally abundant in rock crevices, Cheticamp River, *SSSB 4720.*

Conopholis americana (L.) Wallr. Known only from Fernald and Long's collection (Fernald, 1922) from the LaHave River, Bridgewater, Lunenburg County, the following collections should also be noted. Kings County: oak woods, Belcher Street near Kentville, *R. M. Lewis 1966.* Queens County: in clumps under oaks, back of fish pond, Lake Kedgemakooge, *S. Bleakney* June 29, 1950.

Littorella americana Fern. It was with considerable surprise that this species was collected from several locations on Cape Breton Island. Previously it was known from Shubenacadie Grand Lake, Halifax County, where Mrs. Britton collected it in 1879 (A. Gray, 1880). Richmond

County: abundant in shallow marginal water of Ferguson Lake, *SSSB 5116;* abundant in water of lake margin, Loch Lomond, *SSSB 5056;* very abundant on wet gravelly beach of Grand River, *SSSB 5458.*

SOLIDAGO MULTIRADIATA Ait. Previously the southernmost known station for this species was on St. Paul Island (Perry, 1931). Inverness County: very rare on moist shaded limestone cliff ledges, Big Southwest Brook, *SSSB 4571.*

ERIGERON PHILADELPHICUS L. Rare in Nova Scotia, the following represents a third station for the province. Halifax County: large colony in field between Upper Musquodoboit and Dean, *SESB 4123.*

BIDENS CERNUA L., var. MINIMA (Huds.) Pursh. This tiny extreme, known previously from the boggy margin of Hebb's Lake, Bridgewater (Fernald, 1922); bog at margin of sea, Gabarus, C. B., (Rousseau, 1938), was found in a large colony on the sandy shore of Lake Ainslie at Kenloch, Inverness County, *SSSB 4912.*

Material substantiating the majority of these records has been deposited at Acadia University Herbarium.—PERRY BIOLOGICAL LABORATORIES, ACADIA UNIVERSITY, WOLFVILLE, NOVA SCOTIA.

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SOME RARELY COLLECTED MEXICAN BRICKELLIAS

L. O. Gaiser

While collecting[1] in Michoacan, chiefly around Morelia, and in Jalisco, in the environs of Guadalajara, the writer obtained *Brickellia oliganthes* (Less.) Gray at the base of Mt. Punguato at Morelia and *B. verbenacea* (Greene) Robinson in a little arroyo, near Las Tortugas River on the road to Tequila, about thirty-eight kilometers from Guadalajara. These two closely related species respectively precede and follow *B. reticulata* (DC.) Gray in the Subsection *Reticulatae* of Section *Bulbostylis* in Robinson's monograph of the genus (Mem. Gray Herb. I. 52, 1917). Both have coriaceous and at least partially serrate leaves, the former with short pubescence above and below and the latter scabrous on the margin and slightly so along the veins on the upper side but appearing almost equally green on both sides. The two species are separated in the key on the basis of pedicellate heads in the former and sessile in the latter. *B. verbenacea* is further distinguished by acute rather than mucronate outermost involucral bracts. As there is some variation in the disposition of heads of the inflorescences on larger and smaller stems of one plant, it is difficult to sharply delimit either species by this character. In both, the herbaceous stems arose from a thickened woody caudex.

When returning to Cuernavaca from Jautepec in Morelos, on November 3, 1950, about twenty-three kilometers from the city limits, a single plant[2] which is definitely of this subsection was seen almost hanging over the road from the adjacent mountain side. It was not only gray in appearance as a result of dust from the roadside, but a heavy indumentum covered the stem and both surfaces of the leaves. There were about fifteen stems, of which at least twelve bore some heads, arising from a thick woody base to a height of 7 to 9 dm. While the basal leaves were missing, the internodes were only 1 cm. long, making the stems appear very leafy from the distance of 10 cm. upwards to the base of the

[1] The author gratefully acknowledges a grant from the Penrose Fund of The American Philosophical Society which made possible collection of cytological material as well as herbarium specimens in Mexico.

[2] Specimens of this plant will be deposited at the Gray Herbarium, U. S. National Herbarium, and the Instituto de Biologia, Mexico City.

inflorescence. The lowest leaves were oval, 5 cm. long, 1.5 cm. wide, and almost entire with but very slight serrations toward the apex. The chief inflorescences were corymbs of numerous heads on bracteolate pedicels though the lesser branches bore loose racemes of correspondingly fewer heads on shorter pedicels. The similarity to the figure of *B. reticulata* (DC.) Gray in Robinson, page 52, certainly is striking.

DeCandolle (Prodr. VII. 268, 1836) described the species *Bulbostylis reticulata*, from a specimen collected by Haenke in Mexico without exact locality, as suffrutescent, much branched and entirely tomentose, with almost opposite oval-oblong entire leaves, distinctly reticulate below and with heads axillary and pedicellate, forming leafy racemes. When Gray transferred this to *Brickellia* (Pl. Wright. I. 84, 1852) he suggested, as he stated "after barely having seen it in the herbarium of DeCandolle" that it might possibly be the same as *B. oliganthes* (Less.) Gray, but the latter had narrower serrated leaves and a naked inflorescence. At the time Robinson wrote his monograph on *Brickellia* (loc. cit.) he included *B. reticulata* as described above, but still reported the species doubtfully distinct. Its distribution was not exactly known and with only a poor print of the type specimen at his disposal he left Haenke's specimen as the only reference under that species name. Though Watson (Proc. Amer. Acad. XXII. 421, 1887), in giving the list of plants collected by E. Palmer in the State of Jalisco in 1886 included Palmer's no. 59a as *B. reticulata* with the note that it was a coarser and broader leaved plant than *B. oliganthes*, this specimen at the Gray Herbarium has been annotated by Robinson as "a robust form of *B. oliganthes.*"

It has not been possible to compare this recently collected plant with the type in the herbarium at Geneva, but I have had the use of a recently made, improved print from the negative of it at the Gray Herbarium. While this photograph mostly shows a large inflorescence with only the uppermost leaves, comparison certainly suggests great likeness of the new specimen to it. Also additional information has been found concerning the time and region of Haenke's collections. At the Instituto de Biologia in Mexico City, Prof. M. Martinez suggested that I could check on Haenke's travels in Biblioteka Botánico Mexicana by Dr.

Nicholas León, Mexico, 1895. There on page 323, in a brief account of Tadeo Haenke, the author referred to his visit to Mexico and thereafter followed the sentence (here translated). It seems that they arrived at Acapulco in November and returned to the same place in December. Five fascicles entitled "The Mexican Journey" and "Plants of Mexico" were the fruit of this exploration. The road from Acapulco to Mexico City would most assuredly lead through Cuernavaca and southwest from it. The road to Jautepec also goes south to Juitepec and then turns east. Thus Haenke would have made collections along a route less than twenty-three kilometers distant at Cuernavaca from the road beside which the recently collected plant grew.

Only four Mexican species of *Brickellia* were described by DeCandolle. The type specimens for two were Haenke's collections without exact location, Mendez' specimen for a third, and plants of both Haenke and Mendez were seen for a fourth. The three where Haenke specimens were involved are *B. reticulata, B. hebecarpa,* and *B. scoparia,* respectively. It is perhaps more than coincidental that although *B. hebecarpa* was not found, the related species *B. glomerata,* which was separated from it mostly on the basis of glomerulate heads, was most abundant at this location, and *B. scoparia* was found within seven kilometers' distance along the same road.

While in the author's collections alone, from three different localities in Michoacan, Jalisco and Morelos, plants were found that do match *B. oliganthes* (Less.) Gray, *B. verbenacea* (Greene) Robinson, and *B. reticulata* (DC.) Gray, as described by Robinson, it may be that the first of these three species should be reinvestigated. As shown by all specimens of *B. oliganthes* in the Gray Herbarium, there is quite a range of variation in the width and nature of the margin of the leaves, in the laxity of the inflorescences where the heads range from subsessile to pedicellate. Also, since the step from acute inner to mucronate or acuminate outer involucral bracts is made within a single head, it is difficult to make a sharp distinction between this species and *B. verbenacea* by outermost bracts when a number of specimens are taken into account. The writer feels that many more collections of these plants, from the countries of Central America as well as Mexico, are necessary before any useful purpose would be served in attempting the delimitation of *B. oliganthes*, the entity first described by Lessing (Linnaea V. 137, 1830) as *Eupatorium oliganthes*.

There are two other tomentose species of this subsection *Reticulatae*, *B. venosa* (Wooton & Standley) Robinson of northern Mexico and New Mexico, and *B. Kellermanii* Greenman of Guatemala. Both have smaller oblong to linear serrate leaves. In his introduction, Robinson referred to these two species and *B. reticulata* as being very close to *B. oliganthes* in technical characters. However, the plant collected as *B. reticulata* differs from both in its leaves and is known to vary cytologically from an accession of the latter from Arizona.

With the aid of cytological study of meiotic stages, the specimens collected matching both *B. oliganthes* and *B. verbenacea* showed regularity of division and clear metaphase plates of 9 chromosomes (figures in MS. in preparation). However, in *B. reticulata*, a regular plate at first metaphase could hardly be found due to an early dissociation of one or more pairs of bivalents. This kind of irregularity is sometimes associated with hybridization. In this may lie the explanation of the more rarely found tomentose plant with entire leaves.

Because plants in suitable stages for the study of meiosis, often do not have ripe seeds at the same time, it is not known whether this plant of *B. reticulata* would have been fertile. No achenes had matured on it. Where *B. oliganthes* occurred, there were several plants and it was possible to find two more advanced heads on another plant. Of *B. verbenacea*, Mr. Castillo of Guadalajara, who had been with me at the time of collection, obtained seeds by returning at a later time. Thus we know that both of these, as well as *B. venosa*, produced viable seeds. If the incidence of irregular meiosis favors an interpretation of hybridity, so too the size of the inflorescence of Haenke's collection, like the plant of my recent collection, might indicate hybrid vigor.—BIOLOGICAL LABORATORIES, HARVARD UNIVERSITY.

PREPARING SPECIMENS OF PICEA AND TSUGA.—Preparation of good herbarium specimens of *Picea* and *Tsuga* requires special treatment to prevent the needles from shedding while drying in the plant press. A. J. Sharp (An improvement in the method of preparing certain gymnosperms for the herbarium. RHODORA **37**: 267–268. 1935) glued the specimen to a herbarium sheet and covered it with cheese cloth before pressing but reported lack of success with boiling. Richard Evans Schultes (The use of formaldehyde in plant collecting. RHODORA **49**: 54–60. 1947) observed that some tropical plants normally difficult to prepare make better specimens after having first been treated with formaldehyde solution. Otherwise, these specimens lose their leaves or leaflets rapidly by formation of an abscission layer. F. R. Fosberg (Formaldehyde in plant collecting. Science **106**: 250–251. 1947), noting that formaldehyde apparently stops formation of abscission layers, suggested this technique for the foliage of *Picea* and *Tsuga* and cones of *Abies*. However, Albert G. Johnson (Effect of formaldehyde on *Picea* and *Tsuga* herbarium specimens. Science **107**: 294. 1948) reported this method unsuccessful. Edgar T. Wherry (A plastic spray for coating herbarium specimens. Bartonia **25**: 86. 1949), describing a plastic spray which forms a transparent film over herbarium sheets, remarked: "At last we have a means for keeping hemlock and spruce needles attached to the stems when pressed!"

While trying to press tree specimens in the tropics where driers could not be changed regularly, I soon learned that some shed their leaves and disintegrated in the moist press. Obviously, these twigs and their thick evergreen leaves lived long enough before drying to form abscission layers and produce poor specimens.

Prompt action to kill the tissues before abscission layers can be formed is more important than the kind of treatment. Discrepancies in effectiveness of treatments may be accounted for by variation in the time of application. A toxic solution should be successful if applied soon enough and long enough to penetrate the tissues. Spraying with the appropriate plant growth regulator might be effective also.

Perhaps the simplest way to kill plant tissues is prompt immersion in boiling water. This method is useful especially with succulents before pressing and probably could be adapted to other plants difficult to press. Boiling water is readily available in the field without cost.

For a few years I have successfully prepared herbarium specimens of *Picea* and *Tsuga* by this easy method. If freshly cut branches are placed in boiling water for one minute or more before pressing, most needles will stay attached upon drying. I boil the the specimens at night after a day in the field. However, good results have been obtained after a longer interval when the specimens have remained moist. As boiling changes the color of the needles slightly, removing the glaucous appearance of the stomatal lines, it is well to press an additional small twig in an envelope or pocket unboiled to preserve normal detached leaves.—ELBERT L. LITTLE, JR., FOREST SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON 25, D. C.

NUTTALL'S DIARY OF 1810 AND SOME INQUIRENDAE.[1]—Thomas Nuttall stands as the best known naturalist of North America in the first half of the Nineteenth Century, after Audubon and Wilson in ornithology and beside Bartram, Michaux, and Pursh in botany. We now have a fairly detailed *curriculum vitae* for Nuttall, particularly from the careful investigations of the late Francis W. Pennell. Dr. Graustein's present contribution to Nuttalliana is fresh and important both for the historian seeking materials on the Old Northwest and for the biologist tracing Nuttall's routes and the sources of his later publications. This overlooked diary of 1810 is here published for the first time, with a short introductory biography, full documentation, identification of the plants and animals mentioned, and appendices of collateral Barton material bearing on this tour. Four of the twenty illustrations are first published here, including an excellent portrait of Professor Benjamin Smith Barton.

This notice of the diary may profitably take the form of an *inquirendae* or "what we still do not know about Nuttall." This memorandum is in no sense a reflection of insufficiency on Dr. Graustein's scholarship but rather a tribute to it for her critical work makes it possible to take inventory of our knowledge of a naturalist of the first importance in American natural history. It is encouraging to know that Miss Graustein is working on a full length biography of Nuttall and these remarks may do service to the task. "He that wrestles with us strengthens our nerves and sharpens our skill." Some questions are these:

(1) What became of the plant collections numbered 1–47 mentioned in this diary? Did any survive in Barton's own collection? My studies under way at the Philadelphia Academy may throw light on this question. (2) Are these plants the ones said to have been shipped by Nuttall from New Orleans in 1811 to B. S. Barton? Nuttall took plants and seeds to England but were these merely duplicates of those sent to Barton? (3)

[1] *Nuttall's Travels into the Old Northwest. An Unpublished 1810 Diary.* Edited by Jeannette E. Graustein. Chronica Botanica, Waltham, Mass. vol. 14, pts. 1/2. pp. 88. *11 plates, 9 text figs.* "1950/51" Issued Feb. 1952. $3.00.

Did Nuttall ever meet Barton again after this tour of 1811? It is unlikely, as Graustein remarks, but possible. (4) Did Nuttall linger in New Orleans until Bradbury arrived there January 13, 1812, or had Nuttall left for England before that date? It is very unlikely that they travelled together down the river from Bradbury's failure to mention that fact. Bradbury left New Orleans on January 20, and a search in the contemporary press may add some details here. (5) To whom in England did Nuttall ship the plants from New Orleans or did he take the collection with him and deliver the seeds and plants presonally to the various parties in England? We know that Nuttall disposed of his seeds to John Fraser for the latter issued a *Catalogue* of Nuttall's Missouri River plants in 1813, and it is likely that Nuttall also placed some seeds in the care of John Lyon, whom he may have met in Philadelphia before the trip of 1810. Loudon says that John Lyon introduced *Amorpha canescens* into cultivation in 1812, but this species may have come from Bradbury's seeds distributed by the Liverpool Botanic Garden. Pursh knew Lyon from his residence in Philadelphia where Lyon succeeded Pursh as gardener at William Hamilton's garden, "The Woodlands," and this may relate to Pursh using Bradbury's collections in the preparation of his *Flora*, along with the access to Lambert's set of Bradbury's Missouri plants made possible through Roscoe. "Piracy" then becomes opportunism. John Lyon is a key figure in this period of American botany, for, like the Frasers, he operated a nursery both in England and America, and was instrumental in the introduction of plants and seeds from Philadelphia as the Frasers were from Charleston. (6) What became of the English reprint editions of Nuttall's *Genera* and of his "Travels into the Arkansa Territory," mentioned by P. A. Whipple in 1852? Were these imprints suppressed for one reason or another, if we are to let their extreme rarity guide our imaginations? (7) Does Barton's copy of Hoffman's *Flora germanica* loaned to Nuttall for the trip of 1810 contain marginal notes bearing on the plant names in this diary? It is possible that this copy has been lost. It is evidently not in the Barton collection now at the library of the Pennsylvania Hospital. There is a two-volume London edition in the Barton purchase at the Hospital. (8) Is the date "18 Sep. 1818" written on the title-page of Nuttall's *Genera* (illustrated as text figure 3 in the Diary) significant as evidence for the date of issue of that work? Pennell says the *Genera* must have been finished in the "autumn of 1818" but this date would seem to be our first precise record bearing on the issue of that classic. (9) The true basis for the publication of Fraser's *Catalogue* (1813) is yet to be clarified; there is no doubt that it represents a seed list for sale of novelties but Nuttall's claim to its authorship by inscribing the Collins copy at Philadelphia is curious. The alliances between the Liverpool Botanic Garden, William Roscoe, A. B. Lambert, John Fraser, John Lyon, and other British nurserymen and cabinet naturalists were so intricate that it is difficult to fix motives and level accusations. That Pursh is blameless in his practices is untrue, as the evidence of his publication of the genus *Bartonia*, the reports of Rafinesque, and others, bear witness, but to make

Pursh the scapegoat of the unfair practices of the times is equally unjust. Competition ran high; funds, low. Friendly encouragement and cooperations were weak or altogether wanting. (10) When Pursh was preparing his *Flora* did he see all of Nuttall's American collections? There is evidence that he saw very few Nuttall specimens. It is more likely that Pursh saw plants grown by Lambert at Boyton from Nuttall's (or Bradbury's?) seeds secured from Fraser's nursery. Lambert's personal copy of Fraser's *Catalogue* in the Amherst College Library might be worth a reexamination on this point. Rickett has traced the history of the Bradbury specimens and has pointed out that "Pursh's species are the duplicates used for exchange by Roscoe." Since Nuttall's seeds from the Missouri River region were peddled by Fraser, and Bradbury's collections taken on the same Astoria Expedition reached William Roscoe in Liverpool, and both Fraser's and Roscoe's cabinets were opened to Pursh, it is difficult to extricate the sources of Pursh's new species in many instances. Significantly, Pursh did not mention *Tanacetum huronense* or *Rubus parviflorus,* two well-marked species described in 1818 by Nuttall from his collections of 1810, which if seen, Pursh would surely have included in his *Flora.* (11) Why did Nuttall's collections remain unstudied in England after his arrival there in 1842? Nuttall had access to the best set of his collections made after his *Genera* but did not take the opportunity to publish upon them while a resident in England where the historic herbaria of London were available to him. (12) May Nuttall be said to have reached the "apogee of his career" at the age of thirty-two upon the publication of his *Genera?* Asa Gray and Miss Graustein believe so, but this reviewer is unconvinced. Nuttall had, rather, two climaxes in his career, with a kind of ornithological interlude between them. His first high success came certainly with the appearance of his *Genera,* to be followed by a second, and greater, climax in the years 1838–48 when he published (or Torrey and Gray "pirated"!) his novelties collected on the Pacific Coast, particularly in California, a few years before. Here he was describing a flora he knew intimately in the field. Haenke, Menzies, Lewis and Clark, Douglas, Chamisso,—none of the botanical explorers before Nuttall had worked on their discoveries so discerningly. He defined "small concrete genera" which have repeatedly been shown to be valid, and his acumen in the recognition of species was notable. Nuttall recognized *Paeonia californica* as distinct from the more northern *Paeonia brownii,* a conclusion verified by Stebbins after Nuttall's species had been carried in synonymy for half a century. In the preparation of the *Genera* Nuttall had excellent botanical precedents, apart from the innovations of that work, but his California papers are marked by bold decisions that have proved him an acute botanist, "who of all the early botanical explorers in California makes the strongest appeal to our scientific understanding and to our intellectual sympathies." Joseph Ewan, Tulane University, New Orleans, La.

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NEW POTAMOGETON RECORDS IN NEW HAMPSHIRE[1]

A. R. Hodgdon,[2] P. Giguere,[3] S. B. Krochmal[3] and A. Riel[3]

During the past five or six seasons probably some two or three times as many collections of pondweeds have been made in New Hampshire as had been accumulated in all previous time. Chiefly responsible for this contemporary surge of activity has been the New Hampshire State Fish and Game Department which for several years has been conducting the "Waterway Improvement Survey for Waterfowl" under the direction of Mr. Hilbert Siegler. Early in their study which necessarily included observations on the kinds and quantities of available aquatic plants the technical workers made contact with the late Rev. Hubert J. Sheehan O. S. B. of St. Anselm's College in Manchester and also with the senior author of this paper.

By far the greater part of the specimens collected during the work were taken by Stanley B. Krochmal one of the present authors but valuable collections were made from time to time by others on the "survey." Although other groups of aquatic plants were collected, the genus *Potamogeton* became the real lure, so much so indeed that it is said to have become finally a topic of breakfast conversation. It should further be mentioned that several years ago, Dr. Maurice Provost discovered some very significant stations for pondweeds, and other aquatics as well, in connection with earlier Fish and Game Department studies.

Collections made by those mentioned above are now to be

[1] New Hampshire Agricultural Experiment Station Scientific Contributions No. 144.

[2] Department of Botany, Agricultural Experiment Station, University of New Hampshire.

[3] New Hampshire State Fish and Game Department, Concord, New Hampshire.

found variously distributed in four herbaria, namely, the State Fish and Game Department collection in Concord, Krochmal's private herbarium, and those of the University of New Hampshire and of St. Anselm's College. During the early autumn of 1950 two of the present authors (Giguere and Riel) as part of the work in a graduate course in botany at the University of New Hampshire, elected to identify or verify, as well as record and map, all of the available relevant herbarium material, to record and map all reports in the literature, and finally to observe and collect as much field material as the lateness of season would permit. Their efforts were rewarded somewhat beyond anticipation by the discovery of some new stations for *Potamogeton confervoides* in the vicinity of Durham.

This paper is based upon two principal sources of information in addition to the recent collections: (1) gleanings from the Monographic Studies of St. John,[4] Fernald[5] and Ogden[6] for records from New Hampshire, (2) inspection of exsiccatae in the following herbaria in addition to that of the University of New Hamsphire, the Jesup Herbarium at Dartmouth, the St. Anselm's College Herbarium in Manchester, the Gray Herbarium, and the New England Botanical Club Herbarium. In addition, full attention has been given to recent literature and in particular to "local floras," only a few of which, of course, deal much with such obscure plants as pondweeds.

The authors wish to thank the curators of the several herbaria mentioned above for permitting the use of their specimens.

Of the nine species and varieties of *Potamogeton* to be discussed here, only one seems previously to have been entirely unreported from New Hampshire. However, the other eight have been collected, before this, only from one or at most a few often well known and publicized stations or else, if more abundant, have been known earlier only from one geographical section of the state such as the Connecticut Valley. It is apparent then that these additional stations represent in all cases significant expansions of the known ranges in New Hampshire.

P. pectinatus L.—So characteristic is this species, once its diversity of form is properly recognized, that it is surprising only

[4] Rhodora, XVIII. 121–138 (1916).
[5] Mem. Am. Acad. Arts and Sci. XVIII. pt. 1 (1932).
[6] Rhodora, XIV 57–105, 119–163 and 171–214 (1943).

two stations for it in New Hampshire are well known. The Jesup collection from the Connecticut River at Hanover is both abundantly distributed among herbaria and adequately reported in the literature. The 1886 collection of it by Walter Deane in a "brackish pond," Rye, apparently was not known to St. John, loc. cit., who cited only the Hanover station. In July 1948 specimens of undoubted *P. pectinatus* (not in fruit) but growing in considerable abundance were collected by Hodgdon, Richards, and Leighton in shallow water near the New Hampshire shore of the Connecticut River in the towns of Claremont and Charlestown, Sullivan County. Later in the summer, collections were made by Krochmal in Orford and Piermont, Grafton County, also from the Connecticut River. What is most surprising and certainly warrants more investigation is its appearance in Paugus Bay, Laconia, Belknap County, where it was collected by Krochmal in September, 1948. These recent collections of *P. pectinatus* are all somewhat unusual as to leaf-shape although they all possess the fundamental diagnostic characteristic of "straight cross partitions." Indeed they closely match descriptions and authentic herbarium-specimens except that the leaves are mostly broader than 1 mm., in their wider parts, and actually appear to be hardly "setaceous" or "bristle-like." (Phrases in quotation marks are from standard descriptions.) The statement by St. John, loc. cit., p. 124 commenting on the leaves "(those of the first year's shoot often broader and blunt)" should possibly receive wider circulation if our difficulties in identifying purely vegetative specimens are any indication of the problems others may encounter.

