CEPHALOZIA

(a genus of Hepaticæ)

Its SUBGENERA and SOME ALLIED GENERA.

by

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PREFACE.

The following memoir does not profess to be a complete monograph of all known species of *Cephalozia*, but only a descriptive account of all the species I have been able to examine. A few additional species are known to me only by name, and a few others may lurk undistinguished, or as yet unpublished, in our large herbaria; but the material here brought together amply suffices for my purpose. I have chosen this genus for illustration, because, in an extended view of its limits, it comprises within itself certain characters heretofore deemed of generic or even of tribal importance. Such are, 1°, the frondose, as contrasted with the leafy, stem; 2°, the succubous, transverse, and incubous foliage; 3°, the acrogenous and the cladogenous fructification; all of which modes are to be seen in the various species of *Cephalozia*, and the two last-mentioned often coexist in a single species, or even in the same individual. On the other hand, characters hitherto overlooked, or underrated, are proved, by an extensive study of Hepaticæ, to be constant throughout large groups of species, and therefore of great diagnostic value. These are 1°, the insertion of the branches on the stem: either all postical, as in *Cephalozia*, *Kantia*, &c.; or all lateral, as in *Lejeunea*, *Radula*, *Frullaria*, &c.; or some combination of these modes in various other genera, the most unusual being where all the leafy and the flowering branches are antical (epilados), and only the root-bearing branches are postical (hypocladous), as in *Anomoclada*. The insertion of the branches with respect to the leaves varies considerably in different genera, but is usually constant to one type in the same genus, and sometimes throughout a series of genera. Thus, the branches are all exactly axillary to the sideleaves in *Frullania*, *Scapania*, &c.; infra-axillary (adjacent or adnate to the outer base of the leaf) in *Lejeunea* and *Radula*; axillary to the underleaves in *Kantia*, &c. 2°, the origin of the primary keels or angles of the perianth, which are either derived from the marginal (or intramarginal) sutures of the subplane flower-leaves, as in *Lophocolea*, *Plagiochila*, &c.; or else are the already existing angles of the complicate (or at least carinate) flower-leaves, as in *Cephalozia*, *Scapania*, &c. 3°, the structure of the capsule-walls and the number of cell-layers composing them. This is independent of the kind
and degree of dehiscence of the capsule; as also of the structure of the elaters, and their persistence or decidence; the importance of which in the separation of genera and tribes has long been acknowledged. 4°, the number of the sexual, and especially of the male, organs, which is very constant in many genera, and varies through ascertainable limits in all others. Thus the ♂ florets, or bracts, are monandrous in all Cephalozia, Kantia, Anthelia, &c.; diandrous in the great mass of Lejeuneæ, and monandrous only in two or three small sections of that extensive genus; diandrous—very rarely triandrous—in Frullania; polyandrous in some Plagiochila, Tylimanthi, Scapania and Gottscheæ; &c. &c. The number of pistillidia varies through wider limits, and in many genera the ♀ flowers are polygynous; in Lejeunea, however, they are constantly monogynous; in Frullania, very mostly tetragynous, although one or other of the four pistillidia may remain undeveloped, thus reducing the actual number to two or three. Characters derived from the number and structure of the sexual organs do indeed figure in the descriptions of a few genera framed by Nees, Gottsche, &c., but they deserve accurate determination in all. The relative position of the ♂ and ♀ flowers affords as important characters for discriminating species in Hepaticæ as in Mosses, and is in every case necessary to be ascertained.

The species I have united under the name Cephalozia are all so closely allied by important characters that they must ever stand near each other in a natural arrangement. In the introductory portion of the memoir will be found a full exposition of the reasons which have induced me to combine them into a single genus. To some minds certain of what I have considered mere subgenera may have the value of distinct genera. Perfect agreement on this head is perhaps unattainable; but it is obviously a mere question of names whether we choose to write (for instance) Cephalozia monodactyla, or Cephalozia (Zoopsis) monodactyla, or Zoopsis monodactyla; so long as we do not lose sight of the close relationship of the species to typical Cephalozia.

In the citation of authorities I have followed the rule of Elias Fries; "Ofver vexternes namn" in the Botaniska Utflygter for (I think) 1845: in always citing the writer who first named and described (or published named specimens of) a species as the authority for it. In April, 1846, Dr. Camille Montagne shewed me a translation he had just made of
Fries's essay. It was his intention to publish a notice of it in some periodical, but I cannot make out that he ever did so. However, he allowed me to copy from it as much as I chose, and I here reproduce, in the words of Montagne's translation, a portion of my extracts.

