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SOME SOURCES OF ERROR IN GENERA AND SPECIES.

KATHARINE BRANDEGEE.

Systematic botanists cannot be too often reminded that their work is essentially preliminary, that genera and species do not exist in nature, and that their object should be to supply, as soon as possible, a classification in which the determination of plants as to genera should be extremely easy. There would seem to be no good reason why it should not be so simple that the average child of ten could know the first name of most of the organisms belonging to his environment. The beginnings of the natural sciences, learned in the best way from Nature herself, are always delightful, a constantly enlarging new world opens to the observer, furnishing resources which diminish the temptation to less innocent pleasures in times of idleness. The door to these joys of Nature is difficult of opening because of the uncertainty of names. Observation is constantly checked because the result cannot be intelligently communicated.

The tendency at present seems to be to define as a species every organism which can, by any attribute however minute, be distinguished from its relatives. When by this process, which is essentially the description of individuals, a number of "species" have been accumulated, the next step is to "institute" a genus which shall include the group, which genus in very many cases is simply the equivalent of the earlier single species. The genera and species are in this manner made entirely inelastic, and the

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inevitable further variations can only find room by enlarging the scope of the genus until it again comes too near its neighbors. One of the trivial but annoying features of this attempt to make "natural" genera is found in the care of herbaria. Most of us, with some care, can put Aster into its genus covers, but which of us receiving a large number of forms could put them in place at once in Eucephalus, Dællingeria, Ionactis, Leucosyris, Leucelene, Heleastrum Machæranthera, Xylorrhiza, Oreastrum, Oreostemma? etc., certainly not the author of these genera who is continually shifting the species.

Genera which are thoroughly confluent would probably be more easily managed in sections than as a separate genera, as has been shown by the merging of Astragalus and Phaca, especially, as in a century from now the species of Phanerogams will probably be less numerous in spite of the new ones yet to be found. The small genera can continue to be merged, as they are better known, with their nearest neighbors by the simple means of omitting unnecessary detail.

A particularly objectionable kind of genus is the one which is founded largely on geographical considerations. These are only too apt to be based on wanderers, and are a source of uncertainty in phytogeography. These genera especially abound in Cruciferae.

The flood of "new species" in which American botanists are now almost engulfed shows no signs of abating, unless it may be one, that some of the most prolific show signs of discord and begin to discredit each others work. One can have small hope of checking the progress of botanists whose whole aim is the creation of as many species as possible, but I, nevertheless, venture to call their attention to a few elementary facts which some of them seem to have forgotten.

1. *Although most plants are fixed to their place of growth, their seeds may be widely dispersed.*

This would seem to be quite sufficiently obvious, yet forgetfulness of the fact has caused the re-describing of a host of plants, which as years go by slowly find their proper places. The dispersion of species is often attributed to the ice age, in

apparent forgetfulness of the lapse of time involved in geologic periods, which are certainly long enough to quite preclude the possibility of the survival of any species then existing, while it is quite impossible to grant that evolution acting under different environment in widely separate regions will produce identical organisms. Nature works, as has been well said, along lines of least resistance, and certainly the line of least resistance here is the dispersion of seeds by some of the numerous agencies that are known to be competent. As this introduction and interchange of plants has taken place in the past so we find it now, but at a greatly accelerated rate, owing to the much more rapid and frequent intercourse.

How shall we know whether a plant like *Erodium cicutarium* or *Bowlesia lobata* is indigenous, or not very remotely introduced? By the locality where its variations abound, not by its numerical abundance, for it is a curious fact that Eurasian weeds seem to have become hardy under adverse circumstances and developing under more favorable surroundings to a sturdier growth drive out the feebler native plants.

It does not necessarily follow because a plant was first described from a given region, that it was there indigenous. It may well be doubted, for instance, whether *Agrimonia* or *Xanthium* are indigenous in North America; certainly, although widespread, neither of them are so in California.