P. CONFERVOIDES Reichenb. For some time the classical stations for *P. confervoides* in New Hampshire were Ethan's Pond (Willey Pond) on Mt. Willey, Lonesome Lake in Lincoln, Crawford Trout Pond and the present Saco Lake. Other localities near by where it was collected by Robbins, Oakes or Tuckerman apparently are not now known with certainty. Pease collected it many years ago in Dream Lake, Shelburne and Little Cherry Pond, Jefferson. In Maine *P. confervoides* was taken in 1891 by Fernald from Round Pond, Berwick at nearly sea-level and later was reliably reported from Mt. Katahdin. A much more recently discovered station is Newbert Pond, Appleton in Knox

County. Similarly in Massachusetts, while not common, the species again is found in acid-ponds (probably) at low elevations in Tewksbury, New Bedford, Dartmouth, and Uxbridge with a station at much higher altitude in Berkshire County. Considering its apparent great rarity in Maine and the four or five reported stations in much botanized eastern Massachusetts it comes as something of a surprise to find it appearing in ten different ponds in eight townships in southern New Hampshire. A report of *P. Tuckermani* Robbins from Claremont by Jesup[7] (at present unverified) may prove to be *P. confervoides*. A considerable number of stations occur, therefore, in the southern quarter or third of the state and none apparently between there and Albany, a distance of about fifty miles. These several new stations are as follows: Sullivan Co., Washington, Frog Pond, July 1, 1947, *E. Gould*, and North Pond, June 30, 1947, *E. Gould*; Cheshire Co., Fitzwilliam, Sip Pond, *Krochmal 947;* Merrimack Co., Warner, *Krochmal;* Hooksett, Lakin's Pond, July 12, 1940, *M. Provost*, and Clay Pond, *Krochmal 851;* Hillsboro Co., New Ipswich, Hoar Pond, *Krochmal 915;* Nashua, Round Pond, June 11, 1946, *Gould;* Rockingham Co., Nottingham, Pea Porridge Pond, *Giguere and Riel 140, Riel 217;* Strafford Co., Somersworth, Willand Pond, *Hodgdon, Giguere, Riel et al.* Many of these collections are in excellent fruiting condition; all are otherwise characteristic of this very distinctive pondweed.

The Albany locality (Church Pond) was discovered in 1948 by Martha Gale, then a graduate student at the University of New Hampshire.

Before leaving *P. confervoides*, it is tempting to examine its extraordinary distribution in the light of these many New Hampshire stations. Fernald, loc. cit., pp. 35, 36 concluded that *P. confervoides* and other species of somewhat similar disrupted range occurring in the New Jersey Pine Barrens and also appearing in Northern New England, Newfoundland, etc., in mountainous areas are "really oxylophytes which within rather wide climatic limits are to be expected where highly acid conditions prevail." Further in this same discussion, Fernald suggested that over its entire range embracing Newfoundland, Nova

[7] A catalogue of the Flowering Plants and Higher Cryptograms found within about thirty miles of Hanover, N. H. 48 (1891).

Scotia, New England, New York, New Jersey, and Pennsylvania, *P. confervoides* tends to inhabit two very different kinds of areas, low-altitude ponds on the one hand and ponds of considerable elevation on the other. Apparently at that time he was willing to explain the occurrence of *P. confervoides* along with other somewhat similarly disrupted species on the basis of their being oxylophytes as noted above. Fernald in the same reference, p. 36, concluded his consideration of this species by stating "From these facts it should be apparent that *Potamogeton confervoides* is to be looked for in the acid region from southern Labrador to the Great Lakes." Earlier, however, Fernald[8] had suggested that *P. confervoides* was a preglacial relic in the elevated portions of its range and had stated that "If any lowland pondweed were in post-Wisconsin time to do the improbable and invade the elevated mountain-pools from sea-level, it would less unreasonably be a common or, in the region, essentially ubiquitous and less primitive species." With these relatively numerous and widespread New Hampshire stations of *P. confervoides* we are now in a more favorable position than was Prof. Fernald to appraise its distribution objectively. At the suggestion of Dr. S. K. Harris we have obtained altitude records and pH readings for nearly all of the stations.[9] The following table includes any of the older stations which can be identified with some degree of certainty and all of the recent localities with the exception of a pond in Warner which was recorded only to township when collected. They are arranged in the order of their increasing altitude. The pH readings are those recorded for the pond-surfaces and therefore only partially characterize the plants environment.

It is to be noted that seven stations occur between 100 and 1000, seven others between 1100 and 2000, and two more above 2700 feet elevation. There is no concentration of stations at any particular altitude, either high or low. It must be concluded that the range of *P. confervoides* in New Hampshire is not significantly of either a low- or high-altitude character. Although the acidity-records of the known localities for *P. confervoides* in New Hampshire are somewhat incomplete, it seems likely that all

[8] Rhodora, 33: 59. (1931).

[9] The authors are much indebted to Mr. Hilbert Siegler, Senior Biologist, New Hampshire State Fish and Game Department, who very generously has supplied most of the pH and altitude-data for the table from as yet unpublished surveys.

TABLE I

Location, Altitude and Acidity of New Hampshire Stations of *P. confervoides*

Name of Pond	*Township or Location*	*Alt. in ft.*	*pH*
Willand Pond	Somersworth-Dover	184	—
Round Pond	Nashua	180–200	6.0
Pea Porridge Pond	Nottingham	222	5.8
Lakin's Pond	Hooksett	313	6.1
Clay Pond	Hooksett	427	5.5
Sip Pond	Fitzwilliam	884	6.4
Hoar Pond	New Ipswich	962	6.1
Little Cherry Pond	Jefferson	1102	6.0
Church Pond	Albany-Livermore	1220–1240	6.2
Frog Pond	Washington	1610	6.1
North Pond	Washington	1653	5.2
Crawford Lake	Crawford Grant	1771	6.4
Saco Lake (perhaps Crawford Trout Pond)	Nash & Sawyer Location	1891	6.2
Dream Lake	Shelburne	1900	6.2
Lonesome Lake	Lincoln	2750	6.1
Ethan's Pond (? Willey Pond)	Bethlehem	2840	—

stations are definitely acid and some where it particularly abounds, as in Pea Porridge Pond, are strongly acid. The following table lists in vertical columns the percentages of New Hampshire stations for *P. confervoides* in each of several pH ranges as compared with the percentages of reported ponds in the several River-systems of the State, in those same pH ranges.[10] Not by any means are there acidity data for all of the ponds and lakes in New Hampshire in these reports. However, it is hoped that those which have been reported will eventually prove to have been a fairly representative sampling.

Of the 401 ponds and lakes for which we have surface pH data, 280 or nearly 70% are less acid than any of those which have *P. confervoides*, 57 or more than 14% are less acid than all except two of the stations. It seems evident then that this pondweed is characteristic only of acid-waters as was pointed out by Fernald.

If *P. confervoides* is an oxylophyte as seems to be the case and if it is adapted to ponds and lakes at all altitudes between sea-level and 3000 feet, as also seems to be true, it would seem that the species should appear wherever these two conditions occur.

TABLE II

Percentages of Ponds in New Hampshire in Critical pH Ranges as Compared to Percentages of *P. confervoides* Stations in Same pH Ranges

Watershed	*Number of Ponds and Lakes Reported*	*pH 6.5 or above*	*pH 6.4*	*6.2 or 6.3*	*6.0 or 6.1*	*Less than 6*
Connecticut	108	68.5	12.9	9.25	7.4	1.8
Merrimack	220	74.5	12.7	8.2	.9	3.6
Coastal	17	53	29.4	0	17.6	0
Saco	39	51.25	18	18	10.25	2.55
Androscoggin	17	76.45	17.65	0	5.9	0
Stations of *P. confervoides* of which acidity is known	14	0	14.28	21.43	42.85	21.43

This does not seem to be true, however, for in New Hampshire, as in Maine and Massachusetts, there is an evident break or discontinuity in the range between the more southern, eastern or coastal stations and the more northern, western or inland stations which usually, but not by any means always, occur at higher elevations. Possible answers to this riddle might be that the intermediate areas have not been adequately botanized or that ecological conditions there are not now suited to the species. After recording and mapping all townships in New Hampshire having acid ponds in which we might most expect to find *P. confervoides* (pH 6.3 to less than 6) we find that such are widely distributed and occur frequently in the intermediate area where *P. confervoides* seems to be absent. Possibly the explanation involves recent geological or climatic history. Continued failure to disclose stations in ecologically suitable intermediate situations might lead one to the tempting hypothesis that the species

[10] (See p. 7) Hoover, Earl E. Biol. Survey, Androscoggin, Saco and Coastal Watersheds, N. H. State Fish and Game Department, Surv. Rept. No. 2, Dec. 1937, and Biol. Survey, Merrimack Watershed, N. H. State Fish and Game Department, Surv. Rept. No. 3, Dec. 1938. Warfel, Herbert. Biol. Survey of the Conn. Watershed, N. H. State Fish and Game Department, Surv. Rept. No. 4, Dec. 1939.

achieved its present disjunct distribution at two quite different times. The more nearly continuous southern, eastern or coastal element conceivably attained its present range more recently than the more isolated northern, western or inland occurrences.

P. zosteriformis Fern.—No records of this species occurring in New Hampshire appear in the literature except an unverified report in Jesup, loc. cit., p. 48. If one studies the map in Fernald's monographic study of 1932, p. 37, the total absence of dots in New Hampshire is startling, particularly in view of the stations that are indicated on all sides. Now this gap can be bridged. The following records show the species not to be common but at least to be widely present in the state: Coos Co., Lancaster, *Krochmal 1421;* Carroll Co., Moultonboro, *Dodge and Sheehan 579a;* Belknap Co., Alton, *Krochmal 1331* and Alton River, *Krochmal and Gould 780;* Merrimack Co., Boscawen, Walker Pond, *Krochmal 620;* Hillsboro Co., Nashua, Salmon Brook, *Poirier 282;* Sullivan Co., Charlestown, *E. Gould 24;* Cheshire Co., Hinsdale, Conn. River, *Krochmal 2359.*

P. obtusifolius Mertens & Koch—To the already known New Hampshire stations, Lime Pond, Columbia, Coos Co., and Enfield Pond, Enfield, Grafton Co. should be added the following which demonstrate the species to be widely distributed in New Hampshire though apparently not to be expected commonly; Coos Co., Pittsburg, Harris Pond, *Krochmal 1577;* Grafton Co., Littleton, several stations including Mullikan Pond, *Krochmal & Sheehan 36;* Lisbon, Perch Pond, *Krochmal 1596;* Haverhill, *H. Laramie and S. A. Dole;* Carroll Co., Moultonboro, Lake Wakondah, July 23, 1946, *John Dodge;* Rockingham Co., Deerfield, *Krochmal 1502;* Hillsboro Co., Weare, several stations including Peacock Brook, *Krochmal 853.*

P. Berchtoldi Fieber, and its varieties—A very large series of specimens has now accumulated including all of the varieties which might have been expected, on the basis of previous reports, to occur in New Hampshire. Var. *polyphyllus* has seemed to be the most rare having been reported previously from but one locality, Ladd Pond, Stewartstown. It continues to be represented the least although it is here reported from Coos Co., Pittsburg; Grafton Co., Haverhill; Belknap Co., Alton; Strafford Co., Durham and Lee; Sullivan Co., Croydon.

P. vaseyi Robbins—While this attractive and delicate pondweed has for some time been known from the Connecticut River or near it in Stewartstown, Hanover, and Lebanon, it may be worth while to add several records to the published list inasmuch as the newer ones are not all from the Connecticut Valley. They are: Coos Co., Lancaster, *Krochmal 1422;* Rockingham Co., Exeter, Exeter Reservoir, *Krochmal and Dodge 357;* Hillsboro Co., Manchester, Pine Island Lake, *Krochmal 265* (det. by Fernald); Sullivan Co., Cornish, Blow-me-down Pond Aug. 11, 1940, *M. Provost;* Charlestown, Beaver Brook Marsh, Krochmal; Cheshire Co., Troy, *Krochmal 971* (det. by Fernald).

P. pulcher Tuckerm.—Ogden, loc. cit., p. 121 cites only one collection from New Hampshire and that in Jaffrey in the southwestern part of the state. It seems to be absent from Maine but does appear in southwestern Nova Scotia. A number of New Hampshire stations as follows have been found for it in recent years and all in the southern quarter of the state: Rockingham Co., Nottingham, Pawtuckaway Pd., *Krochmal 396;* Deerfield, Big Shingle Pond, July 15, 1940, *M. Provost;* Merrimack Co., Hooksett, Lakin's Pond, June 8, 1946, *Krochmal;* Hopkinton, Clement Pond, *Krochmal 743*; Dunbarton, Kimball Pond, *Krochmal 166;* Hillsboro Co., Hollis, pot hole, *Krochmal 300* and No Name Pond, June 13, 1946, *E. Gould;* Peterboro, Contoocook River, *Krochmal 888.*

P. nodosus Poiret—Inasmuch as one of the three new records for New Hampshire is remote from the Connecticut River Valley where this species has long been known in Cornish and Hanover, it may be well to list all of the new stations which are as follows: Hillsboro Co., Hudson, Merrimack River, Sept. 10, 1948, *H. Laramie and S. A. Dole;* Sullivan Co., Charlestown, Aug. 7, 1947, *E. Gould;* Cheshire Co., Hinsdale, *Krochmal 1256.*

P. richardsonii (Ar. Benn.) Rydb.—A considerable series of specimens has been taken in New Hampshire all in the Connecticut Valley or nearby and extending all the way from Colebrook to Westmoreland. Its occurrence here is to be expected, for the species, obviously a calcicole, has been reported widely from northern Maine and Quebec, as well as from northern and western Vermont. It has been collected once in Lancaster (Pease) too recently to be included in Ogden's monographic study. The new records are as follows: Coos Co., Colebrook, Connecticut River, *Krochmal 1389;* Grafton Co., Monroe, Connecticut River, *Krochmal and Sheehan 62;* Lyman, Dodge Pond, *Krochmal and Sheehan 57* and Ogontz Pond, *Krochmal 1601;* Orford, Upper Baker Pond, *Krochmal 1467;* Sullivan Co., Claremont, Connecticut River, *Hodgdon, Leighton and Richards, 5885;* Charlestown, Connecticut River, Aug. 7, 1947, *Gould and Krochmal;* Cheshire Co., Westmoreland, *Krochmal 1205.* Some of these collections are somewhat intermediate in vegetative character between *P. Richardsonii* and *P. perfoliatus* var. *bupleuroides.* These are the specimens from Colebrook, Dodge Pond in Lyman and Charlestown. We preferred to consider them as extremes of the former.

NOTES ON THE GENUS CAREX I: A NEW SPECIES OF CAREX FROM WESTERN CANADA[1]

J. A. Calder

Carex raymondii sp. nov.

C. atratiformis Britton. Bull. Torr. Bot. Club, Vol. 22, p. 222, 1895 (*pro parte, typo excl.*).

Planta caespitosa rhizomatibus brevibus adscendentibus; culmi graciles, 3–7 dm. alt., multo longiores foliis, phyllopodici, summi minute vel valde scabri, acute triangulares; laminae basi foliorum subseptato-nodulosae, planae, marginibus revolutis, glaucovirides, (2.5)–3.5–(6.0) mm. lat., erecto-adscendentes, marginibus ad apicem scabris; vaginae ventrale albae, hyalinae, nonnunquam maculosae, ad summas purpureo-rubrae; ligulae a subquadratis ellipticae; folia inferiora reducta, purpureo-nigra vel pallide subfusco-purpurea; spicae densae 3–4–(7), approximatae, ellipsoideae vel interdum cylindricae, 1.1–2.0 cm. long. × 4.5–8.0 mm. lat., superior gynaecandra (raro foeminea), laterales foemineae vel floribus inferioribus paucis masculis, inferiores paulum arcuatae pedunculis gracilibus scabris vel subglabris, superiores erectiores, pedunculis brevioribus; perigynia (7)–20–30–(50) in spica singula adpresso-adscendentia; bractea inferior foliacea, saepius culmo brevior, vagina brevissima, concolor cum culmo vel basi sparse rubro-purpurea; bracteae superiores subulatae et saepius basi rubro-purpureae; squamae anguste ovatae, acutae vel subacuminatae, 2.5–3.0 mm. long., nonnunquam longiores perigyniis sed saepius breviores, saepius sublucidae, pallide vel atre purpureo-rubrae, marginibus hyalinis obsoletis vel conspicuis, nervo singulo obsoleto vel conspicuo, saepius angusto, pallidiore; perigynia ovoidea vel suborbiculata, paulo inflata, 2.5–3.5 mm. long. × 1.5–2.2 mm. lat., bicostata, enervosa, membranacea, granulosa, puncticulata, pallide castanea vel viridi-castanea, interdum ad summas ± purpurascentia, breviter stipata, rostro 0.4 mm. long., bidentata,

[1] Contribution No. 1190, Division of Botany and Plant Pathology, Science Service, Canada Department of Agriculture, Ottawa, Canada.

plus minusve purpurea, apice hyalina; achenia media 1.4 mm. long. × 0.9 mm. lat., granulosa, pallide brunnea; stigmata 3.

Plants caespitose with short, stout, ascending rhizomes; culms slender, 3–7 dm. high, much longer than the leaves, phyllopodic, minutely to strongly scabrous above, sharply triangular; blades of the leaves weakly septate-nodulose at base, flat with revolute margins, glaucous-green, (2.5)–3.5–(6.0) mm. wide, erect-ascending, scabrous-margined towards apex; the sheaths white-hyaline ventrally, occasionally purplish-red-spotted below the concave mouth; the ligule as long as broad or longer; lower leaves reduced, purplish-black to light brownish-purple; spikes 3–4–(7), approximate, ellipsoid or occasionally cylindric, 1.1–2.0 cm. long × 4.5–8.0 mm. wide, the terminal gynaecandrous (exceptionally pistillate), the lateral either totally pistillate or with a few basal staminate flowers, the lower somewhat curved on slender, scabrous to almost glabrous peduncles, the upper more erect, on shorter peduncles; each spike with (7)–20–30–(50) appressed-ascending perigynia; lowest bract leaflet-like, usually shorter than the culm, very short sheathing, the same colour as the culm or sparingly reddish-purple at base; the upper bracts subulate and usually reddish-purple at base; scales narrowly ovate, acute to subacuminate, 2.5–3.0 mm. long, occasionally longer than the perigynia but usually shorter, usually shiny, light to dark purplish-red, with obsolete to broad hyaline margins, and obsolete to broad (usually narrow) midveins of lighter colour; perigynia short-ovoid to suborbicular, weakly inflated, 2.5–3.5 mm. long × 1.5–2.2 mm. wide, two-ribbed, nerveless, membranaceous, granular, puncticulate, pale greenish-castaneous to castaneous, sometimes minutely and dilutely purplish-colored just below the beak, short-stipitate, beak 0.4 mm. long, bidentate, hyaline at tip, lightly to strongly purplish-red-tinged below; achenes averaging 1.4 mm. long × 0.9 mm. wide, granular, light brown; stigmas 3.

In the citations which follow, the abbreviation (CAN) is used for specimens in the herbarium of the National Museum of Canada; all others are in the herbarium of this Division.—**Alaska:** Disturbed sandy-gravel area bordering old airstrip, Big Delta, *Cody & Webster 5480;* sandy soil in depression in cleared area, Delta Junction, Mile 268 Richardson Highway, *Cody & Webster 5947.* **Yukon:** Ear Lake, Whitehorse, *M. P. & R. T. Porsild 49* (CAN); open pine woods, east slope of Rose River valley, Mile 77 Canol Road, *Porsild & Breitung 10252* (CAN); alluvial meadows on west bank of Nisutlin River opposite Mile 36 Canol Road, *Porsild & Breitung 10760, 10762* (CAN); river flats above Rink Rapids, Yukon River, *Macoun 53896* (CAN); moist area along path, willow thicket, west slope of Moosehide Mountain, Dawson, *Calder & Billard 3784.* **Mackenzie District:** Moist crevices in calcareous rocks, Alexander Falls, Hay River, *Lewis 643;* in sand by roadside, Seven Mile Lake, 27 miles west of Fort Smith, *Cody 4640.* **Alberta:** Livingston Valley at the Gap, August 11, 1951, *Malte;* near C. P. R. Notch, Banff, *Macoun 14022* (CAN); Kananaskis, *Macoun 13421A* (CAN); Canmore, *Macoun 13421* (CAN); Moose Mt., Elbow River, *Macoun 25433B* (CAN); Jumping Pound Creek, *Macoun 25434* (CAN); Mt. Coliseum, Nordegg, *Malte & Watson 1511* (CAN); low moist ground, spruce woods, moist fields, burned over area, Nordegg, Clearwater Forest Reserve, *Cormack 582, 584, 754, 775, 789, 790C;* low ground by bog, Pigeon Lake, 40 miles southwest of Edmonton, *Turner 5009;* edge of hay slough, Pigeon Lake area, *Turner 7239;* moist area, Edmonton, *Moss 6019;* moist area, Whitemud Creek, Edmonton, *Turner 2570;* grassland 2 miles northwest of Harmon Valley, *Moss 7718;* McAllister Creek, north of Dunvegan, *Macoun 59530* (CAN); woodland, Beaverlodge, *Jenkins 167;* Moose Lake District, Wood Buffalo Park, *Raup 1939, 1940* (CAN); Pine Lake District, Wood Buffalo Park, *Raup 1941* (CAN); trail about 10 miles southwest of Fitzgerald, *Raup 1942*

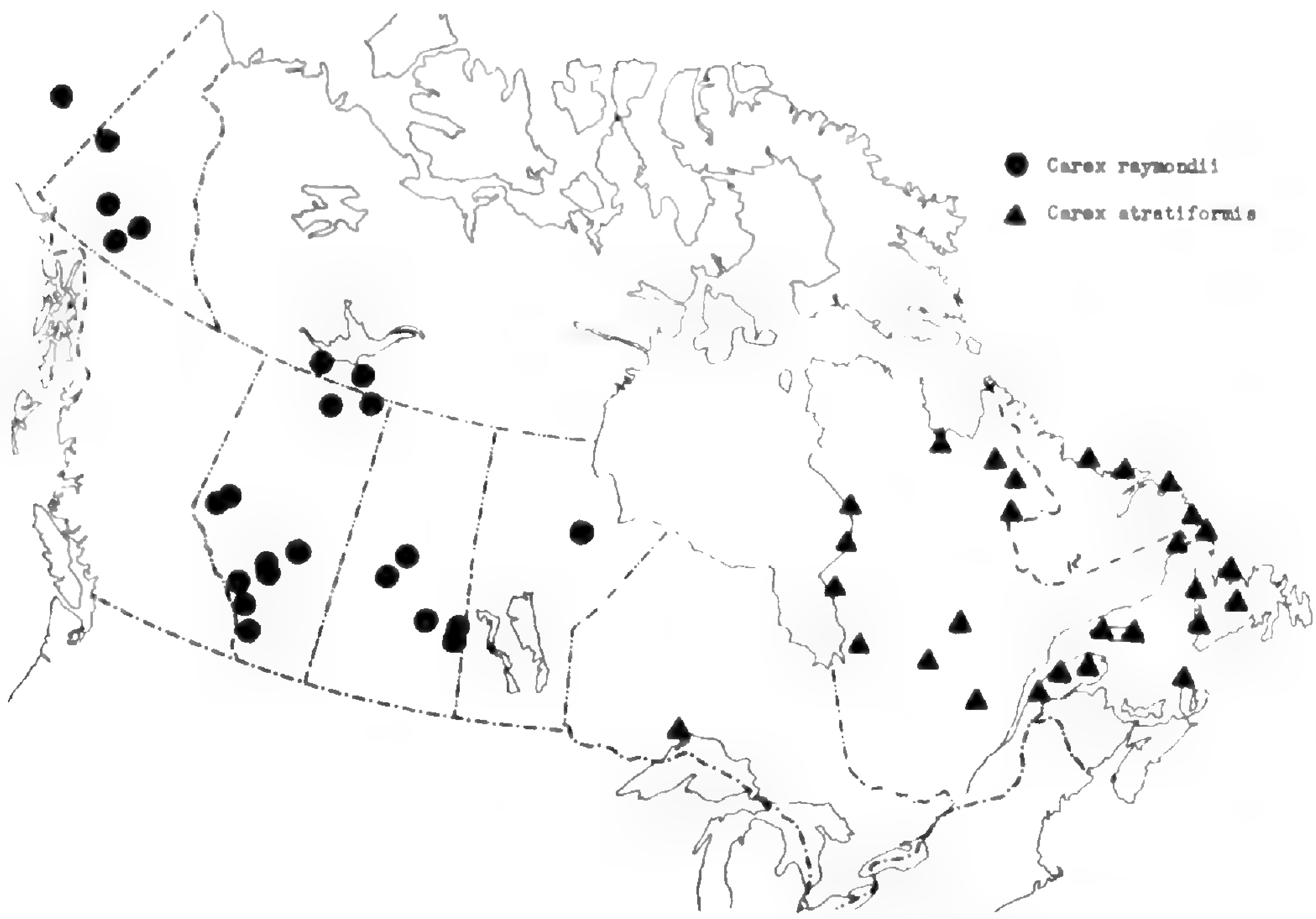

Fig. 1. Distribution of *C. raymondii* and *C. atratiformis* in Canada

(Can); poplar-spruce woods, 1 mile southwest of Fort Smith, *Cody & Loan 4498.* **Saskatchewan:** In loam, roadside 4 miles east of McKague, June 26, 1938, *Breitung;* moist places, McKague, *Breitung 8618;* low ground, woodland trail, 2 miles west of Veillardville, *Breitung 718;* trail, Tallpines, July 4, 1935, *Ledingham;* road through swamp, Prince Albert National Park, July 4, 1934, *Fraser;* moist ditch by highway, Montreal Lake, June 21, 1941, *Fraser* (CAN); Jack Pine woods, Candle Lake, Melfort District, *Boivin & Breitung 6261;* Methye River, *Macoun 13417* (CAN). **Manitoba:** Moist soil along margin of wood-road, Gillam, *Schofield 1270* (Type).