"L'usage d'ajouter à chaque nom son autorité a été pour la science la boîte de Pandore, d'ou sont sortis une foule d'abus; pour y remédier je propose les règles suivantes:

"L'écrivain que le premier a publié un nom d'espèce, d'une manière conforme aux principes généralement admis doit être cité comme l'auteur de ce nom. Ainsi quoique Linné ait adopté sans changements une foule de noms spécifiques d'anciens auteurs, particulièrement de Rivin, on ne doit pas remonter plus haut que lui ["ni plus haut que Tournefort pour les genres"] ajoute Montague.

"Lorsqu'une espèce a été supprimée à tort, ou qu'un nom a été employé mal à propos, il est bon d'ajouter, à titre de document historique, outre le nom du fondateur, celui de l'auteur. D'après ce principe, il est mieux d'écrire, par exemple, salix myrtilloides Linn., Wahlenb., que, suivant l'usage commun, Salix myrtilloides Linn., nec Willd., nec Smith. La première forme seule apprend quelque chose de positif.

"Lorsqu'un vieux genre est partagé en plusieurs et que par suite le nom générique est changé, et que les espèces et leurs noms restent sans changement, on doit conserver comme autorité l'auteur du nom d'espèce. &c. &c."

These rules seemed so just and reasonable that I determined to adopt them, as I did accordingly in my Exsiccata of the Mosses and Hepaticæ of the Pyrenees (London, 1847), and in a memoir on the same flora presented to the Botanical Society of Edinburgh (Jan. 11, 1849).

It has been too little remembered by some naturalists that the constant citation of an author's name along with that of a species is a modern innovation, not contemplated by Linnaeus, and that the former name is by no means an integral part of the specific name. It is doubtless intended to serve some purpose, and that is, for me and most other biologists, to indicate the original authority for a specific name, and not for the combination of that name with a generic name different from the
one under which it was at first placed. The framer of the new composite name can be recognised, whenever it seems desirable, by adding on his name to that of the author of the species, thus:

Plagiothecium denticulatum (L.) Schimp.,

which is becoming the practice of every cryptogamist of repute, as it has been for some time of all zoologists, whose usages it ill becomes botanists to pretend to ignore. The contrary practice may tend to the glorification of the author who puts his own name alone to an old species in a new genus, but it certainly involves confusion to the student; of which we have a flagrant example in the monograph of Euphorbiaceae, contributed by John Müller of Aargau to Decandolle's 'Prodomus,' where even Linnaeus is robbed of his well-established names—sometimes generic as well as specific—and we read, for instance, of Ricinus communis Müll Arg.!!

I believe it is Decandolle who recommends us "never to make an author say what he did not mean to say." Verily a good maxim! Let us apply it in a case of my own. When I returned to civilization and modern botanical literature, after 15 years' wandering in the wilds of South America, I found hepaticologists writing "Hapantthus scutatus Spruce," and "Sarcocyphus adustus Spruce;" but I had never said that, and never meant to say it. In my memoir on Pyrenean Mosses I had assigned to these two species the authority of their founders, thus: "Hapantthus (scutatus Web. et Mohr)" and "Sarcocyphus (adustus Nees);" for I was not the author of either the generic or specific names, and all I had done was to take the species out of genera to which they did not belong and put them in their proper place; but I did not think that gave me any right to arrogate the names to myself, and to quite ignore their actual founders.

It is further to be noted that in Hepaticæ the great bulk of the species stood until quite recent times in a single genus, Jungermania; in Musci (not quite so recently, but still within the memory of veterans of the science) in Hypnum and Bryum; and in Lichenes in the solitary genus Lichen. It is therefore essential to the student to know in what author he may find the original definition of (for instance) Jungermania bidentata, and often of slight (or of no) importance to him to know who first called it Lophocolea bidentata.*
It has been in some sort an advantage to Hepaticology and Lichenology to have had the species united for a long period under a single generic name, for it has conducted to greater wealth and variety of specific names. When a young botanist, it had seemed to me desirable to avoid duplicate specific names in the same natural order, and on mentioning this to Taylor and Montagne I was pleased to find that, as far as possible, it was their own rule of practice. Some of Taylor's names are, indeed, very original and expressive, although it may be admitted that in his eagerness to found new species he sometimes attached too great an importance to the differences he had so acute an eye for detecting.

This brings me to the subject of synonyms, of which I may say I have quoted as few as possible—no more, in fact, than were needed to authenticate a name and to guide the student to original descriptions of a genus or species. For synonymy belongs more to history than to science, and has now assumed such vast proportions as to demand a separate treatise for its adequate elucidation. Exsiccata of Cephalozia can rarely be cited with any confidence, the specimens being too often incorrectly named, and those given under the same number and name being sometimes not all of one species in the different sets. In illustration of this, let the reader consult my remarks under C. catenulata.