Plants which are of annual or biennial duration, especially those growing along the coasts, or in wet places, and belonging to groups which find their chief development in distant regions, should be rigorously scrutinized, and if possible compared directly not only with the less-known species of the genus, but also with those of the neighboring genera, in some one of which it may have been already doubtfully placed. A recent example of this is to be found in *Howellia limosa*¹ which appears to have been at least once described before.² Of course this does

(1) Greene, Pitt. ii. 81.

(2) *Mezleria ? valdiviana* Ph. M. ? glaberrima; caule simplicissimo, debili; foliis oblongis, sessilibus, obtusis, apicem versus utrinque 2—3-denticulatis, omnibus ex axilla floriferis; floribus minutis, albis, petiolum æquantibus; laciniis calycinis triangularibus, dimidiam corollam nec non filamentorum columnam æquantibus.

Habitat in stagnulis prov. Valdiviæ; detexit filius Fredericus.

Caulis interdum pedalis vix $\frac{3}{4}$ lin. crassus, e parte inferiore radices filiformes seu

not invalidate Gray's genus *Howellia*, which may however be the same species, its emersed fruit being still unknown, or it may be one of the obscure aquatic *Lobelias*.

The small annual *Lobeliaceae* and *Campanulaceae* plants seem to possess a high degree of variability. The type of *H. limosa* had expanded corollas, but in the numerous specimens I have seen growing the flowers were cleistogamous.

Campanula exigua,³ which must be very near *C. Reverchoni*,⁴ of which the mature fruit was not known, belongs to a group of small annual *Campanulas* which have their home about the Mediterranean. It is almost certainly an immigrant, may even be *C. Læflingii* Brot., of which I have seen only an imperfect specimen. The recently described *C. angustifolia*⁵ is perhaps only a semi-cleistogamous form, for in the thousands of plants observed I never saw an expanded corolla. The plate, where this form is figured in comparison with *C. exigua*, is somewhat misleading, the unexpanded style of the latter being figured in relation with the fully evolute one of *C. angustifolia*. In the genus the style before maturity is thick, cylindrical or clavate and densely hairy; after expansion of the stigmatic lobes the style appears to shrink to a third of its former thickness, and its hairiness is much less perceptible.

Another plant which may perhaps be a wanderer is *Lithospermum glabrum*.⁶ Dr. Gray compares it with the Old World *L. incrassatum* Guss., which I have not seen, but inspection of a

capillares simplices emittens. Folia alterna, internodiis breviora, 4 lin. longa, 1 lin. lata, omnia (excepta infimis?) florum ex axilla emittunt. Pedunculi fere capillacei, primum flore breviores, 2-2½ lin. longi, demum patuli, capsulam maturam æquantes, fere 4 lin. longi. Calycis tubus angustus, 1½ lin. longus, dentes, e triangulari lanceolati, ¾ lin. longi, trinerves in fructu majores. Corolla calycem bis æquans, dorso fissa, quinquepartita, sed non quinquepetala; lobi duo superiores vix breviores, sed paullo angustiores et auctiores, inferiores latiores, lineares, apice rotundati. Filamenta monadelpha; antheræ connatæ paullulum incurvatæ, inferiores duæ setuloso-aristatæ. Stigma crassum, bilobum. Capsula compresso-prismatica, 3½ lin. longa, 1 lin. lata, subtruncata, apice fissa, unilocularis, polysperma, placentis duabus, parietalibus. Semina oblonga, luteofulva, nitida, sat magna.

Vergleichen wir Endlicher's genera p. 510, so weicht unsere Pflanze durch die einblattrige Blumenkrone, die einfacherige, abgestutzte, nicht mit der Spitze hervorragende Kapsel von den Capschen Mezlerien ab, so wie durch die Monadelphischen Filamente, und nach dem Prodromus von De Candolle sollen die Mezlerien halbkugelige Kapseln haben. Dennoch glaube ich kaum, dass die angegebenen Verschiedenheiten eine generische Trennung rechtfertigen dürften.—R. A. PHILIPPI, *Bot. Zeitung*. xxii, 217.

(3) Rattan, *Bot. Gaz.* 11, 339.

(4) Gray, *Syn. Fl.* ii. pt. i, Supp. 396.