C. raymondii is a western species of the coniferous boreal forest ranging in southern Canada from Manitoba to Alberta and in the north from the southern Mackenzie District westward to Alaska. Although there are no records from British Columbia, as indicated by the accompanying map, it is undoubtedly present in the northeastern part of the province, and it may extend southward into northern Montana. *C. raymondii* is the western counterpart of *C. atratiformis* (*sensu lato*) which was based on *C. ovata* Rudge from Newfoundland, and stated by Britton to be distributed from "Newfoundland to the mountains of New England, west to the Northwest Territory." As now restricted, *C. atratiformis* in Canada ranges from Labrador, Newfoundland, and Nova Scotia (Cape Breton Island), westward over most of Quebec[2] (apparently absent in the southwestern part of the province), with an isolated occurrence in the Port Arthur—Fort William area at the head of Lake Superior in Ontario. Its general distribution as shown on the map is based on Raymond's figure 3 (l. c.), and specimens in the herbaria of the National Museum of Canada and this Division.

In the majority of cases the two species may be readily distinguished solely on the color of the spikes. The table below, however, sets out additional characters by which they may be separated.

	C. raymondii	*C. atratiformis*
SPIKES	always two-toned in color.	predominantly blackish or dark brown in color, occasionally somewhat two-toned
	only slightly compressed.	usually strongly compressed.
PERIGYNIA	moderately inflated.	weakly inflated.
	ovoid to suborbicular.	obovate or ovate to narrowly ovate or elliptical.
	pale greenish-castaneous to castaneous, occasionally dilutely purplish colored just below the beak.	suffused with purple, usually the same color as the scales.
	tip of beak hyaline.	tip of beak reddish-purple.
ACHENES	confined in lower ⅔ of perigynia.	confined in approximately lower ½ of perigynia.
SCALES	light to dark purplish-red.	dark purplish-red.
	obsolete to broad hyaline margins.	obsolete to very narrow hyaline margins.
	obsolete to broad midveins of lighter color.	no midvein of lighter color; or, if present, obsolete to very narrow.
LEAVES	reduced basal leaves purplish-black to light brownish-purple.	reduced basal leaves bright reddish-purple.

[2] For the distribution of *C. atratiformis* in eastern Canada see: Raymond, M. Cypéracées de l'Ile Anticoste. Carex et Kobresia. Can. Jour. Res. C. 28, fig. 3, p. 441, 1950.

The writer would like to express his appreciation to Dr. B. Boivin of this Division for assistance with the Latin diagnosis. It is a pleasure to name this species for Mr. M. Raymond who has been most helpful to the writer with various problems in the genus *Carex*.

NEW MISSOURI PLANT-RECORDS (1949–1951)

Julian A. Steyermark

Since the last report on plant records new to Missouri (Rhodora **51:** 115–119. 1949), a number of interesting species have been collected, some of them indicating new limits within Gray's Manual range. A few of these discoveries were indicated by the writer in a personal communication to Dr. Fernald before his death, and were incorporated in the new edition of the Manual. None of the following records has been published before and they are based upon specimens collected mostly by the author. Some have also been contributed by Mr. Bill Bauer, Mr. Leslie Hubricht, Mr. Harry Ahles, and Miss Shirley Sparling. All the specimens collected by the writer are deposited in the herbaria of Chicago Natural History Museum, Missouri Botanical Garden, and Gray Herbarium.

Potamogeton epihydrus Raf. var. nuttallii (C. & S.) Fern. This northern species, new to Missouri, was discovered in an upland sink-hole pond near another pond where *Decodon verticillatus* had been found and reported as new to the state (Rhodora **51:** 117. 1949). The previous southern limits for this variety were in Georgia and Tennessee. Lily Pond, on top of ridge south of Vinson Hol, T 31 N, R 1 E, NW ¼ sect. 23, 7 miles southeast of Centerville, Reynolds Co., September 5, 1949, *Steyermark 69232*.

Echinodorus tenellus (Mart.) Buchenau. The original pond locality near St. Louis where Engelmann had found this species in Missouri was destroyed long ago, and no collector since Engelmann's time has succeeded in finding another station. While studying the flora of sink-hole ponds, the writer chanced upon a natural upland pond in Howell County, southern Missouri, the margin of which was completely covered by this species. Abundant material was collected for distribution. This is the only known station for the species in Missouri and represents a new western limit for it in the central United States. Adobesee Pond, T 22 N, R 7 W, SE part sect. 36, 9 miles southeast of West Plains, Howell Co., September 4, 1949, *Steyermark 69124a*.

LOPHOTOCARPUS CALYCINUS (Engelm.) J. G. Sm., forma DEPAUPERATUS (Engelm.) Fern.

This was found in the water of a badly pastured and probably artificial pond, T 31 N, R 1 W, sect. 23, 4 miles southeast of Corridon, Reynolds Co., October 29, 1950, *Steyermark 71096*.

SAGITTARIA LATIFOLIA Willd., f. HASTATA (Pursh) Robins. This form, previously unreported for the state, is based upon *Steyermark 66028*, collected along Black River, 7 mi. southeast of Redford, Reynolds Co., August 22, 1948.

UNIOLA LAXA (L.) BSP. At the time of the discovery of *Lindera melissaefolium* (Walt.) Blume and *Oldenlandia Boscii* (RHODORA **51:** 153–162. 1949) in a section of southeastern Missouri, there was also collected an attractive grass with dark green, glossy foliage. This grass proves to be new to Missouri. Wooded small knolls and swales, T 22 N, R 4 E, ¼ SW sect. 35, 4¾ miles south of Naylor, Ripley Co., October 19, 1948, *Steyermark 66921*.

SCIRPUS ATROVIRENS Willd., forma SYCHNOCEPHALUS (S. N. Cowles) S. F. Blake. This form, previously unreported for Missouri, was found by Miss Shirley Sparling. The collection, in the herbarium of Iowa State College, is labelled *Sparling 1173*, bottom of ditch, clay, T 58 N, R 23 W, sect. 19, northeast of Chillicothe, Livingston Co., July 23, 1951.

SCIRPUS HALLII Gray. This is another sink-hole pond discovery to add to the ever-increasing list of unusual isolated coastal plain species occurring in or around the ponds. This is the only known station of this species for Missouri. The pond in which it was found is near Adobosee Pond, the location for *Echinodorus tenellus* noted above; T 22 N, R 7 W, north part of sect. 1, 9 mi. southeast of West Plains, Howell Co., September 4, 1949, *Steyermark 69122*.

CAREX COMPLANATA Torr. & Hook. This species has not previously been reported from Missouri, but I would refer a collection from northern Missouri, although out of the known range, to this species, rather than to *C. caroliniana*. It was found on sterile upland slopes around *Juniperus virginiana*, ravines tributary to Grand River, T 66 N, R 32 W, sect. 15, ½ mi. south of Isadora, Worth Co., May 30, 1948, *Steyermark 65565*.

In this collection the sheaths, leaves, and perigynia are glabrous or glabrate. The perigynia are 2.5–3 mm. long, flattish on the inner face, rounded at the apex, and the achenes have only a slightly bent or declinate tip. In *C. caroliniana* the perigynia are scarcely compressed, both inner and outer faces strongly and subequally rounded, short-pointed at apex, and the achenes have a very abruptly bent tip. The characters of the perigynia (rounded or short-pointed at apex and achenes with slightly bent or abruptly bent tips), while not mentioned in the 8th edition of Gray's Manual, are accounted for in Mackenzie's treatment of the genus in North American Flora (pp. 318–319), and appear to be substantiated as valid differences between these two species by an examination of herbarium material.

Carex straminea Willd. The discovery of this species also made from a sink-hole pond, represents a new southwestern limit for the species. It was previously known as far west as southern Indiana and southern Michigan. The tall culms growing in dense tussocks, nodding moniliform heads with spikes long-clavate at the base, and the broad round-ovate perigynia, are characteristics of the species. The collection was made in an upland sink-hole pond, T 31 N, R 6 W, sect. 32, 7 mi. south of Cedar Grove, Shannon Co., May 3, 1947, *Steyermark 64267*. More mature collections of this same species were made on June 26, 1951, and are represented by *Steyermark 71854* and *71855*.

Carex trichocarpa Muhl. The writer found this species in a swampy calcareous meadow in the southeastern Ozarks. As in the study of the sink-hole ponds, an intensive survey of these calcareous swampy meadows is yielding an increasing number of species new to the state flora and far removed from their nearest stations. Swampy meadow along West Fork of Black River, on property of Mr. D. C. Miner, T 33 N, R 3 W, sect. 23 and NE sect. 26, 3–3½ miles northwest of Greeley, Reynolds Co., July 6, 1951, *Steyermark 71977*.

The numerous erect, sterile leaves, attaining a height of nearly a meter, are a distinctive feature of this plant. The Missouri record represents a new southwestern limit of range for the species, known previously only as far southwest as northern Iowa. It is not to be confused, of course, with *C. laeviconica* Dewey, or *C. atherodes* Spreng., species previously found in Missouri and designated by earlier collectors and by some earlier authors as *C. trichocarpa* or varieties of it.

Juncus tenuis Willd., forma discretiflorus (F. J. Herm.) Fern. This form, new to Missouri, is based upon *Steyermark 64701*, from swampy meadow and pond in depression along road, T 33–34 N, R 16–17 W, sect. 36, 8 miles southwest of Lebanon, Laclede Co., July 5, 1947.

Allium vineale L., forma compactum (Thuill.) Aschers. This Missouri collection, deposited in the herbarium of Iowa State College, is based upon *Sparling 57*, along ditch, partially shaded, T 58 N, R 24 W, sect. 14, north 3.3 miles and west 1.2 miles from Chillicothe, Livingston Co., June 15, 1950.

Polygonatum biflorum (Walt.) Ell. The Missouri collections of this species are deposited in the herbarium of Iowa State College. They are based upon *Sparling 17*, fence row, unshaded, T 58 N, R 24 W, sect. 26, north 1.7 miles and west 0.8 miles from Chillicothe, Livingston Co., June 11, 1950, and *Sparling 1* from the same general locality.

Habenaria psycodes (L.) Spreng. Mr. Bill Bauer sent the writer a fragment and later a flowering specimen of this species blooming in his wild flower garden in Webster Groves, a suburb of St. Louis. He stated that his plant originally was transplanted by him from Caney Mountain Refuge, along Caney Creek, T 23 N, R 13 W, sect. 8, 5½ miles north of Gainsville, Ozark Co. On July 23 the writer with Mr. Bauer visited this spot, but no plants were located. The sole record is based upon the plant transplanted to Mr. Bauer's garden. It is *Steyermark 68585*, July 23, 1949.

Juglans nigra L., forma oblonga (Marsh.) Fern. This rare form of the black walnut was first reported from Missouri by W. A. Dayton in Rhodora **50:** 147. 1948. The writer obtained his collection, the second record for the state, from the southeast part of the Ozarks bordering the Mingo Swamp of the Mississippi Embayment. Swampy meadow in valley of Stanley Creek, T 27 N, R 7 E, sect. 18, 6–7 miles northeast of Wappapello, Wayne Co., September 11, 1949, *Steyermark 69265*.

Alnus serrulata (Ait.) Willd., forma noveboracensis (Britt.) Fern. Typical *A. serrulata*, with the lower surfaces of the mature leaves glabrous or strongly glabrescent, is common throughout the Ozarks. The forma *noveboracensis* was obtained by the writer from the southeastern portion of the Ozarks, and is based on *Steyermark 63871*, along River aux Vases, T 36 N, R 7–8 E, sect. 5 and 7, 5–6 miles north and northeast of Coffman, Ste. Genevieve Co., July 6, 1946.

Quercus velutina Lam., forma macrophylla (Dippel) Trel. A Missouri collection of this form is deposited in the herbarium of Iowa State College. It came from a sparsely wooded pasture, T 58 N, R 24 W, sect. 12, northwest of Chillicothe, Livingston Co., July 21, 1951, *Sparling 1152*.

Polygonum setaceum Baldw., var. tonsum Fern. This variety has not been definitely reported previously from Missouri, although the range "Ky. to Okla.," given in the 8th edition of Gray's Manual, would imply inclusion of the state. A Missouri collection which should be referred to this variety was found on swampy ground along ravine tributary to Silver Creek, southwest of Arnica, T 35 N, R 25 W, sect. 32, Cedar Co., September 27, 1947, *Steyermark 65234*.

Cerastium viscosum L., forma apetalum (Dumort.) Mert. & Koch. This form, not previously reported from Missouri, is based upon the following collection: *Steyermark 67973*, on top of ridge, along Flat Creek, T 45 N, R 21 W, sect. 24, 2½ miles south of Sedalia, Pettis Co., May 20, 1949.

Holosteum umbellatum L. A collection of this plant, not previously recorded from Missouri was made by Mr. Harry Ahles of the University of Illinois and is deposited in the Herbarium of that University. The plants were collected one mile south of Caledonia, Washington Co., April 22, 1950, *Ahles s. n.*

Adonis autumnalis L. This cultivated garden annual was found by Mr. Bill Bauer growing as a ruderal in a wheat field near Gumbo, St. Louis Co., May 7, 1949, *Bauer 201*.

Delphinum exaltatum Ait. The first definite record in Missouri for this species is a collection examined by the writer in the New York Botanical Garden Herbarium. It was collected in a remote section of the Ozarks, along Current River, ½ mi. from Round Spring State Park, Shannon Co., 1942, by Mr. Leslie Hubricht.

Hesperis matronalis L. This addition to the state flora is based upon plants escaped from cultivation along roadside, T 49 N, R 27 W, sect. 17, 5 miles northeast of Odessa, Lafayette Co., May 17, 1949, *Steyermark 67804*.

Erysimum inconspicuum (S. Wats.) MacM. Although recorded for Missouri in the 8th edition of Gray's Manual, this species had not been previously recorded for the state. A recent Missouri collection, deposited in the herbarium of Iowa State College, was made on a r. r. embankment, T 58 N, R 23 W, sect. 8, Chillicothe, Livingston Co., May 12, 1951, *Sparling 766*.

Filipendula rubra (Hill) Robins. This striking plant is another addition to the increasing list of discoveries resulting from the botanizing of calcareous, swampy meadows in the southeastern section of the Ozarks. Iowa and Illinois were the previous western limits known for the species. At the locality given below, the species was very common, and occurred in an extensive, swampy, natural meadow, never previously pastured nor disturbed, with the newly reported *Carex trichocarpa* (see above), *Leersia oryzoides*, *Carex leptalea*, *Fuirena simplex*, *Phlox maculata*, *Lythrum alatum*, *Parnassia grandifolia*, *Epilobium coloratum*, *Solidago Riddellii*, *S. patula*, *Aster puniceus* var. *firmus* f. *lucidulus* (not mentioned in the 8th edition of Gray's Manual, but previously reported by the writer in Rhodora and subsequently collected in calcareous meadows in the adjacent southeastern Ozark counties of Washington, Dent, Reynolds, Shannon, and Howell counties), *Rudbeckia umbrosa*, *Cirsium muticum*, *Dulichium arundinaceum*, *Pedicularis lanceolata*, *Pycnanthemum virginianum*, *Lobelia siphilitica*, *Helenium autumnale*, *Aster novae-angliae*, and *Eupatorium perfoliatum*. The collection was made in a calcareous, swampy meadow along West Fork of Black River on property of Mr. D. C. Miner, T 33 N, R 3 W, sect. 23 and NE sect. 26, 3–3½ miles northwest of Greeley, Reynolds Co., July 6, 1951, *Steyermark 71974*.

Rosa setigera Michx., forma **alba** Steyermark, f. nov., a typo recedit petalis albis brevioribusque.—Along roadside gravelly bank above swampy meadow along Bee Fork, T 32 N, R 2 W, sect. 22, on property of Mr. Reese, 4 miles southeast of Bunker, Reynolds Co., Missouri, July 7, 1951, *Julian A. Steyermark 72011*, type, in Herb. Chi. Nat. Hist. Mus., isotypes in Gray Herbarium and Missouri Botanical Garden Herbarium.

In typical *R. setigera* the petals are roseate, fading to whitish, and the flowers are 4–8 cm. broad. In the forma *alba*, the petals are white from the first and half to two-thirds as long.

Rosa multiflora Thunb. This rose, which has been extensively planted as a living fence in many portions of Missouri and elsewhere, was found as a well-established escape in extreme northern Missouri, where it occurred along with the native vegetation in roadside thickets west of Devil's Horn, T 66 N, R 32 W, sect. 7, 3 miles northeast of Sheridan, Worth Co., May 31, 1948, *Steyermark 65608*.

Prunus virginiana L., forma deamii G. N. Jones. Not previously reported for Missouri, but now represented by *Steyermark 68962a*, northeast-facing wooded bluffs along Des Moines River northwest to

Coal Bank Hollow, T 66 N, R 7 W, sect. 24, 2–3 miles southeast of Dumas, Clark Co., August 13, 1949.

Other collections, such as *Steyermark 68075* from Sullivan Co., and *Steyermark 67548* from Platte Co., have the leaves pubescent beneath as described in f. *Deamii*, but the rachis glabrous as in typical *P. virginiana*. This intermediate condition has been noted in numerous other Missouri collections, a situation which makes it difficult to refer them definitely to one taxon or the other.

TRIFOLIUM PRATENSE L., forma LEUCOCHRACEUM Aschers. & Prantl. A collection with white corollas, which may be referred to this form, was collected in southwestern Missouri by the writer. It is *Steyermark 68576*, Caney Mountain Refuge, along Caney Creek, T 23 N, R 13 W, sect. 8, 5½ miles north of Gainesville, Ozark Co., July 23, 1949.

ROBINIA HISPIDA L. On a trip taken with Dr. L. J. Gier, six well-established shrubs belonging to this species and escaped from cultivation were found. It has not previously been recorded for the state. The collection is *Steyermark 67530*, on upper edge of wooded slopes, just west of old Union Mill distillery, along Platte River, T 54 N, R 33 W, sect. 6, 1–1¾ miles northwest and west-northwest of Edgerton, Platte Co., May 15, 1949.

LESPEDEZA THUNBERGII (DC.) Nakai. Often planted and sometimes escaping from cultivation, this showy species was found by the writer as a ruderal in open places in valley of Massa's Creek, T 47 N, R 4 W, sect. 25, 3 miles south of Jonesburg, Warren Co., September 30, 1951, *Steyermark 73020*.

POLYGALA SANGUINEA L., forma ALBIFLORA (Wheelock) Millsp. The collection which may be referred to this form was found on an upland dry rolling prairie, along highway C on south side of road just east of junction with highway 81, T 66 N, R 8 W, sect. 24, 3 miles northwest of Revere, Clark Co., August 14, 1949, *Steyermark 68976*. It has the bracts white with a greenish keel, the sepals whitish with greenish midrib and a suffusion of green along the middle, and the petals similar except for yellow tips. It is somewhat intermediate between the forma *albiflora*, in which the flowers are predominantly whitish, and forma *virescens* (L.) Farw., in which the flowers are predominantly greenish. However, since the flowers in the present collection have white rather than greenish color predominating, it is assigned to f. *albiflora*.

ACALYPHA GRACILENS Gray. The typical variety has not been previously recorded for Missouri. It is represented by the following two collections: *Shirley Sparling 553*, poorly drained alluvial meadow, T 58 N, R 24 W, sect. 10, 5 miles northwest of Chillicothe, Livingston Co., September 5, 1950; and *Steyermark 66676*, upper slopes of south-facing side, ravines following tributary of East Fork of Crooked River, T 53 N, R 27 W, sect. 10 and 11, 1–1¼ miles north of Millville, Ray Co., October 9, 1948.

EUPHORBIA ESULA L. This species, previously unreported for the state, was found in northern Missouri in a pasture, where it formed a large patch. The collection is *Steyermark 68051*, upland pasture along west side of route 11, T 56 N, R 20 W, sect. 25, 2½ miles southwest of Rothville, Chariton Co., May 21, 1949.

HYPERICUM CANADENSE L. This northern species can now be added to the flora of the state. It is based upon *Steyermark 70133*, open slopes along draw, Bookout Branch and ravines tributary to Spring Creek, T 64 N, R 18 W, SW ¼ sect. 21 and NE ½ sect. 28, 4½ miles northeast of Green City, Sullivan Co., August 25, 1950. This collection from northeastern Missouri represents a new southwestern distributional limit for the species, previously known only as far southwest as Iowa and Illinois.

VIOLA TRILOBA f. **albida** Steyermark, f. nov., a typo differt petalis omnibus albidis.—Cherty draw in upland along route 13, ½ mile northeast of Lampe, Stone Co., Missouri, April 29, 1949, *Julian A. Steyermark 67440*, TYPE, in Herb. Chi. Nat. Hist. Mus. This form differs in having all the petals white.

OENOTHERA PERENNIS L. This species was reported for Missouri by Munz (Bull. Torr. Bot. Club **64:** 304. 1937) on the basis of a cultivated specimen collected in St. Louis by Dr. Earl E. Sherff. Unfortunately, the great majority of Sherff's specimens labelled "St. Louis" were (according to personal communication with Dr. Sherff) collected either from cultivated plants found on the grounds of the Missouri Botanical Garden or in other parts of St. Louis. These specimens, represented by duplicates in several herbaria, have been misconstrued by other workers to represent collections of wild or spontaneous plants, which is certainly far from the real situation. Sherff's collection (no. 194) from St. Louis, cited by Munz from a Gray Herbarium specimen, was obtained, according to an examination of Dr. Sherff's notebook, on July 2, 1910, and undoubtedly was collected from cultivated plants at the same time with such other cultigens as *Hydrangea quercifolia*, *Sedum acre*, *Heuchera sanguinea*, and *Tolmiaea Menziesii*. The present writer found this species growing wild in a remote portion of the central Ozarks as a natural component of the herbaceous vegetation, and this represents the first wild record for its occurrence in the state. The collection was made on an upland flat, wet woods bordering sink-hole pond, T 32 N, R 4 W, sect. 30, ¾ mile south of Turtle P. O., Dent Co., June 25, 1951, *Steyermark 71808*.