In the descriptions I have generally allotted more space to the European species. The South American species are all described at length in my forthcoming "Hepaticae of the Amazon and Andes", so that I have here mostly limited myself to a brief specific character of each. In the terminology I have adopted the term foliola for the underleaves, or stipules—the so-called amphigastria of authors; and I call the upper face of a stem or branch, antical; the under or rooting face, postical; and the sides, right and left of the axis, lateral. In estimating the comparative dimensions of leaf-cells I have used the scale proposed in my paper on Anomoclada (Journ. Bot. 1876) which I here subjoin for reference*. As to the position of the inflorescence I have called it clado-

*The comparative size of the cells of Hepaticae:

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<thead>
<tr>
<th>Cellular</th>
<th>diametro</th>
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<tr>
<td>magna (large)</td>
<td>1/10 mm = '10 mm</td>
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<tr>
<td>majuscula (rather large)</td>
<td>1/20 mm = '05 mm</td>
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<td>mediocres (medium size)</td>
<td>1/30 mm = '033 mm</td>
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<td>parvula (smallish)</td>
<td>1/40 mm = '025 mm</td>
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<tr>
<td>parva (small)</td>
<td>1/50 mm = '02 mm</td>
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<tr>
<td>minutula (very small)</td>
<td>1/60 mm = '0167 mm</td>
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<tr>
<td>minute (minute)</td>
<td>1/70 mm = '0143 mm</td>
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<tr>
<td>minutissima (very minute)</td>
<td>1/80—1/100 mm = '0125—'01 mm.</td>
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genous only when the gynæcium and its envelopes occupy the whole (or very nearly the whole) of a very short branch, such an inflorescence having heretofore been mostly accounted lateral; but when it occupies the apex only of the main stem, or of a long branch, I have considered it acrogenous. Several Cephalosia have both the stem and its more or less elongated branches floriferous at the apex. The same thing occurs in certain subpinnate Plagiochile, where the ♀ inflorescence is mostly terminal on the branches—more rarely on the main axis—and yet is in every case to be accounted truly acrogenous. Where the stem is dichotomous, and the main axis terminates at the first forking—or (if you will) is being repeatedly doubled—the inflorescence may still be acrogenous, as is seen in Blepharostoma, the Plagiochile $ Cristata$, &c. &c.; but in the similarly-branched Bazzania the ♀ flowers, consisting each of a short postical branch, are truly cladogenous.—When I speak of flower-leaves, or anthophyls, I mean the three (more rarely only two) innermost involucral leaves, whose marginal union constitutes the tubular perianth, or colesule. They are thus exactly analogous to the petals of (for instance) the primrose, whose union constitutes the gamopetalous corolla. [The folia floralia of some authors are the leaves exterior to the whorl next the perianth, this innermost whorl alone constituting for them the true involucre. I call them, what they really are, outer bracts.]

It only remains for me to gratefully acknowledge the aid I have received, in the way of specimens of many of the plants described, especially from Messrs. CARRINGTON, HOOKER, HUSNOT, LIMPRICHT, LINDBERG, PEARSON, SLATER, and STABLER.

Richard Spruce.

Coneysthorpe, near Malton.
Sept. 27th, 1882.
ON CEPHALOZIA,
ITS SUBGENERA AND ALLIED GENERA.