(5) Eastwood, *Proc. Cal. Acad.* ser. 3. i, 132 pl. xi.

(6) Gray, *Proc. Am. Acad.* xvi, 227.

fragment, kindly furnished me by Mr. J. G. Lemmon, shows it to be a swollen form of the plant subsequently described as *Allo-carya stipitata*.⁷ Some misplacement of labels is to be suspected, for the form is common in the Alameda marsh lands, particularly about Mount Eden, and is sometimes even stouter than the one in Mr. Lemmon's herbarium.

2. *Although plants are bisexual, one or the other sex is apt to preponderate in varying proportion.*

The influence of environment upon plants has been much considered, and seldom quite ignored, but the sexual differences, unless they have progressed so far as complete separation, have been little regarded. These differences are particularly noticeable in incompletely dioecious annuals, and short-lived perennials, where the greater sacrifice demanded of those which are practically female often appears to shorten the internodes, making the plants lower and more stocky and the flowers smaller. Several of the recent species of *Sidalcea* have no other foundation than these sexual differences. The difference in development of the flowers in different plants of *Borraginaceæ* *Polemoniaceæ*, etc., has most probably a similar origin.

3. *Hybrids, or rather crosses, are common among closely related species, growing together.*

In Europe spontaneous hybrids are numerous and well known, especially in *Rubus*, *Epilobium*, *Hieracium*, *Cirsium*, etc. In this country they have been systematically studied only among the willows. Our lists of species include, and perhaps unavoidably, many of them, as they can only be certainly distinguished in the field, and the collector seldom takes the trouble, even if he suspects, to verify them. They rarely reach generic rank; I believe, in our Flora, only one, *Crockeria*,⁸ which is most probably a hybrid of *Lasthenia* and *Eatonella Congdoni*, has been made out with comparative certainty. *Vanceleva*⁹ is, however, a very suspectable plant. There is in the heads I have examined

(7) Greene, Pitt. i, 19.

(8) Greene, Bull. Cal. Acad. i, 93.

(9) Greene, Pitt. iv, 50 — but style tips, not "sub-terete."

an unusual variation among the florets, the style-branches are irregular, and the stigmatic lines often irregular or indistinct. If it is a hybrid of course *Grindelia* is one of the parents. The doubt concerning this plant attaches in some measure to the genus *Eastwoodia*.¹⁰

Hybridity appears to be within certain limits a matter more of relative size and texture of the essential organs than of absolute relationship as ordinarily accepted and it will certainly not be necessary to resort to parthenogenesis¹¹ to account for the seeding of an *Antennaria* as long as the male of any species of the genus or even of *Gnaphalium* be present.

The field investigation of hybrids is a most interesting and useful employment for botanists who do not have access to large herbaria and libraries. The life history of a single species, its limit of variation and its hybrids, if any, would be far more useful than a dozen "decades" of new violets or *Senecios*. A few years ago I happened upon a very instructive object lesson of this kind. In the experiment grounds of Mr. Luther Burbank, the well-known horticultural hybridizer, at Santa Rosa, I observed a row of *Zauschneria* about a hundred yards in length. Mr. Burbank informed me that he had transferred a single plant from a locality not far away, and saving all the seeds produced by this self-fertilized individual, had planted them to see what variations he could get. In this row were all the forms, both of flower and foliage, which have been observed in the genus, except the extreme narrow or revolute leaf which is climatal variation of drier regions. A few experiments of this kind would rid us of a host of species.

A description of a supposed new organism is imperfect unless every part is fully described. The description by comparison is often worse than none, it involves the assumption that the author is capable of placing a species in the correct genus, or a genus in the proper group, which sometimes can hardly be granted.¹² The

(10) Brandegee, *Zoe* iv, 397.

(11) Greene, *Plant World*, i, 102.