CORNUS FLORIDA L., forma RUBRA (Weston) Palmer & Steyerm. In correspondence with Mr. E. J. Palmer during 1951 with reference to the station which he originally discovered of the pink-flowered dogwood in Missouri, he writes, "I found the tree along a rocky bluff of a stream near 'Moss Spring' about four miles northwest of Webb City on the Carl Junction road. It was a medium-sized tree, about 16 or 20 feet tall . . . I looked for it again a few years ago and failed to find it. So, I fear it has been destroyed. It is the only time I have found it in Missouri."

The writer located a second wild station for this form in the White River section of the southwestern Ozarks. The collection came from along shallow draw in limestone upland, 0.2 mile south of Cedar Creek P. O., T 22 N, R 19 W, sect. 24, just west of road, Taney Co., April 26, 1949, *Steyermark 67343*. A single tree was found there associated with the ordinary-colored type. At the time of this visit the bracts were found to have a rich, deep pink or rose color nearly throughout or only in the upper half, but during a visit on May 5, 1951 the color was noted to be less intense, perhaps because the flower was aging or becoming faded at a somewhat later stage of anthesis. During the latter part of October, 1951, accompanied by Mr. Albert E. Vatter, Jr., I revisited the same locality and observed that the winter flower bud scales of the tree referred to forma *rubra* were of a dull, purplish-rose color, contrasting with the greenish-brown or dull gray-brownish color of ordinary flowering dogwood. During the spring of 1951, Mr. Bill Bauer sent a specimen with rose-colored bracts representing the same color form. It came from a natural stand of dogwood on his wooded property near the Meramec River near Kimmswick in St. Louis County. Thus, there are now known at least two wild stations for this color form.

Lysimachia quadriflora Sims, forma **albescens** Steyermark, f. nov. a typo recedit corolla albida vel lactescens.—Swampy meadow along route 60 along spring branch tributary to right fork of Carter Creek, T 27 N, R 1 E, west part of sect. 2, 6.7 miles northeast of Van Buren, Carter Co., Missouri, July 4, 1949, *Julian A. Steyermark 68397*, type in Herb. Chi. Nat. Hist. Mus. This differs from typical *L. quadriflora* in having a whitish or cream-colored corolla from early through late anthesis.

Convolvulus sepium L., forma malachophyllus Fern. A Missouri collection that should be referred to this form came from a cleared area along r. r., T 58 N, R 23 W, sect. 8, northeast of Chillicothe, Livingston Co., June 11, 1951, *Shirley Sparling 916*. The specimen is deposited in the herbarium of Iowa State College.

Convolvulus sepium L., forma coloratus Lange. Miss Sparling's collection no. 1314 from Livingston Co., Missouri, is representative of this pink-colored form, which had not been recorded previously from the state.

Cuscuta campestris Yuncker. This species, not previously recorded from Missouri, is represented from the state by a collection made in a Lespedeza field, T 58 N, R 24 W, sect. 11, northwest of Chillicothe, Livingston Co., August 18, 1951, *Sparling 1329*, deposited in the herbarium of Iowa State College.

Hydrophyllum appendiculatum Michx., f. **album** Steyermark, f. nov., a typo recedit corolla alba.—Rich, north-facing slopes bordering wooded valleys, Knobnoster State Park, 3–5 miles southwest of Knobnoster, Johnson Co., Missouri, May 19, 1949, *Julian A. Steyermark 67915*, type, in Herb. Chi. Nat. Hist. Mus. This differs from typical *H. appendiculatum* in having completely white corollas.

Scutellaria nervosa Pursh, f. **alba** Steyermark, f. nov., a typo recedit corolla alba.—Bottom woods along Yellow Creek, T 56 N, R 19 W, sect. 20 and 17, at and just north of Rothville, Chariton Co., Missouri, May 21, 1949, *Julian A. Steyermark 68024*, type, in Herb. Chi. Nat. Hist. Mus. In typical *S. nervosa* and varieties the corolla is pale bluish. In the form described it is white.

Prunella vulgaris L., var. lanceolata (Bart.) Fern., forma candida Fern. This form, with the corolla completely white, may be added to the Missouri flora on the basis of the following collection: *Steyermark 71782*, upland north of Elk Hollow, T 34 N, R 7 W, west part of sect. 1, 4½ miles southeast of Anutt, Dent Co., June 25, 1951.

Physostegia angustifolia Fern. A Missouri collection of this species is *Steyermark 69121*, upland limestone prairie, T 23 N, R 8 W, north part of sect. 3, 8 miles south of West Plains, Howell Co., September 4, 1949.

Gratiola viscidula Pennell. This species (including *G. viscidula Shortii*) has hitherto been found in the eastern states of the Piedmont region and Coastal Plain from Delaware and Maryland south to South Carolina and Georgia westward in the interior low plateau and southern Appalachians to southern Ohio, eastern Tennessee, and northwestern Alabama. The Missouri collection was discovered around the margins of a remote sink-hole pond in the southeastern Ozark region. It, like other remarkable examples of isolation of coastal plain and Piedmont species in the Ozarks, represents a new northwestern limit for the species, separated in the present instance by approximately 475 miles airline. Other instances of similar disrupted distributions of primarily coastal plain, Piedmont or eastern species, isolated on the Ozark Plateau are illustrated by *Scirpus etuberculatus* and *Eleocharis equisetoides*. In addition, many species whose distribution is limited to the coastal plain and Mississippi Embayment area, such as *Hottonia inflata* and *Nyssa aquatica*, are known in Missouri, outside their stations in the swampy sections of the southeastern lowlands in the state, only from certain sink-hole ponds of the Ozarks. The collection is *Steyermark 72109*, upland sink-hole pond, Gilmore Pond (known also as Grassy Pond), T 27 N, R 6 W, sect. 34, between Jack's Fork of Current River and Flat Rock Hollow, 6½ miles northwest of Montier, Shannon Co., July 8, 1951. The species was common all along the margin of the pond, and most of the plants were partly submerged at their base.

Pedicularis canadensis L., forma **albescens** Steyermark, f. nov., a typo recedit corolla plerumque albida.—Low, mossy slopes along creek, cherty shallow ravine along route 5, 2½ miles south of Mansfield, Wright Co., Missouri, May 1, 1949, *Julian A. Steyermark 67499*, type, in Herb. Chi. Nat. Hist. Mus. The color variations of this species and its forms (f. *bicolor*, f. *flava*, and f. *praeclara*) range from yellow, yellow and cream-colored, and yellow with purple or crimson, to crimson. The present form differs from all of these in having the corolla mostly white throughout.

Ruellia strepens L., forma **alba** Steyermark, f. nov., a typo recedit corolla alba.—At base of slopes of rich, wooded ravines tributary to Chariton River, T 66 N, R 16 W, south part of sect. 22, northeast of Livonia, 6 miles southwest of Glenwood, Schuyler Co., Missouri, August 26, 1950, *Julian A. Steyermark 70292*, type in Herb. Chi. Nat. Hist. Mus. This form with the corolla white was found growing with typical large-flowered *R. strepens* (*Steyermark 70286*) which had a lavender to blue-violet corolla, and with the small-flowered *R. strepens*, f. *cleistantha* (Gray) S. McCoy, also possessing a lavender corolla.

Lonicera morrowi Gray. This cultivated species has not been previously recorded as an established escape in Missouri. It has recently been collected by Miss Shirley Sparling. Her collections, deposited in the herbarium of Iowa State College, are *Sparling 782* (in flower) and *Sparling 1104* (in fruit), roadside, T 58 N, R 24 W, sect. 21, Chillicothe, Livingston Co., May 13, 1951. The filaments of Miss Sparling's collection no. 782 are pubescent, in this respect only differing from otherwise typical *L. Morrowi.*

Campanula aparinoides Pursh. It was previously noted in this report that *Carex trichocarpa* and *Filipendula rubra*, newly discovered for Missouri in calcareous, swampy meadows of the southeastern Ozarks, represented species of northern and eastern affinities at their southwestern southern limit of distribution. *Campanula aparinoides* is another example of the same phenomenon. Separated by hundreds of miles from the nearest previously known stations in the adjacent states of Illinois, Iowa, and Nebraska, the Missouri collection was found in a swampy meadow associated with *Liparis Loeselii* and other species of northern or eastern affinities. The Missouri collections are: *Steyermark 69320*, swampy meadow along Big Creek, T 31 N, R 3 W, NW ¼ sect. 8, 2¼ miles south of Melton, 4¼ miles southeast of Bunker, Shannon Co., September 25, 1949, and same locality, *Steyermark 68382*, July 3, 1949.

Lobelia siphilitica L. × L. cardinalis L. A natural hybrid between these two species was found by Mrs. Cora Steyermark along Little North Fork of White River between Burse Ford and Nave Ford, on east side of river, T 21 N, R 15 W, sect. 9, 1 mile southwest of Pontiac, Ozark Co., September 26, 1949. The plant occurred here with both parent species. The corolla was of a deep rose-lavender, with a shape like that of *L. cardinalis*, but the leaves and pubescence of the calyx resembled the type found in *L. siphilitica*. Since this area was to be inundated by one hundred feet of water when the Bull Shoals dam became a reality, an attempt was made to rescue the plant by removing it from the locality. Unfortunately, it did not survive the winter of northern Illinois but a pressed herbarium specimen of the upper part of the plant is preserved.

Cosmos sulphureus Cav. This garden annual has not previously been found as a ruderal in Missouri. In company with Dr. Robert Thorne, it was recently collected on shaded upland along route 76, sect. 23, 1½ miles southwest of Ava, Douglas Co., September 1, 1951, *Steyermark 72534*.

Lactuca hirsuta Muhl., var. sanguinea (Bigel.) Fern. *Lactuca hirsuta* Muhl. was cited by Palmer and Steyermark in their Annotated Catalogue of Flowering Plants of Missouri (p. 681) as occurring in Jasper County. Fernald (Rhodora **40:** 477–481. 1938) has shown that typical *L. hirsuta* is a rare and local species ranging from Pennsylvania to Virginia and Louisiana. The Jasper Co. collection may possibly be referred to another species. Several collections of var. *sanguinea* have, however, recently been made in various parts of the southern Ozark region. They are: *Steyermark 71733*, around margin of Brushy Pond (sink-hole pond), on east side of route 19, T 25 N, R 4 W, south part of sect. 1, 3½ miles west of New Liberty P. O., Oregon Co., June 26, 1951; and *Steyermark 72012* from Dent. Co., July 7, 1951.

Tragopogon major Jacq. This species, previously unreported from Missouri, has been recently added to the flora of the state. It is represented by two collections: *Steyermark, Swink, & Rouffa 71731*, open places along route 66, east of Eureka and east of Meramec River bridge, St. Louis Co., June 15, 1951; and *Shirley Sparling 963*, cindered area along r. r., T 58 N, R 23 W, sect. 5, northeast of Chillicothe, Livingston Co., June 24, 1951.—Chicago Natural History Museum and Missouri Botanical Garden.

Cardamine digitata Richardson (Cruciferae).—Two substitute names have been proposed for this species of Alaska and Yukon Territory for no valid reason. O. E. Schulz (Bot. Jahrb. **32:** 372. 1903) transferred *Dentaria digitata* Lam. (Encycl. Meth. **2:** 268. 1786) to *Cardamine* and then proceeded to coin the name *C. hyperborea* (op. cit., p. 550) to replace *C. digitata* of Richardson (Franklin, Journey to the Shores of the Polar Sea. Botanical Appendix, p. 743. 1823). Schulz stated that "*C. digitata* (Lam. 1786)" had priority over Richardson's name. However, the specific name *digitata* was not used in *Cardamine* by Lamarck. The use of this name in *Cardamine* by Richardson for an entirely different species than that of Lamarck predates Schulz's transfer of Lamarck's name by eighty years. More recently Hultén (Flora of Alaska and Yukon, Lunds. Univ. Årssk. **41:** 838. 1945) proposed the name *Cardamine Richardsonii*[1] to replace *C. digitata* Richardson, saying that "*C. hyperborea* Schulz cannot be used for it either, as it does not at all agree with the description of that plant." Since *C. hyperborea* Schulz was a direct substitution for *C. digitata* Richardson, it rests on the same type and whether the description Schulz gave fits or not is not significant in so far as name priority is concerned. If there were any reason to reject *C. digitata* Richardson, then *C. hyperborea* Schulz, being the first substitute name, would be valid. However, *C. digitata* Richardson has priority and is valid. *C. hyperborea* Schulz and *C. Richardsonii* Hultén are both superfluous names for the same species.—R. C. Rollins.

[1] Properly rejected by Porsild, Bull. Nat. Mus. Canada **121:** 190. 1951. Also cf. Porsild, Sargentia **4:** 41. 1943.

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CLADONIA ECMOCYNA IN NORTH AMERICA[1]

ALEXANDER W. EVANS

DURING the summer of 1951 important collections of lichens were made by Dr. I. Mackenzie Lamb in Alberta and British Columbia. In these collections the *Cladoniae* are well represented, and one of the most striking species among them is the controversial *C. ecmocyna* (Ach.) Nyl. Since this species has been confused with *C. gracilis* (L.) Willd., the writer has re-examined and subjected to microchemical tests a series of North American specimens in the Yale Herbarium which had been referred to *C. gracilis*. It soon became apparent that a number of these specimens, particularly among those from Alaska and the Rocky Mountain region, represented *C. ecmocyna*, rather than *C. gracilis*, and that the geographical range of *C. ecmocyna* in North America was more extensive than had been supposed. The specimens in question (with the exception of those from Greenland and the Aleutian Islands) are listed in the present report, following a history of the species and a discussion of its characteristic features.

CLADONIA ECMOCYNA (Ach.) Nyl. Notis. Sällsk. F. et Fl. Fennica Förhandl. **8:** 176. 1866. *Cenomyce ecmocyna* Ach. in part, Lich. Univ. 549. 1810. *Cladonia gracilis* η. *elongata* *f. *ecmocyna* Vainio, Acta Soc. F. et Fl. Fennica **10:** 469. 1894. *C. gracilis* var. *elongata* m. *ecmocyna* Vainio, *Ibid.* **14:** 251. 1897. **C. elongata* f. *ecmocyna* Vainio, *Ibid.* **53:** 93. 1922. *C. gracilis* var. *ecmocyna* Vainio in Zahlbruckner, Cat. Lich. Univ. **4:** 547. 1927.

The history of *Cladonia ecmocyna* is much involved, and the claims of the species for recognition have been repeatedly questioned. Nylander, in his original account (1866, p. 176), merely

[1] Contribution from the Osborn Botanical Laboratory.

stated that "*Cl. ecmocyna* (Ach. pr. p.)" should be separated from *C. gracilis* because treatment with KOH stained the podetial cortex yellow. Although he cited no synonyms he obviously based his species on some component of *Cenomyce ecmocyna* Ach., as indicated in the above synonymy. In fact he soon assigned the combination *Cladonia ecmocyna* to Acharius (1867, p. LV) and listed under it a var. *macroceras* Ach., in spite of the fact that Acharius had not accepted *Cladonia* as a generic name in his publications. The original *Cenomyce ecmocyna* was defined in a broad sense and included a number of elements in addition to the species now known as *Cladonia gracilis* (L.) Willd. Lichenologists, however, have associated Nylander's species definitely with *C. gracilis*, either as a closely related species or as a synonym of one of its varieties.

According to Th. Fries, who was one of the first to comment on *Cladonia ecmocyna* (1871, p. 82), many specimens of *C. gracilis* are negative with KOH, but some specimens of *C. gracilis* "var. *macroceras*" (particularly in material from alpine or arctic localities) are stained more or less definitely yellow by this reagent; and he pointed out that such specimens had been distinguished as *C. ecmocyna* by Nylander. At the same time Fries implied that there were no sharp distinctions between KOH− and KOH+ specimens and that *C. ecmocyna*, therefore, was based on an inconstant character. Vainio, in 1880, reached similar conclusions (see 1894, p. 125) and stated that the younger parts of the podetia in *C. gracilis* were commonly stained yellow by KOH. Under *C. gracilis* η. *elongata*, however, he listed a f. *ecmocyna* (Nyl.) Vainio, as noted in the synonymy, without giving a description of this form. He supplied this three years later (1897, p. 251), when he characterized "var. *elongata* m. *ecmocyna* (Ach.)" as having glaucescent podetia, making no allusion to any color-change induced by KOH.

In 1908 Zopf reported on the lichen-substances produced by various species and varieties of *Cladonia* subgenus *Cenomyce* (Ach.) Th. Fr., using *Cenomyce* Ach. as a generic name. The results obtained by his chemical analyses of *Cenomyce gracilis* var. *chordalis* (Floerke) Schaer. and *C. gracilis* var. *elongata* (Jacq.) Vainio (under which he listed *Cenomyce ecmocyna* γ. *macroceras* Ach. as a synonym) are of special interest in their bearing on Nylander's *Cladonia ecmocyna.* According to Zopf's account the material of var. *chordalis,* which Sandstede had collected in Oldenburg, was stained more or less definitely yellow by KOH and yet contained no atronorine, the substance usually responsible for this color-change. He therefore attributed the reaction to the presence of fumarprotocetraric acid. The material of var. *elongata,* on the other hand, which he had personally collected in the mountains of Tirol at elevations of 1300 m. or above, although similarly stained yellow by KOH, contained both atronorine and fumarprotocetraric acid. Zopf had thus demonstrated, as he supposed, a chemical distinction between var. *chordalis* and var. *elongata,* although he found no definite differences in the color-changes induced by KOH.

Scriba, a few years later (1913, p. 176), disagreed with both Vainio and Zopf in regard to these color-changes and maintained that there was a difference between the distinct yellow color appearing at once in *Cladonia ecmocyna* and the brown color (as he described it) appearing gradually in *C. gracilis.* He noted further that central proliferations of the podetia were not infrequent in *C. ecmocyna,* but exceedingly rare in *C. gracilis.* On the basis of these distinctions he expressed the opinion that *C. ecmocyna* might be recognized as a valid species, except for the fact that it could not always be distinguished from *C. gracilescens* Vainio (now commonly known as *C. lepidota* Nyl.). He therefore included *C. ecmocyna* under *C. gracilescens* as a synonym and listed a specimen from Korea under the latter name. According to Scriba's account the podetia in his European material of *C. ecmocyna* either bore cups or agreed morphologically with cupless forms of *C. gracilis* var. *chordalis.* He was less definite about his North American material, although he compared a specimen from Labrador with *C. gracilis* var. *dilatata* and implied that specimens from British Columbia, Montana, and Washington were similar.

Scriba made no allusion to Zopf's chemical studies, but Vainio was strongly influenced by them. In 1922 he stated definitely that *C. gracilis* var. *chordalis* contained fumarprotocetraric acid only (p. 91), but that **C. elongata* (which he raised to subspecific rank under *C. gracilis*) contained both fumarprotocetraric acid and atronorine (p. 93). He described the color-change induced by KOH in var. *chordalis* as "luteo (demum obscuriore)" and that induced in **C. elongata* as "dilute flavescentia aut lutescentia," but the difference indicated by these phrases is less than the difference described by Scriba between *C. gracilis* and *C. ecmocyna.* As indicated in the synonymy Vainio listed a f. *ecmocyna* under **C. elongata* and still characterized it only by its glaucescent podetia.

Meanwhile Sandstede, in 1912 (p. 381), also influenced by Zopf's report, had raised *C. gracilis* var. *elongata* to specific rank, with *C. ecmocyna* as a synonym, and had listed atronorine and fumarprotocetraric acid as the characteristic lichen-substances of the species. Ten years later, however (1922, p. 207), he recognized *C. ecmocyna* as a distinct species, characterized by the same lichen-substances, and reduced *C. elongata* to varietal rank under *C. gracilis.* He thus implied that the true *C. gracilis* var. *elongata* contained no atronorine and that the so-called material of *Cenomyce gracilis* var. *elongata,* analyzed by Zopf, represented *C. ecmocyna* instead.

In 1928 Anders listed both *C. elongata* and *C. ecmocyna* as valid species, restricting their range in Central Europe to high altitudes. At the same time he emphasized the marked similarity of these species to each other. According to his statements the podetia of *C. elongata* are stained yellow by KOH in the younger parts, but remain unchanged in the older parts, whereas those of *C. ecmocyna* are stained intensely yellow throughout. Anders called attention also to the frequency of central proliferations in *C. ecmocyna* and added that the podetia were grayish green and lighter in color than those of *C. elongata.*

Sandstede, in 1931 (p. 364), again recognized *C. ecmocyna* but in 1938 (p. 66) threw doubts on its validity. After stating that Zopf's analysis of "var. *elongata*" had presumably been based on material of *C. ecmocyna,* he suggested that typical specimens of var. *elongata* should be tested for atronorine. Then, if these tests should yield positive results, the chemical distinction between *C. gracilis* and *C. ecmocyna* would break down, and the latter would have to be reduced to synonymy.

The tests suggested by Sandstede were soon made by Asahina, who reported upon them in 1943. They were based on eleven European specimens distributed by Sandstede in his *Cladoniae* exsiccatae under the name *C. gracilis* var. *elongata.* In eight of these specimens Asahina obtained negative results but was able to demonstrate the presence of atronorine in three, Nos. 714, 1132, and 1133, which he transferred to *C. ecmocyna.* He obtained positive results also with Nos. 600, 954, 1255 and 1281 of Sandstede's exsiccatae, which had been distributed under the name *C. ecmocyna.* He thus proved definitely that there was a chemical distinction between the true *C. gracilis* var. *elongata* and *C. ecmocyna* and that Zopf had based his analysis of "var. *elongata*" on material of the latter species. It is to be recommended, therefore, in distinguishing *C. ecmocyna,* that emphasis should be laid on the presence of atronorine, rather than on the more or less variable color-changes induced by KOH. It may be added that six of the specimens of *C. ecmocyna* distributed by Sandstede came from Sweden and the seventh from a high altitude in Switzerland.

Most writers on North American lichens have ignored *C. ecmocyna,* except perhaps in synonymy, but Dahl, in a report on the macrolichens of South West Greenland (1950, p. 97), accepts the species without question and characterizes it, not only by the presence of atronorine, but also by its coarse podetia, with a smoother cortex than in *C. gracilis.* According to his account *C. gracilis* is represented in Greenland by var. *chordalis* only, and all the specimens from the island, which have been determined as var. *elongata,* should be referred to *C. ecmocyna* instead. He reports the species also from Central Europe, Scandinavia, Spitzbergen, Novaya Zemlya, Kamchatka, "America," and Patagonia, on the basis of specimens which he has personally examined. Dahl emphasizes the fact that in Greenland *C. gracilis* var. *chordalis* grows on rockfalls and lichen-heaths, but that *C. ecmocyna* prefers snow fields and bogs. The two species thus differ ecologically, at least in Greenland.

Aside from the presence of atronorine in *C. ecmocyna* there is really little to distinguish the species from *C. gracilis,* and the few slight differences noted in the literature are based on inconstant characters. The differences in the dimensions and color of the podetia, for example, and in the appearance of the podetial surface are caused largely by external factors and are therefore of little significance. The occurrence of central proliferations, also, although emphasized by both Scriba and Anders, is much less frequent than they imply, and most specimens of *C. ecmocyna* lack such proliferations altogether. Even the range of variability in the two species is much the same, since some specimens of *C. ecmocyna* agree morphologically with *C. gracilis* var. *elongata*, others with *C. gracilis* var. *chordalis*, and still others with *C. gracilis* var. *dilatata*. The varieties of *C. gracilis* in their more typical development are clearly marked and amply distinct from one another; and yet some specimens of the species are less definite in their morphology and represent more or less intermediate forms. Similar, more or less indefinite, forms occur also in *C. ecmocyna*. On the whole the relation of *C. ecmocyna* to *C. gracilis* is much the same as that of *C. cryptochlorophaea* Asahina and *C. Grayi* Merrill to *C. chlorophaea* (Floerke) Spreng.

The geographical range of *C. ecmocyna* in North America, although duplicating that of *C. gracilis* to a certain extent, is more definitely northern and alpine, just as it is in Europe. In New England, for example, the only known station for *C. ecmocyna* is the summit of Mt. Katahdin in Maine, whereas specimens of *C. gracilis* have been collected from as far south as Connecticut.