In a paper on "The Musci and Hepaticæ of the Pyrenees," read before the Botanical Society of Edinburgh, Jan. 11, 1849, and printed the same year in their 'Transactions' and in the 'Annals and Magazine of Natural History,' I proposed to separate from Jungermania a group of small species, consisting mainly of the section Bicuspidæ of Nees (Hep. Europ. II, 211, a. 1836) to which I gave the name Trigonanthus, because the perianth was normally a trigonous prism. This character, combined with the postical ramification—all the branches springing from the back, or underside, of the stem, and the polyphyllous tristichous involucre, in which underleaves were always present, although often absent from the stem—seemed to amply justify the separation of the group, as a distinct genus, from Jungermania. I did not then know that Dumortier had previously proposed for nearly the same group the name Cephalozia, first in his Sylloge Jungermanidearum Europæ (1831) as a section of Jungermania, thus defined: "Perichætium polyphyllo sumique imbricatum, phyllis dissectis:—Species stipulata vel extipulata, foliis suberurrentibus bifariis explanatis divisis."—and afterwards, in his Recueil d'Observations sur les Jungermaniææs (1835) as a genus, with the following essential character: "Périchèze polyphylle, à phylles laciniées, imbriquées circulairement et involucrant la base de la colesule. Colesule sessile dressée renflée contracté et dentée au sommet"; which is a slight modification of the definition given in the Syloge. In this case, as in that of nearly every genus proposed by Dumortier, were it not for the list of species he gives under each genus, we might be at a loss to recognize it from his meagre and more or less incorrect generic character. This has apparently arisen from his imperfect knowledge of the plants themselves, and his reliance on the figures and descriptions of other authors, which also he has sometimes misconstrued or wrongly com-
bined. Thus he unites to *Cephalozia* the *Jungermania capitata* of Hooker, on account of its rather large involucre, whereas it really belongs, by all its characters, to his own § *Lophozia of Jungermania*; but he excludes a very characteristic *Cephalozia*, *C. connivens* (Dicks), solely because of the ciliated mouth of the perianth, and relegates it to his genus *Blepharostoma*, whose character is "Perichaetium polyphyllum undique imbri-catum, phyllis articulato ciliatis. Plantæ extipulatae foliis transversis vel verticalibus." It hardly needs pointing out that *C. connivens*, having neither transverse leaves nor ciliated bracts, could not, on Dumortier's own shewing, be a *Blepharostoma*. He enumerates but 3 species of this genus; *Bl. trichophyllum*, *Bl. connivens*, and *Bl. setacea*. If the first be considered the type of *Blepharostoma*, the second is a *Cephalozia*, and the third a *Lepidozia*; that is, they belong to three distinct genera—all of Dumortier's own proposing!

Dumortier's generic character does not exactly correspond to any single species of *Cephalozia*, yet he indicates by its name a peculiarity which, although found also in some other *Hepaticæ*, is normally never absent from any species of *Cephalozia*, namely the capitate or comate female flowers. The bracts are usually much larger than the stem-leaves, and are closely set in 3 or 4 transverse rows, and along 3 sides of the stem or branch—*i.e.* they are tristichous; for, although in a great majority of the species underleaves are wanting to the stem, they are never absent from the flower heads, and (at least in the innermost row) they mostly equal the side leaves in size and form, being often connate with them into an outer cup, or perianth. Moreover, although in certain species the stem leaves may be round and entire—in a few others reduced to mere papillæform projections, or scales, and in one species entirely absent—in place of the bilobed leaves that prevail in the great majority of *Cephalozia*—the bracts of both male and female flowers are, as a rule, in every species, deeply cloven, mostly bifid—in a few species occasion-ally 3—5 fid.

Within the involucre, quite free from it, and usually protruding a long way beyond it, is a narrow trigono-prismatic perianth; only in certain species of the subgenus *Cephalozia* does it acquire supple-mentary angles and become 4—5—or 6-angled. This three-sided pe-rianth differs essentially from that of *Lophocolea* in the origin of its angles, or keels. In *Lophocolea* the angles are at the marginal sutures
of the connate anthophyls, or flower-leaves, by whose union the (primitively) triphyllous perianth becomes a monophyllum colesule. But in Cephalozia the angles are the folds, or keels, of the complicate flower-leaves; and as these leaves are 3, the third being postical, their union forms a 3-carinate perianth, whereof two keels are lateral, and the third keel is postical, or at the under side. This structure obtains in every Cephalozia, and in several other genera—whether the leaves be succubous, transverse, or incubous—and it always originates in the same way. The sutures at the actual margins of the anthophyls are either plane or depressed, but not elevated into a keel, except in some species of Cephaloziella; and even in these, although the perianths may have normally more than three angles, other perianths are nearly always to be found—sometimes on the same plant—which have the angles reduced to three, and invariably with the third angle postical. [See below, under the description of the subgenus Cephaloziella.]

But in Lophocolea the leaves and bracts—instead of being inflexed on each side of their axis, and more or less complicate, as in Cephalozia, are either plane or bent in the contrary direction—i.e. convex, or reduplicate (i.e. recurvo-canalicate); and the anthophyls are united, either by the actual margin into a keel, or the suture is intramarginal, so that one of the two contiguous leaves projects beyond the suture into a limb or wing, which is a very common feature in tropical Lophocolea, and exists also in the European L. bidentata var. alata. And as under-leaves are everywhere present, the postical anthophyl—similar to, but usually narrower than the lateral leaves—forms with these latter a trigonous perianth, in which (as is easily seen must be the case) the third angle is antical, and the third face postical; the exact contrary of what obtains in Cephalozia, where the perianth is plane in front, and the third angle is postical.