(12) Cf. *Zoe* iv, 63-103 and 287-291.

chief American sinner in this respect is, in fact, somewhat notorious for comparing his new species, not with their nearest, but with their more remote relatives. It may be observed in descriptions by this author, that after a brief description dealing only with the grosser anatomy, the plant in question is compared with one or two others, ending with "species not near akin," "exceedingly well-marked," "not closely related to any other," etc.; indeed, he not only habitually does this kind of work, but defends it¹³ as sufficient. In genera the work of this author is even worse, if that be possible, and he has abundantly shown that he is unable to trace an unfamiliar plant to its correct genus, or a genus to its proper group. This may possibly be due to defective methods of investigation, for inability to get at the finer details of structure is only too evident. Such grievous errors as the location of the Zygophyllaceous genus *Viscainoa*¹⁴ in the vicinity of *Simmondsia* and of *Biolettia*¹⁵ near *Erigeron* ought to have taught him caution, but that it has not is quite evident from the genus *Wootonia*,¹⁶ which is described as rayless, and of "A quite distinct new type, about equally allied to *Bidens* and *Cosmos*, but impossible to be referred to either." The figure of the plant agrees so well with Dr. Gray's *Dicranocarpus parviflorus*¹⁷ as to raise at once a suspicion of their identity; and a specimen, very kindly furnished at my request by Mr. Wooton, shows the suspicion to be well founded. In the only flower examined there were four well-formed but short rays, and four disk flowers. Both under *Dicranocarpus* and *Wootonia* the specific name *parviflorus* has been applied on account of this very obvious character. It is not, however, the earliest specific name, the first known description being under *Heterospermum*,¹⁸ but drawn from very imperfect material. It was collected "between the Guadalupe

(13) "One of our beginners in botanical authorship has lately published the complaint that of my *Antennaria media* no description has been given [E. Nelson in Bull. Torr. xxiv, 210]. The complaint is not, I must confess, wholly groundless; although, in giving the essential characters of the species as compared with those of *H. umbrinella* on the one hand, and of *A. alpina* on the other, I fully satisfied the actual requirements of publication, at least as regards the public of experienced phytographers." E. L. Greene, Pitt. iv, 85.

(14) Pitt. i, 163—Embryo very incorrectly described.

(15) Pitt. ii, 215.

(16) Bull. Torr. xxv, 121. Pl. 333.

(17) Plantæ Thurberianæ, 322.

(18) *H. dicranocarpum*. Pl. Wrightianæ. i, 109.

mountains and the Pecos," in the same general region as Mr. Wooton's plant. Both in Benth. & Hook. Genera Plantarum, and in Engler's Pflanzenfamilien the genus is located among the Melampodiæ.

ASCLEPIAS KOTOLO.

ALICE EASTWOOD.

[This species was published in ZOE, v. 68, without the locality or an explanation of the name. This omission arose because part of the manuscript was misplaced and the proofs were not seen by the author.

As it will be confusing and inconvenient to have part of the description in one number of the magazine and part in another, it is here given complete.]

Asclepias Kotolo, Tall and stout about, 1 m. in height, the simple stems hollow and cylindrical, 15 mm. in diameter near the base. Leaves opposite, ternate or rarely quaternate, 10-25 cm. long, 5-8 cm. wide, oblong; cordate truncate or cuneate at base; the apex obtuse, acute or acuminate and mucronate; margins entire or somewhat sinuate; coriaceous, canescent with soft, velvety tomentum, the upper surface of the leaves becoming smoother with age; midrib broad with the chief veins and reticulations noticeable under the tomentum; petioles thick from almost none to about 1 cm. long, 5 mm. broad, with the upper surface concave. Umbels when in flower near the top of the stem but in fruit appearing about the middle, owing to the growth of the upper stem; involucre bracts linear-lanceolate, varying from 5-20 mm. in length. Flowers fragrant, 30 or more in each umbel, on pedicels 2-4 cm. in length, which in fruit become stouter and longer. Sepals and petals reflexed, the former green with the outer surface densely tomentose, the inner glabrous except near the apex, ovate-acuminate to oblong, unequal, 2-3 mm. long. Petals white, tinged with rose-color or with the midrib rose-color, 3 petals broader than the others; the former elliptical, 7 mm. long, 4 mm. broad; the latter oblong, 2-3 mm. broad; apex acute, margin membranous. Column short; hoods glabrous ven-