The recognition of subordinate categories under *C. ecmocyna* was initiated by Nylander when he listed *C. ecmocyna* var. *macroceras* Ach. (1867, p. LV). Vainio, in 1894, referred this variety definitely to *C. gracilis* η. *elongata* as a synonym (p. 116), and it seems justifiable to retain the varietal name "*macroceras*" for specimens of *C. ecmocyna* which exhibit the morphological features of *C. gracilis* var. *elongata*.

In addition to var. *macroceras* Nylander recognized three forms of *C. ecmocyna:* f. *nigripes* and f. *contorquescens* in 1873 (see Norrlin, p. 319) and f. *gracilescens* in 1876 (see Norrlin, p. 13). According to Vainio (1894, p. 109) the original specimens of f. *nigripes* and f. *gracilescens* are referable to *C. gracilis* γ. *chordalis*, and the writer suggests retaining "*nigripes*" as a varietal name for specimens of *C. ecmocyna* with the morphological features of *C. gracilis* var. *chordalis*, since this name antedates the name "*gracilescens*" by three years. Nylander's specimens of f. *contorquescens*, according to Vainio (1894, p. 126), represent a somewhat aberrant form of *C. gracilis* η. *elongata*.

Apparently the only additional form which has been assigned in the literature to *C. ecmocyna* as a species is f. *foveata* E. Dahl, which was proposed as new in 1950 (p. 99). This form was based on specimens collected by the author at Ivigtut, Greenland, and is known only from the type-locality. Zahlbruckner, however, in the fourth volume of his catalogue (1927, p. 548), listed the following forms under *C. gracilis* var. *ecmocyna:* f. *nigriceps* (Nyl.) Zahlbr., f. *rostrata* (Ach.) Zahlbr., and f. *subdilacerata* Vainio. The first is obviously a misprint for f. "*nigripes.*" The second, under which "*C. gracilis* f. *rostrata* Ach." is cited as a synonym, is presumably based on *Cenomyce ecmocyna β. rostrata* Ach. (1810, p. 550), at least in part. Vainio interpreted this as a synonym of *C. gracilis η. elongata*, and it therefore seems safe to include Zahlbruckner's f. *rostrata* under *C. ecmocyna* var. *macroceras.*

The third form was originally described by Vainio under the name *C. gracilis* *f. *subdilacerata* (1894, p. 95) and was later cited by him as *C. gracilis* var. *elongata* f. *subdilacerata* (1897, p. 251). Both Merrill (1924, p. 25) and Sandstede (1931, p. 363), who recognized f. *subdilacerata*, included it without question under *C. gracilis* var. *elongata*, and Anders (1928, p. 99) was equally definite in including it under *C. elongata.* Under the circumstances it is perhaps wisest to leave it in this position.

The varieties *macroceras* and *nigripes* will provide for specimens of *C. ecmocyna* having the morphological features of *C. gracilis* var. *elongata* or of *C. gracilis* var. *chordalis.* Specimens with the features of var. *dilatata*, however, are still without a name. For such specimens the writer recommends the name "*intermedia*," derived from *C. elongata* f. *intermedia* Robbins (1931, p. 137). This form was based on specimens from Wyoming, and Dr. Blake, the collector, has kindly supplied a portion of the type-material. Although Robbins associated f. *intermedia* with *C. elongata*, the podetia form cups essentially like those of *C. gracilis* var. *dilatata*, and microchemical tests reveal the presence of atronorine.

Cladonia ecmocyna var. macroceras (Floerke) Ach. in Nylander, Middendorff's Reise in Siberien **4:** LV. 1867. *Capitularia gracilis γ. Capitularia macroceras* Floerke, in part, Weber and Mohr's Beiträge zur Naturk. **2:** 330. 1810. *Cenomyce ecmocyna β. C. rostrata* Ach., in part, Lich. Univ. 550. 1810. *Cenomyce ecmocyna γ. C. macroceras* Ach., in part, Syn. Lich. 263. 1814. *Cladonia ecmocyna* f. *contorquescens* Nyl. in Norrlin, Notis. Sällsk. F. et Fl. Fennica Förhandl. **13:** 319. 1873. *C. gracilis* var. *ecmocyna* f. *rostrata* Zahlbr. Cat. Lich. Univ. **4:** 548. 1927.

Alaska: Etchepuk River, *Palmer*, 1923, No. 506, listed by Merrill (Bryologist **32:** 47. 1929), as *C. gracilis elongata.* **Quebec:** Frazier Island, Hudson Bay, *Gardner*, 1939, Nos. 93, 102, 103, and 105, listed by Gardner (Mém. Soc. Bot. France 1949: 93. 1950), as *C. gracilis* var. *elongata;* island at mouth of Kikkerteluk River, *Taylor*, 1944, No. 323; Mont Blanc, Matane Co., *Lepage*, 1942, No. 3510, listed by Lepage (Natur. Canadien **75:** 183. 1949); ten miles northeast of Cape Jones, *Lepage and Dutilly*, 1944, No. 6768. **Ontario:** twenty miles north of Lake River, James Bay, *Smith*, 1944, No. 67. **Manitoba:** Fort Churchill, *Gilett*, 1948, No. 1615. **Northwest Territories:** Leonard Island, Hobewan Sound, *Taylor*, 1944, Nos. 123, 317a, and 320. **Alberta:** Sulphur Mountain, near Banff, *Lamb*, 1951, No. 6195; Johnson Canyon, near Banff, *Lamb*, 1951, Nos. 6200 and 6206; Corral Creek, north of Lake Louise, *Lamb*, 1951, No. 6311; Redoubt Mountain, near Lake Louise, *Lamb*, 1951, No. 6314; Egypt Lake, *Lamb*, 1951, No. 6502. These stations are all in the Banff National Park. **British Columbia:** Yoho National Park, *Lamb*, 1951, No. 6373. **Maine:** summit of Mt. Katahdin, *Allard*, 1938, Nos. 5202 and 5204. **Colorado:** north slope of Twin Sisters Mountain, *Kiener*, 1930, Nos. 606, 607, and 619; vicinity of the University of Colorado camp, near Nederland, Boulder Co., *Miss Fulford*, 1936, No. 1024; near the Rocky Mountain Biological Station, Gothic, *Miss Fulford*, 1936, No. 1048; near Lake City, Hinsdale Co., *Darrow*, 1937, No. 1352; Long Lake, South St. Vrain, *Kiener*, 1937, No. 5241; Sandbeach Lake, Boulder Co., *Kiener*, 1937, Nos. 5603 and 9602; west slope, Trail Ridge, *Kiener*, 1938, No. 7153; Longs Peak, Larimer Co., *Kiener*, 1939, Nos. 8143, 8173, 9130, and 9237; Glacier Gorge, Larimer Co., *Kiener*, 1939, Nos. 9266, 9269, 9270, 9271, and 9273; Willow Creek Road, north of Granby, Grand Co., *Darrow*, 1947, Nos. 4106 and 4118. Most, if not all, of these stations are at high altitudes, 9,000–11,800 ft. **Wyoming:** Yellowstone National Park, *Blake*, 1927, five specimens without numbers, listed by Robbins (RHODORA **33:** 137. 1931), as *C. elongata* f. *laontera;* Medicine Bow, Carbon Co., *Manning*, 1935, No. 106; Yellowstone National Park, *Kiener*, 1936, Nos. 5943 and 5944. **Oregon:** near Clear Lake, Willamette Forest, *Sipe*, 1938 and 1939, Nos. 1037, 1045, and 1047; near Fish Lake, *Sipe*, 1939, No. 1028.

The specimens assigned to var. *macroceras* exhibit a considerable range of variability. In some cases the podetia, which are cupless or with narrow cups, are free from squamules or nearly so and agree in their morphological features with esquamulose specimens of *C. gracilis* var. *elongata*, such as those figured by Anders (1928, pl. 14, f. 1–3) under the name *C. elongata* var. *esquamosa.* In other cases the podetia are more or less squamulose, and this condition is found in much of the material from the

Rocky Mountains. Podetia of this type bear a striking resemblance to the podetia of *C. gracilis* var. *elongata* f. *laontera* (Del.) Arn., figured by Anders (1928, pl. 14, f. 5) under the name *C. elongata* var. *squamosa* f. *laontera*. In the more robust specimens of var. *macroceras* from North America the podetia are 2–3 mm. in diameter and attain a height of 6–8 cm.

Cladonia ecmocyna var. **nigripes** (Nyl.) comb. nov. *C. ecmocyna* f. *nigripes* Nyl. in Norrlin, Notis. Sällsk. F. et Fl. Fennica Förhandl. **13:** 319. 1873. *C. ecmocyna* f. *gracilescens* Nyl. in Norrlin, Medd. Soc. F. et Fl. Fennica **1:** 13. 1876. *C. gracilis* var. *ecmocyna* f. *nigripes* ("*nigriceps*") Zahlb. Cat. Lich. Univ. **4:** 548. 1927.

Alaska: Etchepuk River, *Palmer*, 1923, No. 494, listed by Merrill (Bryologist **32:** 47. 1929), as *C. gracilis chordalis;* Peace River, *Palmer*, 1923, No. 623, listed by Merrill (l. c.), as *C. gracilis chordalis;* upper Buckland River, *Palmer*, 1924, No. 933; First Chance Creek, *Palmer*, 1924, No. 941; Cantwell, *Palmer*, 1926, No. 1454; between Palmer and Willow, *Dutilly, Lepage and O'Neill*, 1947, No. 22,181; Umiat, *Scholander*, 1948, no number; same locality, *Llano*, 1949, No. 534b; Kodiak Island, *Llano*, 1949, No. 1801b; Kenai Mountains, *Lutz*, 1949, No. 421. Most of the specimens of *C. ecmocyna* from Alaska are duplicates of specimens in the U. S. National Herbarium. **Quebec:** ten miles northeast of Cape Jones, *Lepage and Dutilly*, 1944, No. 6507; Manik Lake, Rogan River, Ungava, *Lepage*, 1950, No. 13,152. **Northwest Territories:** Christopher (Shell) Island, *Polunin*, 1946, No. 18,750. **Alberta:** Twin Cairns Mountain, Banff National Park, *Lamb*, 1951, No. 6500; "Lake Nipigon and Rocky Mountains," *Macoun*, 1885, distributed in Macoun's Canadian Lichens, No. 95, as *C. gracilis* var. *elongata* f. *chordalis*, station doubtful but perhaps in Alberta. **British Columbia:** Parson's Mountain, Vancouver Island, *Macoun*, 1893, distributed in Macoun's Canadian Lichens, No. 161, as *C. gracilis* var. *elongata* f. *macroceras*. **Colorado:** Willow Creek Pass, north of Granby, Grand Co., *Darrow*, 1947, No. 4117. **Wyoming:** Canyon Junction, Yellowstone National Park, *Blake*, 1927, no number, listed by Robbins (Rhodora **33:** 137. 1931), as *C. elongata* f. *ecmocyna* .**Washington:** Yakima Park, Mt. Rainier, *Miss Howard*, 1931, No. 600, listed by the collector (Bryologist **40:** 100. 1937), as *C. amaurocraea*. **Oregon:** Hardesty Mountain trail, Willamette Forest, *Sipe*, 1933, No. 809.

The specimens of var. *nigripes* show less variability than those of var. *macroceras*, and the podetia in the North American material are either entirely free from squamules or very sparingly squamulose toward the base. Most of the podetia are cupless and taper to sharp points, but occasional examples form narrow cups, which may give off marginal proliferations. The podetia rarely exceed 1 mm. in diameter or 5 cm. in height and are therefore more slender and usually shorter than those of var. *macroceras*. Typical specimens are more or less pigmented with brown and agree, in their morphological features, with *C. gracilis* var. *chordalis* f. *amaura* Floerke, as illustrated by Anders (1928, pl. 13, f. 12).

CLADONIA ECMOCYNA var. **intermedia** (Robbins) comb. nov. *C. elongata* f. *intermedia* Robbins, RHODORA **33:** 137. 1931.

Manitoba: Fort Churchill, *Thomson*, 1950, No. 3418; Farnsworth Lake, Churchill, *Edmund*, 1950, No. 25,214. **Alberta:** Lake Agnes, near Lake Louise, Banff National Park, *Lamb*, 1951, No. 6277. **British Columbia:** Yoho National Park, *Lamb*, 1951, No. 6363. **Wyoming:** Canyon Junction, Yellowstone National Park, *Blake*, 1927, no number (type of *C. elongata* f. *intermedia*); Yellowstone National Park, *Blake*, 1927, no number, listed by Robbins (RHODORA **33:** 137. 1931), as *C. elongata* f. *ecmocyna*.

The robust podetia of var. *intermedia* broaden out gradually and form broad and shallow cups, which are mostly 5–8 mm. in width. Some are sterile but many bear brown apothecia, either sessile or shortly and irregularly stipitate. In rare instances one or two marginal proliferations are present. Aside from the cups the podetia are much like those of var. *macroceras* and may be more or less squamulose or free from squamules. The type-specimen of *C. elongata* f. *intermedia*, as illustrated by Robbins (1931, pl. 209, f. 1), is both squamulose and fertile. The figure of *C. ecmocyna* published by Anders (1928, pl. 14, f. 8) shows broad cups with marginal proliferations. In all probability the specimens figured represent var. *intermedia*, although not wholly in agreement with the North American specimens.

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PERLUSTRATIONES PLANTARUM ARCTICARUM IV:

'PARRY PLANTS' ADDED TO THE UNIVERSITY HERBARIA, OXFORD

NICHOLAS POLUNIN

THAT the various Herbaria belonging to Oxford University, rich as they were in ancient collections and type specimens, lacked special 'sets' of plants from Sir W. E. Parry's arctic expeditions, had long been a source of regret—especially in view of the number and excellence of such sets that were known to be deposited in other institutions in Europe and North America—for the botanical collections made during Parry's expeditions were practically the first of real scientific value to be brought back from the American Arctic. To be sure, the Fielding Herbarium (Oxford's main, general herbarium) contained a useful total of specimens from Parry's first two expeditions, apparently collected in a very few instances by the great man himself, and more often by his surgeons John Edwards and Alexander Fisher, or by his lieutenants Beechey, Hoppner, or J. C. Ross (all of whom, and also

Dr. Walker of M'Clintock's notable voyage in search of Sir John Franklin, and Captain Sabine and E. P. Philpots, though represented by specimens in the Fielding Herbarium, are missing from Vines and Druce's 'Account . . . Part II'[1]). But still of Parry plants there were only scattered specimens, often of a very scrappy nature, and, most unfortunately, more frequently than not, entirely unlocalized. In other respects, too, the labelling seemed deficient—as in the frequent mention of a "Cap. Cheyne" of "Cap. Parry's 1st or 2nd voyage," though no such gentleman appears to be mentioned in Parry's official account of either of these expeditions.[2] Proper sets were lacking, and to me this seemed a particularly sad 'gap.'

Accordingly, on being appointed in 1939 to succeed the late Dr. G. Claridge Druce, as Fielding Curator and at the same time Keeper of the University Herbaria, by then multiplied and further extended, I resolved to try to remedy the deficiency. Attempts were so successful (or good fortune such) that the Herbaria now possess three special sets of 'Parry plants'—one large and important, another large but less significant, and the third very small but fortunately containing notes by Parry himself. I myself have been given two further sets which can be considered as added to the others, although for the time being I am retaining them, as they were given to me personally for purposes of comparison and reference.

[1] 'An account of the Herbarium of the University of Oxford, Part II,' by S. H. Vines and G. Claridge Druce, *Oxford:* Clarendon Press, pp. 21–55, 1919. This account has long been out of print and is now hopelessly out of date, so it is hoped that the complete revision, commenced during the present writer's period in charge, will soon be available.

[2] There is, however, mention on pp. 66 *et seq.* of Parry's account of his 'second' voyage (*see* footnote 6, below) of a 'Point Cheyne' lying in about 66° 09′ N. lat., and 84° 30′ W. long., on the south coast of Melville Peninsula, bordering on Hurd Channel. Point Cheyne was so named by Parry's second in command on this 'second' voyage, Captain G. F. Lyon, "after my old friend and messmate Captain Cheyne," as Lyon himself informs us in his 'Private Journal of Captain G. F. Lyon, of H. M. S. Hecla, during the recent voyage of discovery under Captain Parry'—*London:* pp. xii + 468, map and plates, 1824. Cheyne was evidently not with Lyon on the latter's voyage to these regions in 1824 (*see* G. F. Lyon 'A brief Narrative of an unsucessful attempt to reach Repulse Bay . . . '—*London:* pp. xvi + 199, map and plates, 1825), when some plants were "gathered upon a few low islands which were met with in, or near, the position assigned to Southampton Island"; indeed Cheyne does not appear ever to have visited the Arctic, unless it was as a very young man before his promotion to the rank of lieutenant in 1813, according to the Acting Librarian to the British Admiralty (*in litt.*). The labels are evidently misleading—perhaps referring to the mere passing on or 'communicating' of the specimens by Cheyne who had been given them by the collector or some other person.

Oxford has thus acquired or will possess five sets in all, coming from different sources, and the object of the present contribution is to relate them as far as possible to other known sets, and, where necessary, describe them and note such "new records" as they may afford. This is rendered the more necessary in view of the hasty treatment that has in the past greeted the discovery of other sets—as, for example, the Bristol Naturalists' Society's set described in Perl. I,* and now given to Oxford. Indeed two of the five sets with which we are here concerned were described in Perl. I, which leaves only three to be treated in detail.

One of the sets given directly to the University will be described first as 'A' (below). It was sent to me at Oxford by Professor W. Rae Sherriffs, of the then University College, Southampton, as a gift to the Department of Botany—as already recorded in the North Western Naturalist[3] and in the Department's annual report for the year ending 31 July 1942 (*Oxford University Gazette*, LXXIII, p. 320, 1943). One of the sets given to me privately will be described in detail as 'B' (below); the other is the 'University of Durham set' described in Perl. I, for which I am very deeply indebted to Professor J. W. Heslop Harrison, to whom it had actually belonged. The third, small set belonging to the University Herbaria was transferred thereto by Mr. R. C. Spiller, University Reader in Mineralogy, Oxford, who found it among the effects left by his predecessor, the late Professor H. L. Bowman; it will be described under 'C' (below).

The order and nomenclature followed in the plant lists given below are in general those of my 'Botany of the Canadian Eastern Arctic,' Parts I[4] and II,[5] to which reference may be made for details of distribution, etc., though subsequent information and nomenclatural and other changes should be, and where possible here already are, taken into consideration. Where the name used for a plant is different from that employed for it in those works, sufficient synonymy is given for direct reference thereto.

* References of this type are to previous installments in the present series.

[3] Polunin, Nicholas. 'On some early collections of arctic plants.' *North Western Naturalist*, XVII, pp. 168–173, 1942.

[4] Polunin, Nicholas. 'Botany of the Canadian Eastern Arctic, Part I: Pteridophyta and Spermatophyta.' *Canada:* National Museum Bulletin No. 92, pp. vi + 408, maps and plates, 1940.

[5] 'Botany of the Canadian Eastern Arctic, Part II: Thallophyta and Bryophyta,' including contributions by R. M. Whelden, G. Seidenfaden, R. Ross, D. H. Linder, B. Lynge, and W. C. Steere, compiled and edited by Nicholas Polunin. *Canada:* National Museum Bulletin No. 97, pp. v + 573, maps, etc., and plates, 1947.

A

Professor Sherriffs's donation of 'Parry plants' was followed by a box of rocks and minerals which had been collected on the same expedition. These non-botanical specimens, with his permission, I passed on to the Department of Geology, on whose behalf they were accepted by Professor J. A. Douglas (*Oxford University Gazette*, LXXIII, p. 314, 1943). A note written in Parry's hand, evidently referring to both plants and hardware, but which I took the liberty of retaining with the former, reads as follows: "Captain Parry presents his compliments to Mrs. Sturges Bourne, and requests her acceptance of the accompanying very rough box of trifles from the Arctic Seas. London Novr. 26th. 1823." This note is addressed on the back simply "Mrs. Sturges Bourne." Writing from Southampton, England, Professor Sherriffs suggests that this was "probably a local lady," and, concerning the entire material, that she "presented it to the long-defunct Hartley Institution in this town."

Parry himself mentions on page 75 of the account[6] of his 'second' voyage, during which the present collection was evidently made (*see* below), "The Right Honourable William Sturges Bourne," after whom he named the group of islands lying around lat. 66° N. and long. 83° 45′ W., to the east of the larger Vansittart Island. Sturges Bourne was a man of note. After a long and distinguished political career, during which he appears to have refused high office over and over again, he retired from Parliament in 1831 and at the same time from all public offices except that of Lord Warden of the New Forest. He was M. P. for Christchurch during two long periods and died at Testwood House, near Southampton, in 1845; thus his wife was indeed a 'local lady' to a considerable extent, though originally a native of Oxford, to which it is accordingly all the more appropriate these specimens should come.

This plant collection consists of 35 specimens mounted on separate sheetlets of medium-weight paper (rather heavier than that of the differently watermarked first set described in Perl. I), each measuring 10.8 by 17.7 cm. The sheetlets are apparently all of similar origin, being of closely comparable (though no longer

[6] Parry, W. E. 'Journal of a second voyage for the discovery of a North-West Passage from the Atlantic to the Pacific; performed in the years 1821–22–23, in His Majesty's Ships Fury and Hecla.' *London:* pp. xxxi + 571, maps and plates, 1824.

always identical) color and texture, and in many instances watermarked with parts of the text "R. Barnard 1822" in large (15 mm.) and small (12 mm.) capital letters. A 36th sheetlet without any specimen also conforms to this type; but the paper on which Parry's note of presentation is written had clearly some other origin. The collection is enclosed in two paper-covered metal sheets of similar size, on the outside of one of which is stuck a tiny label bearing the single word "Plants," apparently in Parry's hand.

The sheetlets bearing specimens are all uncommonly well labelled with both the locality and date of collection of each individual specimen. These labels, though in a hand somewhat resembling Parry's, were clearly written by somebody else—quite likely by the collector, though unfortunately there is no note as to who he was; nor was I able to determine this in the circumstances of segregation of many Admiralty and other records. The places named on the labels are all familiar localities visited during Parry's 'second' voyage, and the dates all tally with the narrative of this[6] (with the possible exception of one or two having a suggested discrepancy of at most three days). The localities are on, or on islands near, Melville Peninsula—with the exception of Duke of York's (York) Bay, which is nearby in Southampton Island, and the Upper Savage Island, which is in Hudson Strait, off the southern coast of Baffin Island.

All of the plant species represented in the present collection appear to be mentioned or otherwise 'covered' in Sir William Hooker's 'Botanical appendix'[7] to Parry's account of the voyage, though by no means all of the individual records afforded by the present set are given in Hooker's appendix, which once again (cf. Perl. I, II, and III) appears to have been written without the author consulting by any means all of the sets of plants brought back by the expedition.* Thus there can be practically no doubt that he did not see the present one except possibly after drafting his 'Botanical appendix.' This and other points of interest should be clear from the following list of plants comprising the set, which in view of its size and unusually detailed

[7] Hooker, W. J. 'Botanical appendix': pp. 381–430 of the 'Appendix to Captain Parry's journal of a second voyage . . .' *London:* pp. 432 and plates, 1825.

* Note also in this connection Hooker's remark on p. 426 of his 'Botanical appendix' concerning a specimen "Received by Mr. Greville from some gentleman of the Expedition."

'individual' labels, as well as the general (but not universal) excellence of the specimens, is a particularly valuable one. My thanks are due to the following for expert help with identifications: Drs. E. M. Delf and R. M. Whelden (Algae), Dr. W. Watson and Mr. Eilif Dahl (Lichenes), Dr. A. R. Clapham and Mr. James Kucyniak (Musci).

AGARUM CRIBOSUM (Mertens) Bory (*A. turneri* Post. & Rupr.). "Found on the surface of the sea about the middle of Hudson's Strait, 29th July 1821"—cf. Hooker (*l. c.* pp. 426–7 sub nom. '*Laminaria Agarum*'). Dr. E. M. Delf, to whom this and the next specimen were submitted, pronounced the material insufficient for certain determination except by "someone very familiar with the structure of thalloid Algae of all sorts," but this need was subsequently filled by Dr. R. M. Whelden with the above results. I have myself found this remarkable Alga not far to the south-east of the 'middle of' Hudson Strait, cast up in plenty on the shores of Akpatok Island,[8] and several times farther north in the Canadian Eastern Arctic, both at Dundas Harbour, Devon Island, and in Pond Inlet, Baffin Island.[5] There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England.