This structure of the perianth of Lophocolea is always accompanied by, and may be considered to originate in, a more or less distinct lateral compression of the stem with the leaves. In Plagiochila, where the underleaves (if present at all) are mostly reduced to the grade of minute scales, the lateral compression reaches its limit, and the perianth becomes flattened and bivalvular—often winged at the antical suture of the valves (or anthophyls) by the overlapping edge of one of the two, and sometimes also at the postical suture. The floral underleaf (where it exists)
Cephalozia.

is often adnate to the perianth, either externally, or more frequently internally, and usually by only one edge, so as to form an inner wing to the postical suture. It is, however, not very rare to find a floral underleaf connate with the side leaves into a trigonous perianth, and then the diagnosis from Lophocolea may become rather difficult; especially where the stem leaves of the Plagiochila are bifid at the apex (as in Lophocolea), which is a not unfrequent character of several Plagiochila. For in both genera the recurvation of the antical leaf-margin is a constant feature; and, in both, the perianths are often terminal on the stem, as well as on the branches. The branches of Lophocolea, whether floriferous or not, are never truly postical (as has been affirmed of them)—never spring from the axil of an underleaf—sometimes, indeed, stand midway between two underleaves. Their true origin is contiguous to, and at least half way within, the under angle of a sideleaf. The branches of Plagiochila have in many species a similar origin, but in some they are more nearly mid-axillary. Pinnately-branched species are rare in both genera, but do exist, and then the branches spring exactly from the mid-axil of the side-leaves, as in Plagiochila abietina N., Lophocolea tracyropa Tayl. &c. In Leioscyphus and Mylia, where the perianth is compressed laterally, as in Plagiochila, but apparently never winged at the sutures, the floral underleaf is sometimes included; very rarely is it connate at both edges with the sideleaves into a trigonous prism, with the postical face much the narrowest. In Leioscyphus, however, I have found the branches constantly axillary to the underleaves—i.e. postical, although subfloral innovations axillary to the side leaves are occasionally present; and there are cases where the ramification is almost the only character to be relied on for distinguishing this genus from Lophocolea.

In other genera allied to Lophocolea, but with a pluricarinate perianth, although the number of keels or angles may vary in nearly every species, yet, wherever the angles are reduced to only three, the third angle is invariably antical; of which we have examples in Eu-Jungermania sphaerocarpa, lurida, amana, &c., and in Nardia (Eucalyx) obovata (N.), N. (Eucalyx) succulenta (Lehm. et L.) Spruce, &c. The lateral flattening of the leaves to the stem in all these genera is visible enough at the apex of the stem and branches and in the inflorescence. In some cases it is so pronounced as to render the leaves laterally complanate, or accumbent.
In those genera, however, that shew a *frontal* compression of the leafy stem—a great majority of which have either succubous or transverse leaves—and a perianth whose primary angles are derived from the medial *fold*, or keel, (and not from the marginal sutures) of the flower-leaves, whenever those angles are reduced to three, the *third angle is constantly postical*, and the perianth is flattened (not keeled) in front. To this law there is no exception, as may be seen throughout the large genera *Lejeunea* and *Frullania*; also in *Lepidozia*, *Micropterygium*, *Herberta* (*Sendtnera*) and many others. Even in *Cephalozia*, where the great majority of the species have succubous leaves, the same law obtains.

In *Scapania* and *Radula*, where the perianth is so much compressed frontally as often to bring the upper and under faces into contact—at least in the upper half, and there are externally no angles visible besides the two lateral (or marginal) ones, a transverse section will often shew a very slight and obtuse, yet distinct, postical keel. It is hardly necessary to observe that the flattening of the perianth in these two genera, as also in the few species of *Lejeunea* where it exists, is exactly at right angles to that of *Plagiochila*, *Leioscyphus*, &c.

The whole of the leafy *Jungermanidae* thus divide themselves into two great groups, whereof the one (*Epigonianthae*) has the third (or odd) angle of the perianth in front, or *antical*; and the other (*Hypogonianthae*) has it at the back, or *postical*. I do not, however, propose them as primary divisions, for there are cases—chiefly in the genus *Jungermania*, as it remains after the elimination of *Cephalozia* and a few other smaller groups—where the leading characters of the two divisions seem to combine, or their distinction to fade away. For instance, a small section of *Jungermania*, comprising *J. J. pumila*, *riparia*, *cordifolia*, &c., has a furrow instead of a ridge at the antical suture of the perianth, and thus recedes from *J. spherocarpa* and other plainly epigonianthous species.

It is only, in fact, by a judicious combination of all the characters which an extensive study of species reveals to us, that a perfectly natural grouping of the genera of *Jungermanideae* can be arrived at; and that is not the task I propose to myself to-day.

A recapitulation of the main characters of *Cephalozia*, as I now understand it, is needed to render clear what I shall have further to say of its subgenera and allied genera.
1. *Prothallium* slender, linear or almost filiform, consisting of only a single (more rarely in part of a double) series of cells; either simple or subramose; often passing at the apex insensibly into the stem, and persisting a long time.