PTILOTA PLUMOSA (L.) C. A. Agardh. "Found on the surface of the sea about the middle of Hudson's Strait, 29th July 1821"—cf. Hooker (*l. c.* pp. 427–8). The provisional determination was subsequently confirmed by Dr. R. M. Whelden.

CLADONIA ALPESTRIS (L.) Rabenh. "Upper Savage Island, Hudson's Strait, 24th July 1821." Hooker (*l. c.* pp. 424–5) already reports '*Cenomyce rangiferinus*,' which may quite likely refer to that allied species, from Upper Savage Island. This determination was kindly verified by Dr. W. Watson, who remarked (*in litt.*) that the specimen possessed "rather thicker branches than usual." The occurrence of *C. alpestris* on Upper Savage Island was already announced by Dr. I. M. Lamb, then of the British Museum, in a letter which he wrote to the late Professor Bernt Lynge (of Oslo) who, in his contribution on the lichens in Bot. Can. E. Arctic II,[5] confirms it as being plentiful in, particularly, the subarctic parts of eastern America. There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England.

CETRARIA DELISEI (Bory) Th. Fr. "Repulse Bay, August 22nd 1821." *Det.* Eilif Dahl. Hooker (*l. c.* p. 423) does not mention any *Cetraria* from Repulse Bay, which suggests that he did not consult the present collection (*see* above). According to Lynge,[5] *C. delisei* is "common and widespread" in the Canadian Eastern Arctic—as I can myself confirm from numerous field observations made during several expeditions in the region. The species appears to be the "*C. islandica* . . . Var. Thallo opaco, ramulis numerosissimis" of Hooker (*l. c.* p. 423).

[8] Polunin, Nicholas. 'The Flora of Akpatok Island, Hudson Strait.' *Journal of Botany*, 72, pp. 197–204, 1934.

Cetraria cucullata (Bell.) Ach. "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 423). *Fide* Eilif Dahl. Dr. W. Watson remarks (*in litt.*) that "This specimen is not so pale as is usual," but such is also the case with most of the other century-and-more old specimens in the Fielding Herbarium and would accordingly appear to be an attribute of age. Lynge[5] dismisses the species as "very common . . . all over the [Canadian Eastern Arctic] region."

Alectoria ochroleuca (Ehrh.) Nyl. "Upper Savage Island, Hudson's Strait, 24th July 1821"—cf. Hooker (*l. c.* p. 426, sub. syn. *Cornicularia ochroleuca*). Lynge[5] remarked that "this species is plentiful all over the Canadian Eastern Arctic," and so I can confirm from my collections and ecological notes taken during 1931–4.

Caloplaca elegans (Link) Th. Fr. "Repulse Bay, August 22nd 1821." Hooker (*l. c.* p. 422, sub syn. *Lecanora elegans*) reports this plant from several of the localities visited on Parry's 'second' voyage but not from Repulse Bay, which suggests again that he did not see the present collection. The species is "a very common one, distributed all over the [Canadian Eastern Arctic] region" (according to Lynge[5]), and has already been recorded from several localities on or about Melville Peninsula, though Repulse Bay appears to be an addition to those hitherto known.

Tetraplodon mnioides, var. urceolatus (Brid.) Steere. "Repulse Bay, August 22nd 1821"—cf. Hooker (*l. c.* p. 419). In making this combination in his contribution to Bot. Can. E. Arctic II, Steere[5] remarks that this variety is "widespread in the Canadian Eastern Arctic, but apparently not common," commenting also that "It has been pointed out by many authors that this moss intergrades with *T. mnioides*, especially at the highest altitudes and latitudes. Indeed more than a century ago Hooker . . . said of *T. mnioides* from Arctic America 'The leaves are here more concave, than they are in my British and European specimens of this moss; and those of *S. urceolatum* are less so; thus, as it were, uniting the two species.' This same overlapping of the two forms has been noticed in the collections of Polunin and other recent explorers, and the conclusion has been reached that *T. urceolatus* is only a reduced form of *T. mnioides*."

Haplodon wormskjoldii (Hornem.) R. Br. (*Splachnum wormskjoldii* Hornem.). "Island of Igloolik, July 18th 1822"—cf. Hooker (*l. c.* p. 418, sub syn. "*Aplodon Wormskioldii*"). Steere[5] writes of this moss "Plentiful in the Far North and widespread through the rest of the Canadian Eastern Arctic. Grows chiefly on decaying animals and dung." There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England.

Hierochloe alpina (Sw.) Roem. & Schult. "South shore of the Strait of the Fury and Hecla, August 27th 1822"—cf. Hooker (*l. c.* p. 410).

Trisetum spicatum (L.) Richt., var. maidenii (Gandoger) Fernald. "Duckett Cove, August 28th 1821"—cf. Hooker (*l. c.* p. 409, sub syn. *T. subspicatum*).

PLEUROPOGON SABINII R. Br. "Duke of York* Bay, Southampton Island, August 18th 1821"—cf. Hooker (*l. c.* p. 409). Concerning the rendering 'sabinii,' *see* Bull. Torrey Bot. Club, **71,** p. 248, 1944, and **77,** p. 220, 1950, the latter proposal being adopted at the Stockholm Congress.

POA ARCTICA R. Br. "Duke of York* Bay, Southampton Island, August 18th 1821"—cf. Hooker (*l. c.* p. 408).

PUCCINELLIA ANGUSTATA (R. Br.) Rand & Redfield, *s. l.* "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 408, sub syn. *Poa angustata*).

CAREX MISANDRA R. Br. "Five Hawser Bay, Lyon Inlet, 9th Sept. 1821"—cf. Hooker (*l. c.* p. 406, sub nom. *C. fuliginosa β squamis*), whose "*β squamis* Capsulisque pallide fuscis" appears to be a purely minor variant (even though the relatively light color of the present inflorescence, which had been gathered as late as 9 September, is more often seen only in much 'younger' specimens) whose extreme is expressed in f. *flavida* Fernald (of Bot. Can. E. Arctic I, though this ought to be styled f. *ochrolochin* Ostenfeld ex Ostenfeld & Lundager). This is the only specimen I know which confirms Hooker's report (*l. c.*) of this species from Five Hawser Bay; but it still does not necessarily indicate that he saw the present collection, as indeed he almost certainly did not (*see* above).

? SALIX ARCTICA Pall., *s. l.* "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 404). An indeterminable scrap labelled "Salix Arctica" and probably belonging to this very common and variable species. All labels on the sheetlets appear to be in the same hand. Where specific identifications are attempted I have noted the fact in this paper; but where generic names alone have been suggested, as is frequently done near the bottom of the sheet, I have not considered this worthy of remark.

OXYRIA DIGYNA (L.) Hill. "South shore of the Strait of the Fury and Hecla, August 27th 1822"—cf. Hooker (*l. c.* p. 403, sub syn. *Oxyria reniformis*).

POLYGONUM VIVIPARUM L. "Duckett Cove, August 28th 1821"—cf. Hooker (*l. c.* p. 403).

LYCHNIS APETALA L. "Duke of York's Bay, Southampton Island, August 18th 1821"—cf. Hooker (*l. c.* p. 389). Correctly named on the sheetlet, in the usual hand of all the other labels written on the sheetlets (as opposed to the accompanying note and single word written, apparently, by Parry—*see* above).

CERASTIUM ALPINUM L., *s. l.* "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 390). Correctly named on sheetlet. There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England.

ARENARIA RUBELLA (Wahlenb.) Sm. "Island of Neerlo-nakto, August 15th 1822"—cf. Hooker (*l. c.* p. 391). Correctly named on sheetlet.

PAPAVER RADICATUM Rottb. "Island of Neerlo-nakto, August 15th 1822." Hooker (*l. c.* pp. 384–5) records this plant (sub nom. *P. nudicaule,*

* Apart from superfluous commas, etc., the labels are copied exactly, although slight variations in their orthography (e. g. 'York's' for 'York') appear to be without significance.

which the present sheet is labelled) from "Igloolik. 1822 and 1823. Duckett Cove. Repulse Bay" but not from Neerlo Nakto (as it is now written on Canadian Government maps). The fact that Hooker expressly says: "The specimens of this plant are from seven to eight inches high, with their corolla, when fully expanded, nearly two inches in diameter," excludes the present specimen (which is barely four inches high, with the corolla, although expanded, less than one inch in diameter), and further indicates that Hooker did not consider the present collection when writing his 'Botanical appendix.'[7] Dr. A. C. Fabergé has published (in *Journ. Genetics*, **46**, p. 140, 1944) his figures of the chromosome number of plants grown from seed which I collected for him in 1936 in the Canadian Eastern Arctic: that from Pond Inlet in north-eastern Baffin Island, and from Chesterfield on the west coast of Hudson Bay, was all n = 28; that from Clyde on the east coast of Baffin Island was n = ±28. On the other hand, material from Reykjavik, Iceland, gave n = 35 (Fabergé *l. c.*). The seeds which I sent Dr. Fabergé from south-western Greenland in 1937 failed to germinate,[9] but others of *P. radicatum* and *P. macounii* which I sent more recently from the north coast of Alaska to Copenhagen proved viable and gave 2n = 42 (C. A. Jørgensen *in litt.*). It is now being determined which, if not both, of these species is involved.

Draba fladnizensis Wulfen, *s. l.* "Five Hawser Bay, Lyon Inlet, 9th Sept. 1821"; also labelled "Draba Androsarea" (*sic*) in the usual, apparently contemporary, hand. Hooker (*l. c.* pp. 386–7) includes this and some other species as varieties of *D. hirta*, but does not record any of these varieties, or indeed any *Draba* at all, from Five Hawser Bay. The present collection contains another, flowering specimen which I take to belong also to the *D. fladnizensis* complex—this time from "Duckett Cove, August 28th 1821", whence Hooker (*l. c.* p. 386) recorded his "D. hirta . . . Var. 4. 1–3-pollicaris, foliis integerrimis scapo gracili aphyllo," to which this specimen indeed conforms.

Draba cinerea Adams. "The Island of Igloolik, July 1822"—cf. Hooker, who reports (*l. c.* pp. 385–7) all five of his 'varieties' of *D. hirta* from this place. The present specimen is scarcely determinable, having lost all reproductive structures; in spite of some unusually long and straight hairs it comes nearest to my conception of *D. cinerea*.

Saxifraga caespitosa, subsp. eucaespitosa f. uniflora (R. Br.) Engler & Irmscher. "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 393).

Saxifraga aizoides L. "Duke of York's Bay, Southampton Island, August 18th 1821." Hooker (*l. c.* p. 393) records this species only from Igloolik; but quite apart from the present specimen, I have seen, in the British Museum and Copenhagen herbaria, others gathered by members of the same expedition at what is now called 'York Bay' on Canadian Government maps—which suggests once again that Hooker did not cover

[9] Polunin, Nicholas. 'Contributions to the flora and phytogeography of south-western Greenland: an enumeration of the vascular plants, with critical notes.' *Journal of the Linnean Society, Botany*, LII, pp. 349–406, 1943.

by any means all of the pertinent material when writing his 'Botanical appendix.'

SAXIFRAGA TRICUSPIDATA Rottb. "Duke of York's Bay, Southampton Island, August 18th 1821"—cf. Hooker (*l. c.* p. 393). Labelled "Saxifraga Triuspictata" (*sic*).

SAXIFRAGA HIRCULUS L. "Duke of York's Bay, Southampton Island, August 18th 1821." Hooker (*l. c.* p. 392) reports only the northern extreme phase which we now call var. *propinqua* (R. Br.) Simmons, and which is represented in the present collection by a separate specimen, labelled "Island of Neerlo-nakto, August 15th 1822. Saxifraga Propinqua." The strikingly different typical form occurs plentifully farther south in Southampton Island, as I have myself seen during several visits there, but does not appear to have been previously detected from York Bay, though well exemplified by the narrow leaves and long petals of the present specimen.

SAXIFRAGA OPPOSITIFOLIA L. "Island of Neerlo-nakto, August 15th 1822." Hooker (*l. c.* p. 392) faithfully records this almost universally (in the Arctic) common species from several other places visited on the voyage but not from Neerlo Nakto, which again suggests that he did not see the present specimen which is labelled "Saxifraga Oppositafolia" (*sic*).

POTENTILLA VAHLIANA Lehm. "South shore of the Strait of the Fury and Hecla, August 27th 1822"—cf. Hooker (*l. c.* p. 395, sub nom. *P. nivea*). The present specimen is labelled, in the usual hand, "Potentilla Nivei" (*sic*). There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England.

OXYTROPIS MAYDELLIANA Trautv. "Five Hawser Bay, Lyon Inlet, 9th Sept. 1821." This appears to be a new locality for the present, perfectly distinct and relatively widespread species, which, however, was already known to be common on and about Melville Peninsula—*see* Bot. Can. E. Arctic I, p. 292. It is noteworthy that, whatever may have been the state of confusion in this genus at the time, Hooker (*l. c.* p. 396) fails to report any *Oxytropis* from Five Hawser Bay or anywhere else in Lyon Inlet.

PEDICULARIS HIRSUTA L. "The Island of Igloolik, July 1822"—cf. Hooker (*l. c.* p. 402). Labelled "Pedicularis Arctica"—of which, however, I have not seen typical specimens (or, I now think, even doubtful ones) from Melville Peninsula or its accompanying islands. There is an apparently duplicate specimen in the set recently transferred from the Scott Polar Research Institute to the University Herbarium, Cambridge, England—*see* Perl VII. (in prep.)

ERIGERON HUMILIS Graham (*E. unalaschkensis* (DC.) Vierh.), approaching *E. eriocephalus* J. Vahl. "Five Hawser Bay, Lyon Inlet, 9th Sept. 1821"—cf. Hooker (*l. c.* p. 398, sub nom. *E. uniflorum*). The specimen is labelled "Erigeron uniflorum" (*sic*).

B

The second set to be described in the present contribution was given to me by the present Admiral Sir W. E. Parry and his mother, Lady (Anna) Parry, whose letter (dated 10 August 1942) announced that her son had found the set during a brief period of leave among the papers of his father, the late Sir Sydney Parry (*see* Perl. II), grandson of the navigator. The set consists of 17 specimens mounted on sheetlets that had been cut, not always regularly, by some sharp instrument. The paper is thick and had evidently been made in rather large sheets, being all of the same weight, texture, and color, and showing no watermarking except in two instances which have sufficient lettering to indicate that the source is the same as that of the sheetlets of set 'C' of the Manchester Herbarium possessions described in Perl. II, one of which is watermarked "1826." In both these sets the sheetlets are 15–16 cm. long by 9–10 cm. wide; presumably they were once all together, quite likely remaining so for some time after the specimens were mounted and possibly even until relatively recently.

The set now being considered is enclosed in a home-made folder of slightly thicker and smoother paper with a 'fancy' gilded margin. It bears on the outside the following caption, in what appears to be a child's hand: "Specimens of Arctic Plants Collected by W. E. Parry R.N. A.D. 1819–20–21." Inside is a sheetlet of still thicker paper or really card bearing the following label in Parry's hand, ending with his formal signature: "Specimens of Plants Collected in the Polar Regions by W. Parry." The only other sheetlet (apart from the 17 bearing specimens) is of rather thin paper of entirely different color and watermarking, used evidently to enclose the set as, like the card bearing Parry's label, it is slit by two parallel cuts (apparently to hold a ribbon, though none was present when the set reached me).

The individual sheetlets bearing specimens were unmarked on their faces except in one case (*see* below) which bears a label indicating that the specimen had come from Melville Island, where it must have been collected during Parry's 'first' voyage.[10]

[10] Parry, W. E. 'Journal of a voyage for the discovery of a North-West Passage from the Atlantic to the Pacific; performed in the years 1819–20, in His Majesty's Ships Hecla and Griper.' *London:* pp. xxix + 310, and appendix, 1821.

Thus of the total of three detailed labels accompanying the set, the two quoted in the last paragraph are 'general' and not to be relied upon as necessarily covering all of the enclosed specimens (cf. Perl. I, II, and III). Nor is either of these very helpful, although both may well be accurate as far as they go. That written by Parry could scarcely be otherwise, from its own nature as well as what we know of the man; that on the outside cover may perhaps indicate rightly that the specimens emanated from both Parry's 'first' and 'second' voyages, as the years mentioned suggest. However this may be, there can scarcely be any possible chance of settling the outstanding questions of dates or localities, though it may be noted that, of the 17 different plants represented, no less than 14 are mentioned in Robert Brown's 'Chloris Melvilliana.'[11] A fifteenth appears to involve hybridization of a species long known to be plentiful on Melville Island with another (*Saxifraga hieracifolia*) which has not been recorded therefrom, though very likely to occur there, while the sixteenth, apparently not recognized by Brown but merged in his "Polymorpha species" *Potentilla nivea*, was collected on the same expedition and is now well known to occur on Melville Island (*see* Simmons, p. 108,[12] and cf. Perl. II), where the seventeenth has been discovered since. Thus there is to my mind no ground for serious argument against the specimens composing this set having all come from Melville Island, but on the other hand no adequate indication (with one exception) that they did; so accordingly, once again, no new records can safely be founded on this set.

A description of this little collection follows: instead of referring each item to the appropriate place in Robert Brown's account[11] it will be sufficient to give synonyms where different names are employed in that work—except in the instances of the three plants which are not there mentioned, of which more detailed accounts will be necessary.

Poa abbreviata R. Br.

Poa arctica R. Br.

Oxyria digyna (L.) Hill. *See* Brown (*l. c.* p. cclxxxii, sub syn. *Oxyria reniformis*).

[11] Brown, R. 'A list of plants, collected in Melville Island, by the officers of the Expedition; with characters and descriptions of the new species': pp. cclxi–cccx in 'A supplement to the appendix of Captain Parry's voyage . . .' *London:* pp. clxxx–cccx and plates, 1824.

[12] Simmons, H. G. 'A survey of the phytogeography of the Arctic American Archipelago.' *Lunds Universitets Årsskrift*, N. F. Afd. 2, ix, Nr. 19, pp. 1–183 and maps, 1913.

Polygonum viviparum L. Correctly named on back of sheetlet in pencil, in a hand which may possibly be Parry's.

Cerastium alpinum L., *s. l.*

Papaver radicatum Rottb. *See* Brown (*l. c.* p. cclxv, sub nom. *Papaver nudicaule*). Labelled "Papaver Nudicaule Melville Island North Georgia" in the same hand as the specimen so labelled in the Manchester Herbarium (*see* Perl. II), which is also of very similar appearance and flowering state. The writing is in pencil in both cases, and may possibly be Parry's.

Braya purpurascens, var. dubia (R. Br.) O. E. Schulz. *See* Brown (*l. c.* p. cclxvii, sub syn. *Platypetalum dubium*).

Saxifraga caespitosa, subsp. eucaespitosa, f. uniflora (R. Br.) Engler & Irmscher. *See* Brown (*l. c.* p. cclxxiv, sub syn. *Saxifraga uniflora*).

Saxifraga cernua L.

Saxifraga foliolosa R. Br. (*S. stellaris* var. *comosa* Retz.).

Saxifraga nivalis L.

Saxifraga cf. hieracifolia × nivalis. *Saxifraga hieracifolia* Waldst. & Kit. is not known to occur on Melville Island, though its range and requirements suggest that it most probably grows there. The present specimen is more reminiscent of it than is the somewhat similar one in the Manchester Herbarium's set 'C' (*see* Perl. II), but still retains some of the characters of *S. nivalis*. The two species appear to hybridize rather freely in the Canadian Far North, if one may judge by the intermediate forms that are to be found.

Saxifraga flagellaris Willd. ex Sternb.

Potentilla hyparctica Malte (*P. emarginata* var. *typica* Abrom. of Bot. Can. E. Arctic I[4], but the specific epithet is invalidated by an earlier homonym—*see* Fernald in *Rhodora* XLV, pp. 111–2, 1943). Apparently not distinguished by Brown (*l. c.* p. cclxxvii) from the polymorphic *P. nivea*, but collected on Melville Island by several expeditions (including Parry's of 1819–20 according to Simmons, p. 108[12]).

Cassiope tetragona (L.) D. Don. *See* Brown (*l. c.* p. cclxxx, sub syn. *Andromeda tetragona*).

Pedicularis hirsuta L. This is the 'seventeenth' plant, which, though not recorded by Brown (*l. c.*), has since been reported from Melville Island by Simmons (*l. c.* p. 124), the basis of whose testimony there seems no reason to doubt in spite of the slight scepticism he himself expressed.

Taraxacum phymatocarpum J. Vahl in Hornem., *s. l.* *See* Brown (*l. c.* p. cclxxviii, sub nom. *Leontodon palustre*).

C

This smallest set of 'Parry plants' recently added to the Oxford University Herbaria is the last which need be described here. It had been presented to the Department of Mineralogy, University Museum, Oxford, by the late Mr. H. G. Madan—probably in 1901 with the "large collection of apparatus . . . presented towards the close of the year and shortly before his death" (*Oxford University Gazette*, XXXII, p. 650, 1902), but was lately transferred to the Herbaria of the University Department of Botany by Mr. R. C. Spiller (*see* above).

The set is accompanied by a caption on a separate slip of paper written by Mr. Madan as follows: "Arctic Plants collected by Capt. Sir W. E. Parry. R.N. 1819–21." This caption appears to be a mere contraction of an earlier one saying "Specimens of Arctic Plants collected by Captn. Sir W. E. Parry. RN. AD. 1819.20.21", on a small label stuck on a carefully fashioned board of exotic wood which is very reminiscent of, and indeed closely comparable with, that accompanying the Manchester set 'C' described in Perl. II. However, it bears no signature and may have been written considerably later (Parry was not knighted until 1829), though again I think the writing is probably Parry's. Inside, on a separate sheetlet of thin paper, comes a caption written in a hand quite typical of Parry's when a youngish man, and containing his formal signature of those times: "Arctic Plants Collected by W. Parry. Captain R.N. Commander of the Polar Expedition." Mention here by Parry of "the Polar" expedition suggests the last arctic one of which he had command—the objective of which was indeed the North Pole,[13] whereas the others were concerned with finding a north-west passage from the Atlantic to the Pacific. Another point of interest is that alongside the "by" in this label is pencilled in brackets a faint "me"—again presumably by Parry and indicating that he, personally, had been the collector. Unfortunately no other labels or indications accompany the set, although it appears from this last-mentioned label that the other two are erroneous. They suggested as the venue Melville Island and/or the regions to the south that were visited during Parry's 'second' voyage.

There are only five specimens in this set, mounted on separate sheetlets of apparently the same paper as that used in the set described above as 'B' and the Manchester one described in Perl. II as 'C'—though unfortunately there is no sign of any watermark to confirm this. The rough cutting and sizes are

[13] Parry, W. E. "Narrative of an attempt to reach the North Pole . . ." *London*: pp. xxiii + 229, maps and plates, 1828.

also similar. The sheetlets are separated by pieces of tissue paper: this to me suggests, however vaguely, that there were never many of them between these stout and flat enclosing boards, and that the tissue paper was introduced as a precaution against crushing.

The following are the five specimens. As to where they came from it is again impossible to be sure, though there is a strong suggestion at least that one or two may have come from the Old World (most likely from Spitsbergen), as is already suggested by the label written by Parry and described last above. An arctic phytogeographer who ignored the labels and looked only at the plants (which indeed are not in any way attached to the labels) would almost certainly suggest Spitsbergen, even if he did not know that Parry had been there.

SALIX POLARIS Wahlenb. *Fide* Eilif Dahl. In its entire leaves, hairy capsules, etc., this appears to be a typical specimen of this familiar Spitsbergen species which should yet be searched for on Melville Island where, however, the form most likely to occur is subsp. *pseudopolaris* (see Perl. II).

POLYGONUM VIVIPARUM L. Plentiful all over the Arctic, in both Old and New Worlds, and extending far south.

SAXIFRAGA FLAGELLARIS Willd. ex Sternb. Occurs both in Spitsbergen and on Melville Island; nor can I see any difference between Old and New World arctic specimens which appear to exhibit a similar range ofvariation.

POTENTILLA cf. HYPARCTICA Malte, vel hybr. *See* set 'B' (above). *P. hyparctica* is circumpolar in distribution and well known to occur and, apparently, hybridize promiscuously both in Spitsbergen and the Melville Island region.

DRYAS cf. OCTOPETALA, subsp. PUNCTATA (Juz.) Hultén. Although the material is insufficient for certain determination, there seems very little room for doubt that it belongs to the familiar Spitsbergen etc. *D. octopetala* series rather than the somewhat comparably crenate-dentate leaved New World *D. integrifolia* f. *intermedia* (Nathorst) Polunin. Meanwhile *D. octopetala,* even if it is unknown from the whole of the Canadian Eastern Arctic,[4] should be searched for on Melville Island and elsewhere to the west, in spite of the contention of Simmons (*l. c.* p. 105) that it does not reach the American Arctic Archipelago and of my own remarks in Perl. I that it is "supposedly absent from all those parts of North America that lie between Greenland and the Rocky Mountains; indeed it was subsequently reported by Mr. A. E. Porsild (in *Sargentia,* IV, p. 50, 1943) from the near side of the Mackenzie River Delta, even though the same author later revised some at least of his determinations rather drastically (cf. *Canadian Field-Naturalist,* 61, pp. 191, 192, etc., 1947).—GRAY HERBARIUM OF HARVARD UNIVERSITY.

USES OF CELLULOSE ACETATE IN THE HERBARIUM

NORMAN C. FASSETT

CELLULOSE acetate, mentioned several years ago as a base for mounting small seeds,[1] has been found increasingly useful in the preparation and care of mounted material. It is safe to use in the herbarium, since it lacks the highly inflammable property of cellulose nitrate. It can be procured inexpensively by boiling the emulsion from old X-ray film, or conveniently by purchase in large sheets.

Protection of herbarium sheets in the laboratory. Herbarium sheets that are to be used by classes may be protected from wear and breakage by being covered with a sheet of cellulose acetate. The acetate may be fastened to the sheet by stapling around the edges; the staple is less likely to break through the paper sheet if it is put through the back of the paper with the clamped ends folded over the acetate.

Picking stylus. The use of a stylus of cellulose acetate, to pick up small objects by static electricity, has already been noted.[2] It should perhaps be added that this procedure is more successful on a cold winter's day than when the humidity is high.

Reinforcement after mounting. A fairly stiff solution of cellulose acetate in acetone is an excellent substitute for gummed strips in reinforcing mounted material such as roots, petioles, twigs. With a needle, or dowel, or even a twig (but not a lacquered penholder or pencil) a line is dripped over the object; it will harden and adhere to paper and plant material. It will not adhere to a heavily cutinized material.

The drying time for a simple solution of acetate in acetone is but a few minutes or even seconds, rather than the 20 minutes described for the plastic mounting agent by Dr. Archer,[3] so it could probably not be used in the oil-can dispensers.

Mounting delicate plants. A very thin solution of cellulose acetate in acetone is used. Lay the plant (*Najas, Potamogeton, Callitriche,* etc.) on the sheet and apply the solution over the plant lightly with a brush. Enough will run under to fasten it, and the thin layer of acetate on plant and paper will be quite

[1] RHODORA **41**: 367. 1939.
[2] RHODORA **51**: 60. 1949.
[3] RHODORA **52**: 298. 1951.

invisible when dry. Aquatics that have been floated out on paper before drying can thus be fastened down without being disturbed.

Minor repairs. A bottle of cellulose acetate solution kept on the working table is useful for instant repair of small breakage of herbarium specimens. The solution is best spread directly on the paper, and a leaf or flower replaced while the solution is still wet. It dries and hardens in a minute or two, and is invisible if a thin solution is used.

Mounting small seeds or fruits. Small objects, such as seeds of *Euphorbia* or *Juncus*, removed from their fruits, are easily secured directly to the herbarium sheet with a drop of cellulose acetate solution; an arrow or other mark on the sheet locates them for the next user.

A better method is to mount them on pieces of acetate sheet, cut perhaps 1 x 2 inches, that may be kept in packets. Seeds of orchids, for example, are scattered on the acetate sheet and touched with a drop of acetone; the mount is permanent in a few seconds. In preparation of a monograph of *Callitriche*, the writer has recently found this method invaluable for making direct comparison of fruits from different collections. An acetate strip with fruits from one collection can be placed over a fruit on another herbarium sheet, and the two compared side by side under the binocular microscope. Some special techniques described for handling of *Callitriche* fruits[4] may be adapted for use in other groups.

Spores of *Isoetes* are easily secured to an acetate sheet with a drop of acetone, but they are brittle and will be broken if the sheet is placed in a packet. For their protection, small pieces of acetate, about one mm. wide and 5 mm. long, are built up log-cabin style about the spores, and secured in place with a drop of acetone. Further protection is assured by putting on a roof; a piece cut the right size is put on top and secured with acetone.

A dried flower that has been softened by boiling or by soaking in a "detergent" solution can be mounted permanently by spreading it on an acetate strip; it is flushed with alcohol for dehydration, then saturated with acetone.

Pressing delicate flowers. Corollas of *Eichornia*, for example,

[4] Rhodora 53: 141. 1951.

too often appear in the herbarium as colorless blobs. Both shape and color can be preserved by pressing individual flowers on an acetate sheet. The flower may be laid on a sheet of convenient size, or the corollas may be removed and laid out flat. After ordinary pressing, a quick wash with acetone fastens the dried flower to the acetate. The writer has not tried this on *Iris* but is confident that it would produce excellent preparations.

Millimeter scale. Lines a millimeter apart, scratched on a piece of cellulose acetate, produce a ruler that can be laid over the object to be measured. This type of rule is especially useful when close measurements are to be made under the binocular microscope. A machinist can engrave such lines down to 0.2 mm. apart.—Department of Botany, University of Wisconsin.

The Effect of Forced Aeration on the Longevity of Laminaria[1].—For some time investigators have been desirous of keeping Laminaria and other large marine algae alive in the laboratory for periods of several weeks. This desire, however, has been met with little or no success. In ordinary running sea water in the laboratory, the tissue of Laminaria and many other marine algae begins to slough off progressively within a few days. Usually after one week the plant is of no use.

The writer, while investigating epiphytism among marine algae, found it necessary to keep Laminaria alive in the laboratory for periods of several weeks. Some consideration of the problem revealed that species of Laminaria had been kept alive in the laboratory over a longer period of time by the addition of orange juice to sea water. In this report, however, it was not pointed out what elements of the orange juice were responsible for the longevity of Laminaria in the laboratory. The writer thought this method a little too expensive; therefore it was not tried.

Laminaria collected around Woods Hole, Massachusetts, is usually found attached to rocks or other substrates in areas where water is in rapid motion. As the result of this rapid motion, large amounts of gases are collected from the atmosphere. The writer felt that the difficulty in keeping Laminaria alive in the

[1] Paper presented at Marine Biological Laboratory, Woods Hole, Massachusetts.

laboratory might be overcome by more satisfactorily duplicating the natural environment of the plant.

With this in mind a $\frac{1}{16}$ inch hole was drilled in the nozzle of a salt water faucet. This hole was drilled in a downward direction at an angle of about 22.5 degrees. To the faucet was attached a rubber tube which extended to the bottom of a 4,000 ml. beaker. The holdfasts of recently collected Laminaria were loosely but securely tied to rocks and placed in the beaker. The water was then allowed to run at full force throughout the experiment. Weekly cleaning of the beaker insured the maximum amount of light and periodic cleaning of faucets insured the maximum amount of force to produce aerated water movements. Air drawn in through the hole in the nozzle produced foam similar to that often observed in the natural environment of Laminaria. Air was drawn in with a much greater force through the hole in the nozzle than through hole in rubber tube; therefore the hole in the nozzle gave more desirable results.

During the summer of 1950, *Laminaria Agardhii* Kjellman was kept alive under the previously described conditions for a period of ten weeks with a minimum amount of sloughing off. A small amount of sloughing off could be expected since this normally takes place under natural environmental conditions as the plant grows older. At the end of ten weeks these plants were dried and they are now in the herbarium of the writer. This experiment was repeated for six weeks during the summer of 1951 and the results closely approximated that of 1950.—John W. King, Morgan State College, Baltimore, Maryland.

A Further Note on the Plants of Vinland the Good.—In reference to the interesting article on "The Identity of Vinber and Vinland," by Jacques Rousseau in Rhodora **53**: 244, 245, 1951, it may be of interest to call attention to the publication on Newfoundland-Labrador by V. Tanner, issued by the Cambridge University Press in 1947. On page 43 of the first volume, Tanner has a great deal to say about the early explorations in Labrador, particularly about the Norse discoveries, and his map shows the locations of the various Norse localities as understood by him. According to Tanner, "mark" was old Norse for "wood" and referred to wooded parts of the Atlantic Coast of Labrador.

"Vinland" according to the same author, had nothing to do with either wine or grapes but came from an early Norse word "vin," signifying grassland or pasture suitable for cattle. Vinland is located by Tanner in the northern part of the Long Range Peninsula of Newfoundland. "Vinber" would be the berries from the pasture land. Many controversial attempts have been made to locate these various localities, visited by the Norsemen about the year 1000. Tanner, at any rate, has a first hand knowledge of the Labrador coast.

Since the foregoing notes were written, I have received from the eminent Icelandic botanist, Dr. Åskell Löve, a reprint of his "Plants of Vineland the Good," recently published in the Icelandic Canadian, vol. 10, no. *2*: 15–22. 1951. Dr. Löve feels that the modern Scandinavian languages have very little value in the identification of the plants of the Norse voyages, with the exception of modern Icelandic which has changed very little from that of a thousand years ago. He mentions Rousseau's contribution and takes up in detail the question of the identity of "*Mosurr wood,*" "*self-sown wheat*" and "*vinber.*" He agrees with the conclusions of Fernald that the Mosurr wood is probably the canoe birch (*Betula papyrifera*); but does not agree that the self-sown wheat is *Elymus*, which would have been very well known to the travelers from Greenland, but thinks that it is the wild rice (*Zizania aquatica*). The "vinber," Löve believes to be some species of grape. Currants were never known as wine berries in Iceland, and Löve points out that the grape and the "plant which bears the grape" are clearly differentiated in the present Icelandic language just as they were at the time of the Sagas. Geographic distribution of these plants, taken together with the mild climate and the relatively long days of mid-winter would place the Norse expeditions far to the south of Labrador. Dr. Löve thinks that a team of scientists "should visit Cape Cod for the purpose of trying to dig some of the remains of the first white settlement on the American mainland."

It is clear from the citations in these recent articles that the location of the Norse settlements and the identity of the plants involved are by no means settled. Who will be next?—Henry K. Svenson, The American Museum of Natural History, New York.

ANTENNARIA ROSEA GREENE IN THE LAKE SUPERIOR REGION.—While making a preliminary survey of the genus *Antennaria*, as it is represented in the Upper Peninsula of Michigan, this writer came upon two collections of this genus that are strikingly different from any species thus far known to occur in the state; these specimens are deposited in the Beal-Darlington Herbarium of Michigan State College. Both specimens were collected by Herma A. Baggley—one on July 3, 1940 and the other on May 25, 1941—on Caribou Island, a small island off the main body of Isle Royale. Mrs. Baggley had identified one of the specimens as *Antennaria rosea* and made the following comment on the other: "Very similar to *Antennaria rosea* of Yellowstone. Bracts a rose-pink."

After studying these unusual plants the writer, too, is convinced that they are *Antennaria rosea* Greene, the previous easternmost record for which appears to be in the Black Hills of South Dakota more than eight hundred miles west-southwest of Isle Royale. To verify the opinions of Mrs. Baggley and the writer, one of the plants was sent to Dr. S. F. Blake of the U. S. Department of Agriculture for his expert opinion. Dr. Blake's reply is as follows: "The *Antennaria* collected by Mrs. Baggley on Caribou Island, Michigan, seems to be definitely *A. rosea* Greene."

The writer has made a further study of the specimens of *Antennaria* from the Lake Superior region as represented in the Herbarium of the University of Michigan and the Herbarium of the Canadian Department of Agriculture, Ottawa, Canada. A specimen from the latter herbarium, collected at Fort William, Lake Superior by I. K. McMorine in June 1879 has also been determined by the writer to be *Antennaria rosea* Greene. Fort William is situated on the Ontario shore of Lake Superior approximately thirty miles northwest of Isle Royale and almost the same distance north-northeast from the Minnesota-Ontario boundary.

The three collections discussed above are evidence that *Antennaria rosea* Greene occurs, although perhaps only locally, in the Lake Superior region and well within the range limits of edition eight of Gray's Manual. The range of this species thus extends much farther eastward than has been reported in any previous publication.—PETER A. HYYPIO. MICHIGAN STATE COLLEGE, EAST LANSING, MICHIGAN.

The White Form of the Fringed Polygala in New Hampshire.—Mr. R. J. Eaton in a recent issue of Rhodora (Rhodora **54**: 27–28. 1952) has noted that the color forms of the fringed *Polygala* are rare. The blue flowered form, *Polygala paucifolia* Willd., forma *caerulea* Eaton, is known from a single locality. The white flowered form, *P. paucifolia* Willd., forma *alba* Wheelock, is represented in the Gray Herbarium and the New England Botanical Club by three collections, from Concord and Sherborne, Massachusetts, and from Bangor, Maine.

Mr. Edgar Keen of Warner, New Hampshire, recently sent to the author specimens of *P. paucifolia* f. *alba* which represent the first record of that color form from New Hampshire. The plants were first observed in flower on May 18th. and were recollected in flower on June 1, 1952. Mr. Keen reports there were a dozen plants in about one square yard with a few more plants located a few yards away. They were growing amid the typical pink flowered plants in a mixed growth of hardwood and evergreen on an eastern slope. The earlier collection was made from plants growing near an opening made for a road.

This new record of *P. paucifolia* f. *alba*, from Warner, New Hampshire, is an interesting addition to the known distribution of this attractive plant.—Richard A. Howard. GRAY HERBARIUM, HARVARD UNIVERSITY.

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THOMAS NUTTALL'S CONTROVERSY WITH ASA GRAY

A. Hunter Dupree

Pirates are colorful people, but their business is stealing. Joseph Ewan's parenthetical comment[1] making Thomas Nuttall the victim of piracy raises a vision of Long John Torrey and Captain Kidd Gray gleefully counting botanical doubloons captured from an innocent traveler. Although the bitter controversy of 1841 between Nuttall and Asa Gray burned out long before the principals died, and although no scientific knowledge about the particular plants involved is to be gained by reopening it, the charge of piracy against Torrey and Gray has real importance. Granting that these two men played a preponderant role in building American scientific institutions in the nineteenth century, the charge implies that coercion and robbery were a part of their scientific practice. Since Torrey and Gray concerned themselves with the ethics and standards of a new profession then in its infancy, was piracy a part of those ethics? Or perhaps was hypocrisy the actual accompaniment of the development of scientific standards in America? To establish the fact that Torrey and Gray stole from Nuttall the fruits of his prodigious labors in the West would have a measureable effect on the answers to these questions.

When Thomas Nuttall returned from his journey to the Pacific coast in 1836, he settled down in Philadelphia to work on his own collections. At about the same time Asa Gray, with time on his hands waiting for the sailing of the United States Exploring Expedition, became a junior partner in John Torrey's great

[1] Joseph Ewan, "Nuttall's Diary of 1810 and Some Inquirendae (Review)," *Rhodora*, LIV (1952), 236.

project for a *Flora of North America.* The New York State Survey and many extraneous professional duties occupying most of Torrey's time meant that progress on the *Flora* depended on Gray's efforts. When its first number appeared in July, 1838, Nuttall had as yet published none of his Western plants, which were signal additions to the botany of the trans-Mississippi region of North America. For Torrey and Gray to bring out their comprehensive *Flora* without considering Nuttall's novelties would have rendered it spectacularly obsolete the day it appeared. On the other hand, for them to wait for Nuttall would have delayed the *Flora* indefinitely if not eternally.

To get around the difficulty, Nuttall sent to Torrey and Gray in New York a set of his plants and a manuscript describing the new genera and species. In addition Torrey and Gray consulted the fuller set of Nuttall's plants in the herbarium of the Academy of Natural Sciences, Philadelphia.[2] The evidence of this arrangement appeared immediately in the *Flora,* for in the first genus treated, *Clematis,* Torrey and Gray not only referred to "Nutt.! mss." for three new species but gave the collector's own descriptions and notes directly. Such quotations continued with great frequency through the first number of the *Flora.* This mode of publication was not in itself piracy. Nuttall received full acknowledgment for both his names and his descriptions. Comprehensive recognition appeared in the preface. Nuttall must have been entirely familiar with the process, for A. P. De Candolle had published his manuscript names of *Umbelliferae* under a similar arrangement in the *Prodromus,* Part IV, in 1830. Had Nuttall objected to Torrey's and Gray's practice, he could have withdrawn his manuscript after the first number of the *Flora.* But the references continue in the second part of volume I, published in October, 1838. Since Gray then went to Europe, the completing parts did not appear until June, 1840, giving Nuttall almost two years to voice his displeasure. Far from this, the collector in Philadelphia continued to send descriptions as he worked on his plants.[3] The complete lack of larceny in the process of publication itself suggests that some other irritant estranged these men who were working in apparent harmony.

[2] John Torrey and Asa Gray, *A Flora of North America* . . . (New York, 1838–43), I, ix–x.

[3] *Ibid.,* I. 671.

Nuttall finally reached the point of publication in his own right when he began to read a paper on his *Compositae* before the American Philosophical Society on October 2, 1840. On December 18, 1840, he finished, the combined paper appearing in the *Transactions*, published the following year.[4] But in November of 1840, between Nuttall's delivery of the two parts, Gray went to Philadelphia "to study the collections there." He, too, was working on the *Compositae* and had a manuscript elaboration of them for the *Flora*. No evidence of coolness at this time appears in Gray's account of his meeting with Nuttall. He looked at the collector's *Compositae*,

> none of which had been sent us,—went through his collection at his desire, and pointed out to him at least half a dozen instances in which he was about to publish old genera as new, assisted him heartily and freely in every way, yielding to him freely in all cases in which we had the same plants to describe, although previously elaborated in my manuscript from our own materials.

According to Gray, the part of Nuttall's paper which he had read at the meeting in October had already gone to the printer. This circumstance formed the basis for the younger man's later ire, for when the sheets reached New York early the next year Gray "found that in one or two instances he had entirely taken to himself my remodelling of genera which he had entirely missed, without the slightest word of acknowledgement or reference to me . . ."[5]

Thus the charge which broke the peace was actually that Nuttall was the pirate!

Nuttall had created a new genus, *Heterostephium,* which after Gray's visit he had referred to *Corethrogyne,* DC. He had also placed some species, once separated as a new genus, in *Berlandiera,* DC.[6] Gray "pointed out the inadvertance in a letter to Mr. N. suggesting to him the propriety of making the proper allusion in a note or otherwise in the forthcoming part of his

[4] Thomas Nuttall, "Descriptions of New Species and Genera of Plants in the Natural Order of the *Compositae*. Collected in a tour across the continent to the Pacific, a residence in Oregon, and a visit to the Sandwich Islands and Upper California, during the years 1834 and 1835," American Philosophical Society, *Transactions*, VII (1841), 283–356, 357–453.

[5] Asa Gray, New York, to Sir William J. Hooker, May 20, 1841, MS. copy in Gray Herbarium Library, Harvard University, taken from original at Royal Botanical Gardens, Kew.

[6] Torrey and Gray, *Flora of North America*, II, 97–98, 281.

memoir."[7] To this Nuttall replied, "I am sorry that your letter came to hand after my paper was printed off and there remained no opportunity of making the acknowledgement you required."[8] Gray refused to be satisfied, "informing him that if his course was intentional, I should not tamely submit to it . . ."[9]

At the same time another matter was breeding trouble between the two. Gray naturally felt indebted to Sir William Hooker, who was not only giving general encouragement to the *Flora* but was shipping whole sections of his herbarium to New York. In January, 1841, the American described to Hooker some of Nuttall's new *Compositae*, and added that the collector "ought to send all these to you, but his *amor pecunia* is rather strong. I know you would desire to have them, even Nuttallian specimens . . ."[10] These sentiments reached Nuttall promptly, possibly in a letter from Gray himself. In March he sent from Philadelphia to the New Yorker 118 specimens of *Compositae* destined for Hooker, saying that "they have cost a good deal of *money*, much *time*, and considerable *risk* in the procuring, for which, what I set for specimens is not like to remunerate me." A touch of bitterness appears in his succinct analysis of Western economics.

> The expence of conveying things over land, the *whole distance* of the continent, and then shipping them round Cape Horn is a very different affair to the making of collections elsewhere. If a *pint* of New England rum which costs 12 cents, has to be charged 3 *dollars* in the mountains, some idea may be formed of the value of other things dragged on horseback over double such a route.[11]

A month later Nuttall wrote to Gray that "I forgot to mention in my last, that I do not wish to be held up as a huckster to Sir Wm. J. Hooker, and I therefore wish you to send him the specimens in *Compositae* I sent you, as a present from myself."[12] This Gray immediately did, winning his point at the cost of increased rancor. In the complete collapse of mutual respect, the former intimate collaboration afforded much fuel for mis-

[7] Gray to Hooker, May 20, 1841.

[8] Thomas Nuttall, Philadelphia, to Asa Gray, March 27, 1841. MS. in historic letter file, Gray Herbarium Library.

[9] Gray to Hooker, May 20, 1841.

[10] Asa Gray, New York, to Sir William J. Hooker, January 15, 1841. MS. copy in Gray Herbarium Library.

[11] Nuttall to Gray, March 27, 1841.

[12] Thomas Nuttall, Philadelphia, to Asa Gray, April 23, 1841. MS. in historic letter file, Gray Herbarium Library.

understandings, once dismissed as unimportant but now rekindled.

Nuttall's first reaction was to call for the return of his manuscripts "with the Academy's collection when you send them."[13] He had a good bit to say about *Corethrogyne,* stating

> that Mr. Gray assured me one of the species I had collected in California was the plant intended by De Candolle in his prodromus, otherwise (in the absence of a specimen) I should greatly doubt their identity. I had made the remark concerning this plant (of which I had been obliged to form a distinct genus) that it appeared wholly to agree in habit and nearly in character with Corethrogyne, but that the receptacle was certainly without paleae.[14]

After further discussion Nuttall reached the point that "I . . . now perceive (when *too late*), what I had suspected, that my genus *Heterostephium* is a good and distinct one, and ought not to have been abandoned, altho' it appears to be almost isomorphous with *Corethrogyne.*" Although he never admitted that Gray deserved any credit for suggesting the identity of the genus as a whole, he gave in just perceptibly concerning one of the species, revealing incidentally how closely the two had once worked together. "I am not aware that *Aster filaginifolius* was a suggestion of yours, at the same time I have not the smallest objection to allow it. It was described in Beechy's voyage Suppl. We read it over together. I used my own judgment on the occasion."[15]

Gray had to prod hard to get an answer on *Berlandiera,* "the chief thing in which I felt aggrieved."[16] In spite of his delay, Nuttall's answer here was nearer the question. "In regard to Berlandiera, I say that without other means of comparison, I did not suspect that it was the same genus . . . , and this ought to have been mentioned in my paper . . ." thus admitting the need for the acknowledgment that Gray had been seeking. But he went on to say that he had referred the cognate species to a single group "certainly *without any aid* from your mss. *Not a line was*

[13] Nuttall to Gray, March 27, 1841.

[14] Thomas Nuttall, Philadelphia, to Asa Gray, April 7, 1841. MS. in historic letter file, Gray Herbarium Library.

[15] Nuttall to Gray, April 23, 1841.

[16] Asa Gray, New York, to Thomas Nuttall, April 14, 1841. Draft of reply marked "sent April 16" in Gray's handwriting, historic letter file (Nuttall folder), Gray Herbarium Library.

altered after seeing or hearing your manuscript."[17] Nuttall evidently to the last thought Gray was charging him with taking descriptions of various details, not realizing that the names themselves of the genera were the points at issue.

Nuttall's essential answer to Gray's charges was not defense but a vigorous counteroffensive. In the first place he charged Gray with not accepting various things in his manuscript. For example Gray had shifted *Cosmidium* from one division to another, had given the name *Tolmeia* to a genus Nuttall had named otherwise, had made a *Ligusticum* from California into the new genus *Deweya*, and had provided many other "invidious examples."[18] This boiled down to the charge that Gray had not in all cases followed Nuttall exactly.