2. *Plants* usually small and tender, in only a few species rather robust; of almost all shades of green and brown, or whitish and pellucid, sometimes tinged with rose; growing in depressed matted tufts, or flakes, or creeping over Sphagna and other mosses.

3. *Stems* usually prostrate or procumbent, leafy throughout, or rhizomatous and leafless at the base—very rarely with the leaves reduced to mere scales—still more rarely frondose; branches all postical, springing from the underside of the stem, and axillary to the underleaves where any exist; *radicles* usually copious, pale and slender.

4. *Leaves* mostly succous, in a few species transverse, in a very few subincubous; horizontal or assurgent, never deflexed, roundish, or subquadrato, or cuneate, rarely lanceolate, very seldom plane, usually concave, and in most species somewhat complicate and bilobed (but never divided to the very base, nor with capillary lobes), in a very few species undivided or variable at the apex; margins uniformly plane or subincurred—never convex or recurved—very mostly quite entire, but in a few species toothed. *Reticulation* in the typical species lax and pellucid, in a few species denser and subopaque; cells often subquadrato, in the subgenus *Alobiella*, large and oblong or rectangular; cell-walls mostly thin, rarely conspicuously thickened at the angles; cuticle smooth or scaberulous.

5. *Underleaves* much smaller than the side leaves, and oftener undivided at the apex, but in some species subdentate at the margin; entirely absent from many species [except in the involucre, where they exist in every *Cephalozia*.]

6. *Inflorescence* dioicous or autoicous—very rarely paroicous. *Andræcia* amenuiform, occupying the whole, or only a part, of a branch, rarely terminal on the stem. *Bracts* in many pairs, leafy (even where there are no stem-leaves) bifid, uniformly monandrous.

7. *Gynæcia* capitata, usually seated on an abbreviated branch (i.e. cladocarpous), but sometimes terminal on longer branches or on the main
stem (acrocarpous). Bracts much larger than the subjacent leaves (where any exist on the same axis), tristichous, i.e. with underleaves added, even where absent from the rest of the plant, and in three, or more, amplexicaul rows; all cloven (usually bilobed, sometimes 3—5-lobed) and very often toothed or subspinose; cells elongate. Pistillidia about 20, shortish and flaskshaped.

8. Perianth free, usually very long and narrow, and elongato, reticulate like the bracts, fusiform, trigonous—rarely with the angles varying from 3 to 5 or 6 in the same species, but, whenever reduced to 3, with the third angle always postical; mouth truncate, but usually constricted (from the angles becoming more pronounced and pliciform at the apex), variously toothed, ciliate, laciniate, or entire.

9. Calyptra free (superior), with the sterile pistillidia surrounding its base.

10. Capsule on a long pedicel (which at the calceolate base buries itself deeply in the fertile branch), oblong or sub-cylindrical—usually about twice as long as broad, but in the subgenus Cephaloziella often shorter, oblongo-globose—4-valved to the base; capsule-walls of two layers of cells, whereof the inner are strengthened by semiannular fibres.

11. Elaters elongate bispiral, about as wide as the diameter of the smooth or scaberulous spores.

12. Propagula apical, minute, red or whitish, polyhedral or amorphous; rarely present, except in a very few species.

I divide Cephalozia, as above-limited, into eight subgenera, as follows:

1. Proto-Cephalozia
2. Pteropsiella
3. Zoopsis
4. Alobiella.
5. Eu-Cephalozia
6. Lembidium
7. Odontoschisma
8. Cephaloziella
In pointing out wherein these differ from each other, and where they touch, or coalesce, so as to constitute but a single comprehensive genus, I shall take first the typical group, and thence pass on to the less-known, or hitherto unnoticed, groups.

To begin then with Eu-Cephalozia, (whereof the well-known and widely distributed Jungermania bicuspida L. is the most characteristic example,) we find in this group: Stems slender and mostly fragile, and usually (but not in every species) coated with large pellucid cells, vaguely branched, emitting radicles throughout their length, and in some species rooting also by flagella. Leaves succous—in some species almost longitudinal, but becoming crowded and nearly (or quite) transverse in the flower-spikes, mostly oblong—in some species rhombeo- or quadrato-rotund—concave or obtusely complicate, seldom plane, more or less deeply bifid, but never to much below the middle; segments acute or subacuminate, rarely obtuse or rounded; margins entire. Cells often large (\(1/15\) mm long), but more commonly moderate (\(1/30-1/40\) mm), never minute, often subquadrate, or quadrato-hexagonal, and about as long as broad, only a few of the lower cells being elongate. Underleaves normally wanting in most species, always present in a few, and occurring exceptionally in some others. Female infl. mostly cladogenous; but the flowering branch is sometimes much elongated, and even the main stem occasionally flowers at its apex. Bracts normal, often toothed, or subincised, not constantly connate in any species. Perianth always trigonous, Capsule usually elongate.