In the second place he made a severe indictment of Gray's scientific courtesy. "I was, I had thought, in consideration of what I had done, *not in the closet* but in the *field*, entitled to expect, the same privilege of consulting Dr. Torrey's herbarium that you have of consulting the Herbarium of the Academy. It is now determined, I find, that I shall be obliged to work in the *dark*, and somebody will then come after and hold up my unavoidable errors and mistakes as a beacon on which to establish something de novo."

Finally Nuttall reached the point of complaining about the collaboration itself. "For respecting many of my manuscript names (given in great haste in the herbarium of the Academy) I certainly have no occasion to *thank* you. In regard to the names of things recently introduced into that collection from the West they cannot be taken at all as the names I shall ultimately employ and therefore the quoting of them is to me an essential injury, as it tends to create confusion and error."[19] This charge, which incidentally is inconsistent with the first one claiming neglect, carries at long last the implication of piracy mentioned by Ewan. It is, however, much less timely and explicit than Gray's accusation against Nuttall, and it got a much stronger answer.

Gray dealt with the first charge "*seriatim*" showing in each case that Nuttall's manuscript had been set aside only for

[17] Nuttall to Gray, April 23, 1841.
[18] Nuttall to Gray, April 7, 1841.
[19] *Ibid.*

sufficient reasons, often drawn from material on hand from earlier collectors such as David Douglas. On the second charge Gray had

> only to say that neither Dr. Torrey nor myself have ever refused you the privilege of consulting freely our collections, nor have we had the intention of so doing. On the contrary they have always been at your service. The insinuation that *somebody* wishes to oblige you to work in the dark, and then form a reputation for science by holding up your unavoidable errors . . . is as untrue as it is unworthy of you.

Concerning the third charge,

> you say you have no occasion to thank me for respecting your mss. names. Certainly not. I do not expect thanks for doing that which is not only mere justice, but is required by the courtesy of science. No botanist, living or dead, has reason to complain of me in this matter. Have Dr. Baldwin's manuscript names been equally respected by all botanists?

Then Gray made a cryptic reference, "Do you remember a genus called *Petalanthera* in Dr. Torrey's herbarium?" To this he added and then struck out the quotation, "'Let the galled jade wince &c.'"[20]

Even if Gray deleted this imagery, Nuttall reacted violently to *Petalanthera*. This plant, collected by Edwin James, Torrey had named in manuscript but had sent to Robert Brown in England before publishing. Brown identified it with *Cevallia*, but in the meantime Nuttall published it[21] under the same name Torrey had given—*Petalanthera*. Nuttall considered Gray's mere mention "a *most grave* insinuation or charge." To the "*enquiry* whether I ever saw a genus in Dr. Torrey's Herbarium called *Petalanthera*!" he answered "as before the last tribunal, that *I certainly never did*!!! I never saw the name in any other than my own or the Academy's collection and received from Dr. T. the specimen I had without any attempt at a name of any kind and soon after he had received the specimens from Dr. James." As to the use of the same name, Nuttall claimed that it "is an appropriate one and must have been arrived at independently of each other . . . ," a pure coincidence. Gray's injection of this genus into the controversy did indeed reveal a

[20] Gray to Nuttall, April 14, 1841.

[21] Thomas Nuttall, "Description of Some of the Rarer or Little Known Plants Indigenous to the United States," Academy of Natural Sciences of Philadelphia, *Journal*, VII (1834), 107.

very old fester. Nuttall continued that "you have harbored against me this unjust and injurious as well as *false* suspicion probably for *many* years. It has come out. I am obliged to you for the disclosure *at last*!"[22]

Nuttall's letter of April 23, which contained these remarks, shows many signs that it was written by a man under great tension, and in a postscript he himself recognized this. "If I have used any harsh and improper expressions, I hope you will excuse them, and attribute them to an undue excitement." A passage which he struck out but left still legible reveals much concerning his attitude not only while conducting this controversy but also while he was making up his mind to leave the United States.

> From circumstances, over which I have *no control*, I am obliged to use the utmost economy to live. I have sold everything I am able, to keep out of debt, and I therefore, tho' reluctantly, desire Dr. Torrey, to return me the dried plants, sent to him, when done with, as, having given away one set, (to the Academy of Nat. Sciences.) it is as much as I owe to a *country* that never patronised or assisted me in any thing, and to explore which I have sacrificed much property and spent nearly my whole life. On returning these with my manuscripts, I will, if desired, send back 3 or 4 odd numbers of your Flora for which I have now no further use.

Although Gray wrote one more letter,[23] the controversy sputtered to a close, and at the end of the year Nuttall sailed to England to live permanently. Torrey's and Gray's *Flora*, for many reasons entirely unconnected with this controversy, did not progress beyond the *Compositae*. In 1884 Gray wrote that "probably few naturalists have ever excelled Nuttall in aptitude for . . . observations, in quickness of eye, tact in discrimination, and tenacity of memory." But he also said that "there are obvious points of resemblance between the later writings of Nuttall and Rafinesque, which might tempt us to continue the parallel;—but in scientific knowledge and judgment he was always greatly superior to that individual."[24] Complimentary as this was, many naturalists in the 1840's felt that even a remote comparison with Rafinesque was damning. When Nuttall returned to the United States and met Gray again in 1848, they

[22] Nuttall to Gray, April 23, 1841.

[23] Asa Gray, New York, to Thomas Nuttall, June 4, 1841. Draft of reply in historic letter file (Nuttall folder), Gray Herbarium Library.

[24] Asa Gray, "The Longevity of Trees," *North American Review*, LIX (1844), 193.

were at least outwardly cordial.[25] In 1856, while Nuttall was still alive, Gray made a final private statement to Charles Wilkins Short on a controversy now dead for fifteen years.

> As to Nuttall, he is a truthful man, no doubt, and an interesting one. If I ever spoke disrespectfully of him (as I may have) I was to blame. His Genera was an admirable work for its day, and much the best thing he ever did. His later works and memoirs fell off in character, sound judgement, and conscientiousness—very much indeed, and there are things about them that would tempt one who followed closely after him to compare him with Rafinesque; but it would not be just. If Nuttall had kept up to the promise of *Genera N. Amer. Plants* he would have been the great expounder of American botany.[26]

The inapplicability of such terms as piracy to these two sensitive, upright, and angry gentlemen is clear. Torrey and Gray certainly had a right to publish Nuttall's manuscript names and descriptions, for which they gave full credit. Had they not done so, many more of his Western plants would have remained unpublished. In the taxonomic charges and countercharges the younger man rather more than took care of himself. On the other hand, no one raised on *Two Years before the Mast* can fail to sympathize with Nuttall and to see that he needed help more than refutation. The controversy appears more a result than a cause of some deep and bitter emotional disturbance within him.

Too nice a solicitude for abstract justice in a quarrel long past is both futile and unnecessary. Nevertheless, the historian who sees this controversy from a broader point of view can surmise that the protagonists moved under the impulse of forces they themselves only faintly recognized. Torrey and Gray's *Flora of North America* was a new kind of enterprise on the American scene. It called for the final determination of taxonomic questions to be made in the United States and not left to Europeans. This placed such a heavy burden on the available manpower that a practical separation of duties between the field collector and the herbarium specialist was arising in spite of the wishes of both. Nuttall in the old way was still trying to do both, but he could not bring to his herbarium work the tools

[25] Asa Gray, Cambridge, to George Engelmann, March 15, 1848. Typed copy in the Gray Herbarium Library.

[26] Asa Gray, Cambridge, to C. W. Short, October 10, 1856. W. C. Coker, ed., "Letters from the Collection of Dr. Charles Wilkins Short," Elisha Mitchell Scientific Society, *Journal*, LVII (1941), 157.

which Torrey and Gray had developed. While Nuttall had gone to the ends of the earth, Gray had gone to Europe and had dug to the bottom of many North American botanical problems whose answers lay in European herbaria.

The side issue of plants for Sir William Hooker is indicative of another aspect of Torrey's and Gray's enterprise. They aimed to establish botanical autonomy in the United States by co-operation with Europe, not by competition. Hooker was not only moving over to make room in the upper hierarchy of botany where decisions had real authority but also was giving them active encouragement. Early in 1842 he wrote that "Nuttall ought to place all his western plants in your hands for Dr. Torrey & you to describe & to exercise your own unfettered judgements in the determining of them."[27] Torrey and Gray, earning their authority over the plants of North America by doing work comparable in excellence to the best in Europe, were exceedingly careful to mesh their practices and interpretations with those of men such as Hooker and to be generous to a fault in their dealings with them.

Nuttall's plaints about being "in the dark" and making "unavoidable errors" focus on another institutional change in the structure of America itself. Philadelphia, the metropolis of the colonies and the cultural center of the early republic, found herself outstripped by 1840. The natural sciences had given added luster to Philadelphia in her great days, but like other things they deserted in her relative decline. Nuttall was the last who, like the Bartrams before him, used Philadelphia as a base for the botanical exploration of North America on a continental scale. The immediate future lay with New York and Boston, where Torrey and Gray gathered the tools for greatly accelerated botanical production which could keep up with the fruits of American expansion in the two decades ahead.

When institutions change, those who do not change with them feel the pinch. The mountain men, whom Nuttall saw drinking three-dollar rum in the beaver country, are good examples, highly skilled and specialized, of those passed by in the rapid changes in America in the 1840's. The spread of settlement and the decline of the beaver trade left many of them, although young

[27] Sir William J. Hooker, Kew, to Asa Gray, January 23, 1842. MS. in historic letter file, Gray Herbarium Library.

in years, with their way of life destroyed. Nuttall, whose great glory was to explore the West when it was open only to mountain men, found himself, like them, old before his time in 1841.

TEMPORAL VARIATION

Norman C. Fassett

Taxonomists have learned to watch for several types of intraspecific variation, other than that which involves varieties and subspecies in different geographic regions. Among these are:

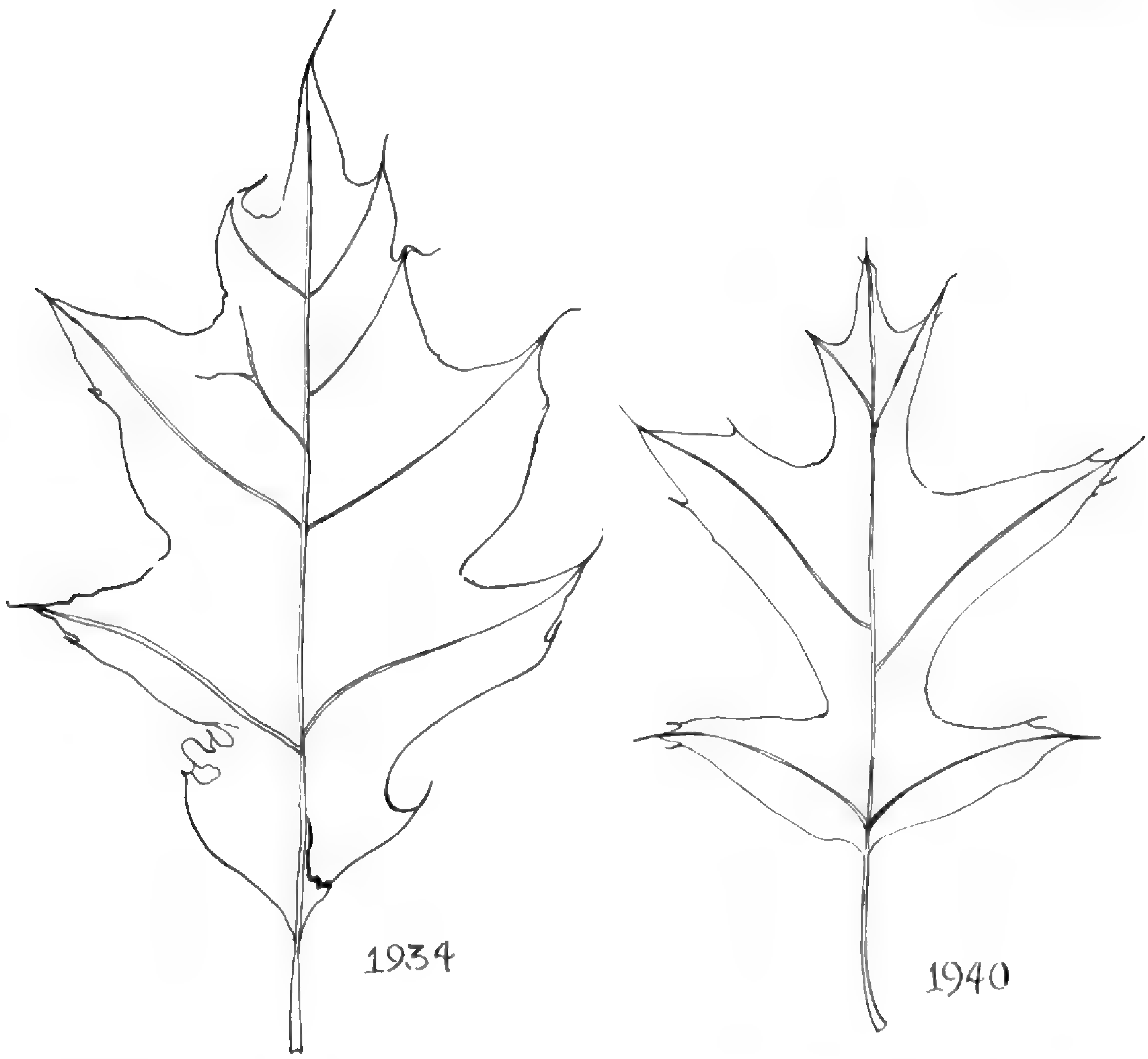
1. Genetic variation—the individual, or personal, characters of each plant or clone. This was discussed by Dr. Edgar Anderson for Iris (1928); clonal characters may easily be observed in such plants as *Podophyllum peltatum*, where each clone has a slightly different leaf pattern, in *Rhus typhina* or *R. glabra* where the general nature of the panicle differs slightly from clone to clone, or even in *Geranium maculatum* where close inspection shows a different cutting on the leaves of each clump.

2. Variation due to habitat. This is particularly obvious in certain aquatics; a classic example is in the amphibious Polygonums where the aquatic and terrestrial phases of one clone are so different that they were once described as separate species.

3. Variation on different parts of the same individual. Foliage may normally be different, for example, on flowering and sterile branches, between sucker shoots and old stems in *Populus*, between juvenile and mature foliage in *Juniperus* or *Eucalyptus*, or on the upper and lower parts of the stem in *Aster cordifolius* and its relatives. The leaf types on different kinds of shoots and at different levels on the same shoot have been discussed in detail by Dr. C. R. Ball (1943).

Less frequently are most of us in a position to observe what might be called:

4. Temporal variation, or variation in homologous parts of the same individual in different years. In the herbarium of the always stimulating Dr. C. C. Deam of Bluffton, Indiana, are two sheets, collected in different years, both from the same branch of an oak tree. The one collected in 1934 is a remarkably good match for Fig. 919 in Gray's Manual, ed. 8, representing *Quercus rubra.* In 1940 the same branch had leaves almost as



Figs. 1 and 2. Leaves collected in different years from the same branch of an oak.

Del. Katherine Gimmler

closely matching Fig. 920, *Q. palustris*. In both collections the branches were fruiting. The data on the two labels are as follows:

Flora of Indiana. St. Joseph County. C. C. Deam. *Quercus palustris* DuRoi. No. 55,573, Sept. 14, 1934. A tree about 8 inches in diameter on the north bank of the Kankakee River about 100 ft. west of the Nasturtium or Mayflower road about 3½ miles southwest of South Bend. On farm of Geo. Dodd. Note that the leaves have very short lobes. Specimen cut with long pruning shears from the tip of long branches. E. J. Palmer says he thinks this is a narrow-leaf form of the species.

Flora of Indiana. St. Joseph County. C. C. Deam. *Quercus palustris* DuRoi. No. 55,573 equals 60,214. Oct. 1, 1940. A tree about 8 inches in diameter on the bank of the Kankakee River near Mayflower Road about 3½ miles southwest of South Bend. The leaves from this tree taken Sept. 14, 1934, were not lobed to the middle but the leaves are quite normal this year.—DEPARTMENT OF BOTANY, UNIVERSITY OF WISCONSIN.

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BALL, C. R. 1943. Castanea **8**: 67–71.

TOVARA IN MEXICO.[1]—When the recent monograph on *Tovara* was completed and published in the current volume of RHODORA,[2] material of this genus from Mexico was not then available to its author. Three localities on the eastern escarpment of the Mesa Central are represented in the collections of Dr. H. E. Moore, Jr., and myself.

The Mexican specimens are relatively uniform and although differing from much of *T. virginiana* (L.) Raf. of eastern United States by having smaller leaves (rarely over 10 cm. in length) and roseate calices, they fall within the limits of variation to be found within populations of *T. virginiana.* A collection (*Burns G-39*) in the herbarium of the University of Tennessee from Townsend, Blount County, Tennessee, differs little from the Mexican material except for the paler calyx.

In determining the Mexican collections as to species, much of the Asiatic material of *Tovara* from the Gray Herbarium and the U. S. National Herbarium was examined. It is somewhat difficult to separate *T. virginiana* and *T. filiformis* (Thunb.) Nakai because of the great variability within each and the overlapping of characters. This overlap is indicated by Dr. Li's key. Further collecting may demonstrate that *T. virginiana* and *T. filiformis* are one highly polymorphic species. *T. filiformis* var. *kachina* (Nieuw.) Li and *T. apoensis* (Elmer) Li seem much more distinct.

For the benefit of future workers, the collection data from the Mexican specimens are cited below.

HIDALGO: About Lake Atexco below Molango, 1400 m., *Moore 3478.* Between Tenango de Doria and Santa María Temescalpa, 4000 ft., *Sharp 45943.* Moore's specimens are to be found at the Bailey Hortorium and the Gray Herbarium; Sharp's, in the herbaria of the University of Tennessee and the Instituto Biológico de México. **PUEBLA:** Near Huau-

[1] Contributions from the Botanical Laboratory, The University of Tennessee, N. Ser. 145.

[2] Li, Hui-Lin. 1952. The Genus Tovara (Polygonaceae). RHODORA **54**: 19–25.

chinango, 4900 ft., *Sharp 441204*. This collection is represented at the Gray Herbarium, and the herbaria of the Smithsonian Institution, the Instituto Biológico de México and the University of Tennessee.

My sincere thanks are given to the Director of the Gray Herbarium and the Curator of the U. S. National Herbarium for the loan of *Tovara* material.—Aaron J. Sharp.

Wolffia papulifera in Texas.—In the eighth edition of Gray's Manual (p. 387. 1950), the late Prof. M. L. Fernald assigned to *Wolffia papulifera* C. H. Thompson a range from Virginia to Illinois, south to Kentucky, Missouri, Kansas, and Mexico. The year before the Manual was issued it had been recorded from Columbia County in north central Florida by Don L. Jacobs (Amer. Midl. Nat. **42:** 110–111. fig. 1. 1949), who suggested that it should be looked for in the region from Georgia to Texas and Missouri. At the Florida station it was accompanied by *Wolffia columbiana* Griseb. and *Lemna perpusilla* Torr., both of which were in abundant flower on 20 September, although no flowers of *W. papulifera* were seen. Since that time it has been reported from southwestern Georgia by R. F. Thorne (Castanea **16:** 35. 1951), and from several localities in Maryland by Neil Hotchkiss (Rhodora **53:** 92. 1951). It can now be recorded from Texas.

The Texas occurrence was on the ranch of Mr. Hamilton Wilson, in and along the west line of Kerr County (south-central Texas), about 20 miles west of Hunt, 23 miles NNE of Leakey, and 90 miles NW of San Antonio, on the divide between the headwaters of the Rio Frio and the South Fork of the Guadalupe River. Abundant fresh material, including many plants in flower and fruit, was sent in Nov. 1950 to the Bureau of Plant Industry, Soils, and Agricultural Engineering by Dr. R. D. Radeleff, veterinarian at the Bureau of Animal Industry station at Kerrville. According to information supplied in February, 1951, by Dr. Radeleff, the plant was first noticed by Mr. Wilson in small numbers two years before on a small fresh water pond fed by springs and with an underground outflow. During the past year the plant had reproduced rapidly, on still days completely covering the pond, which is about 30 by 300 ft. and less than 3 ft. deep at all points. With a light breeze, the plants would accumulate to the depth of several inches on the lee side. The cattle, in order to drink, would often submerge their faces up to the eyes in the water, producing the curious phenomenon of green faces on red cattle, from the abundance of the clinging *Wolffia*. When fall calving began almost all the calves were still-born. Attributing this to the influence of the *Wolffia*, Mr. Wilson shifted his cattle to another pasture and found that the trouble ceased. He had not previously had any difficulty of this sort with his cattle. Later, at the suggestion of Dr. Radeleff, he treated the water with copper sulphate at the rate of 10 parts per million in the estimated volume of water and apparently eliminated the plant, but not long afterward it reappeared and again covered the pond. About a year later he again put his cattle in the old pasture about the pond but had no further difficulties with them, so that the *Wolffia* was evidently not responsible for his previous losses.—S. F. BLAKE, DIVISION OF PLANT EXPLORATION AND INTRODUCTION, U. S. D. A., BELTSVILLE, MARYLAND.

NEW PLANT RECORDS FOR ILLINOIS.—These plants, which were collected by the author in Henry County, comprise new additions to the known flora of Illinois. Specimens of all of these plants were determined at, and deposited in, the Gray Herbarium of Harvard University.

HETEROTHECA SUBAXILLARIS (Lam.) Britt. & Rusby—Along railroad tracks in Section 7, Edford Township, September 17, 1944.

ELAEAGNUS ANGUSTIFOLIA L.—The Russian Olive seems to be rapidly spreading from cultivation in Henry County. On June 16, 1945 a small tree was found on the high terrace border of the Geneseo Creek in Section 28, Geneseo Township, and on June 14, 1951 a larger tree was found in a dense roadside thicket in Section 32, Kewanee Township.

GALIUM MOLLUGO L.—My first specimens were found along railroad tracks in Section 18, Geneseo Township, June 9, 1948. The specimens which were deposited in the Gray Herbarium were collected from the same colony, June 26, 1951.

HYPERICUM DISSIMULATUM Bickn.—Low wet meadow in Section 16, Phenix Township, August 14, 1947, with the suggestion from the Gray Herbarium that it confirms, at least in part, the opinion expressed by the late Professor M. L. Fernald in the eighth (1950) edition of Gray's Manual, that it might be a hybrid of either *H. boreale* (Britt.) Bickn. or *H. mutilum* L. and *H. canadense* L.

VIBURNUM RECOGNITUM Fern.—Low wet woodlands bordering Crescent Lake in Section 15, Oxford Township, July 15, 1947.—RAYMOND J. DOBBS. GENESEO, ILLINOIS.

Chrysopsis falcata Adventive in Canada.[1]—In October, 1949, a number of plants were received for identification from Dr. Fletcher Bell Sharp, of Toronto. Included in the lot was a specimen of Golden Aster, *Chrysopsis falcata* (Pursh) Elliott, collected along the Canadian National Railway tracks west of Toronto, Ontario, on August 25, 1949.

C. factata grows as a native in sandy soil on the Atlantic Coastal Plain from southeastern Massachusetts to New Jersey. Its presence in Canada has not previously been reported, hence its chance occurrence near Toronto is worthy of note. The plant had what appeared to be good fruit and, since it is a perennial, it is quite possible that the species may persist and spread as a weed. The specimen has been preserved in the Divisional Herbarium.—W. J. Cody.

[1] Contribution No. 1177 from the Division of Botany and Plant Pathology, Science Service, Canada Department of Agriculture, Ottawa.

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ERRATA

Page 8, line 25; *for* expermental *read* experimental.
Page 11, line 22; *for* obvous *read* obvious.
Page 36, line 23; *for* obtiuscula *read* obtusiuscula.
Page 38, line 32; *for* untrinque *read* utrinque.
Page 41, line 6; for *Cochleari* read *Cochlearia.*
March cover; for **Phyteographic** read **Phytogeographic.**
Page 98, in the key; *for* 2b *read* 2d; *for* 2c *read* 2e, *for* 2d *read* 2c, *for* 2e *read* 2b.
Cover of No. 641; *for* Davis *read* Davies.
Page 123, running head; *for* Davis *read* Davies.
Page 125, line 18; for violascens read violescens.
Page 128, line 9; for oblongifolia read oblongifolium.
Page 164, last line; for **642** read **641**.
September cover; for **Brickelias** read **Brickellias.**

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