A small section (Subluridae) of Eucephalozia has opaque stems, without any pellucid cortical layer, and usually lurid foliage, with more or less obtuse lobes; its main representatives are C. Francisci and C. fluitans. In habit and character it approaches Odontoschisma on the one hand, and Jungermania § Gymnocoela on the other.

To unite Odontoschisma (= Sphagnoecetis Nees) with Cephalozia may at first sight shock the notions of those conversant only with our two European species; although the impossibility of framing characters, derived from the parts of fructification alone, to distinguish between the two supposed genera, is acknowledged by all who have attempted it. For, although the stem-leaves of Odontoschisma are usually of firmer texture, subrotund and entire, yet the tristichous bracts of the clad-
ogenous female flowers are bilobed and usually laxly reticulate as in Eucephalozia; while the trigonous perianth, the form and number of the pistillidia, the calyptra, and the capsule in two layers, whereof the inner are strengthened by semiannular fibres, are all exactly on the same type. In his 'Mexikanske Levermosser,' Gottsche admits a Sphagnoecetis with leaves emarginate or 2—3 dentate at the apex; but, indeed, in our own Odontoschisma Sphagni retuse or indented leaves are often met with; and Mr. Stabler has gathered on Fowlshaw Moss, Westmorland, a form in which emarginate leaves decidedly predominate.

Again, Eucephalozia Francisci (Hook.) is almost a miniature copy of Odontoschisma denudatum, in the numerous flagella, the suborbicular leaves, the female involucre and perianth, the reddish gemmae borne on the apex of attenuated branches, &c.; and only the slight, but distinct and constant, apical notch of the leaves of C. Francisci is quite wanting to O. denudatum, or is seen rarely on slender sterile branches.

On the bark of trees inundated by the river Casiquiari, in South America, I gathered a small Cephalozia (C. obcordata n. sp.) with leaves no larger than those of C. Francisci, but flatter, and obcordato-orbicular in outline; in its habit so like small Cephalozia Sphagni that I took it for a form of that species, until examination shewed essential differences in the absence of flagella, the shape of the leaves, and the monoicous inflorescence: the ♀ flower mostly springing from the side of a ♂ spike, as is sometimes seen in C. bicuspidata, C. pygmaea n. sp. and other species. In the sum of its characters, it is exactly a link between Odontoschisma and Eucephalozia.

From Odontoschisma to Lembidium is but a step, without any break. This is a name applied by Mitten to a small group from the southern hemisphere—chiefly from the oceanic islands—of which the earliest known species, Jung. nutans Tayl. (1844) stood for some time in Mastigobryum (Cf. Hook. f. et Tayl. Fl. Antarct. and Lindemb. et G. Spec. Hepat.)—a genus from which it is remote enough, having neither the dichotomous branching nor the narrow falcate leaves (truncate, and normally 2—3 dentate at the apex) common to all true Mastigobrya.

The habit of Lembidium is very much that of O. denudatum, but the leaves are mostly much denser and nearly transverse—in L. nutans, indeed, occasionally subincubous—cochleato-or-cymbiformi-concave, and
either entire, or very shortly bifid, or subdenticulate at the apex. The main difference, however, is in the female bracts, which scarcely differ from the stem-leaves except in being slightly larger and longer, but are quite conformable to them at the apex, and not at all more deeply divided (as is usual in most other Cephalozia). C. Boschiana (Luc.) is exactly intermediate between Lembidium and Odontoschisma, having the peculiar bracts and the boat-shaped leaves of the former; but the loosely-imbricated, obliquely-inserted and succulent leaves of the latter. The trigonous perianth and its included organs, and the monandrous male bracts are exactly as in Odontoschisma and Eucephalozia.

If we start from Eucephalozia in another direction, it brings us to Alobiella nobis: a subgenus confined, so far as hitherto known, to tropical America, where I have gathered 4 species, one of which (Jung. Husnoti Gottsche) has been found also in the Antilles, by M. Husnot. Here also, as in Odontoschisma, the leaves are normally entire, and only by rare exception cloven at the apex; but, instead of the concave and rather closely reticulate leaves of Odontoschisma, we find nearly flat, oblong or lanceolate leaves, with large pellucid elongate cells, 1/16–1/12 mm long, and half as broad, which give the plants at first sight more the aspect of Kantia Trichomanis than of Cephalozia. In C. Alobiella integrifolia n. sp., indeed, an incisive leaf is sometimes (though very rarely) interposed among the normal succulent leaves, which makes the resemblance to Kantia more striking. The very long perianths are mostly laciniate at the constricted mouth, and the lacinia ciliiform. Three of the species are cladocarpous, but the fourth (C. Al. acrosypha n. sp.) is aerocarpous, having the perianth constantly terminal on the main stem; yet in every essential feature it is a Cephalozia. C. Al. macella n. sp., by its habit of slender C. bicuspis, and by the variable leaf-apex—rounded, obliquely acute, or bidentate—unites this subgenus to Eucephalozia.

A minute Amazonian Eucephalozia (C. micromera n. sp.) diverges from the type by the minute leaves, having the antical lobe much smaller than the postical, and not unfrequently quite obsolete, so that the leaves become simple and acuminate; but the globose cells—equilateral-hexagonal by mutual pressure—forbid its being placed in Alobiella. It affords, however, a direct transition to the curious subgenus Zoopsis Hook. f. et Tayl., through C. Z. monodactyla n. sp.
Zoopsis was at first curiously misunderstood, Taylor having described the stem as a frond, with crenate or sinuato-repand margins, the supposed crenations being true, though minute and scale-like leaves. It has also escaped the notice of all recent writers on the subject that the leaves of the two original species, _Z. argentea_ H. f. et Tayl. and _Z. setulosa_ Leitgeb, although so minute, are really bilobed!! In _Z. argentea_ the leaf consists (normally) of two large cells only—not placed one upon the other, but laterally contiguous on a line parallel to the axis of the stem; and the two cells are connate only in their lower half, so that the upper half of each projects as a hemispherical or paraboloidal lobe. In _Z. setulosa_, however, each basal cell is tipped by another cell—slender, hooked and claw-like—and the bilobed structure is manifest. These two species have been found in New Zealand, Tasmania, and as far north as Java. In the Amazonian _Z. monodactyla_ the leaves are only one-lobed, and they are almost exact counterparts of a half leaf of _Z. setulosa_, for they consist of a single large truncato-conical basal cell, tipped by a much smaller and slenderer unguiform cell; but the missing lobe is restored in the bipartite ♀ bracts, and the ♂ bracts also are usually bidentate.—In all the species, the postical ramification, the involucres of both sexes, the monandrous ♀ bracts, the trigonous perianth and the 2-layered capsule, are exactly as in _Cephalozia_.—_Z. monodactyla_ differs from _Eucephalozia_; even when the leaves of the latter shew only a single lobe—in the stem being formed of only 5 longitudinal series of cells, 4 cortical and 1 axial, and in the leaves consisting of but 2 (rarely of 3) cells: whereas in _C. micromera_ the stem has 6 rows of cells, and the cuneato-quadrate leaves consist of about 10 cells. These are the main differences, and they are obviously insufficient to constitute a valid generic distinction.*

In _Pteropsiella_ the stem-leaves entirely disappear, and are replaced by a broad green wing, of from 4 to 12 rows of cells, on each side of the stem, exactly as in _Blyttia, Metzgeria, &c._, to one of which genera the plant might easily be referred, were it not observed that the cladogenous

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*As those species of a genus, or other group, whose development is of the lowest grade often resemble the young stage of the most highly-developed species; so, in this case, a mature plant of a _Zoopsis_ is very like, in its vegetative organs, the earlier stage of a _Eucephalozia_. (Cf. Hofmeister on the Higher Cryptogamia, t. ix, figs. 8, 9, of a young plant of _Cephalozia bicuspidata_, where the rudimentary leaves consist of only 1, 2, or 3 superposed cells, as in the fullgrown leaves of _C. Z. monodactyla_.)
Cephalozia.

♀ involucres and the ♂ spikes consisted of broad leafy bilobed bracts, and that the perianth and capsule were constructed exactly as in Cephalozia. If the inflorescence and fructification, together with the mode of branching, be considered to afford the essential marks for distinguishing genera, then Pteropsiella can only rank as a subgenus of Cephalozia; but for those who regard the difference between a frondose and a foliose stem an adequate generic distinction, Pteropsiella will stand as a distinct genus.

The contrast in size and aspect is very great between Zoopsis and Pteropsiella. In the former the stems resemble slender silken, or silver, threads; in the latter narrow green ribbons, and when much branched are not unlike Ferns of the genus Pteropsis.

In Proto-Cephalozia the extreme of simplicity of structure is reached. No stem, properly so called, exists; there are consequently no stem-leaves. From the base of the persistent and much-branched prothallium springs a ♀ flower, and certain branches of the prothallium end each in a ♂ spike. The bracts of the inflorescence of both sexes are exactly conformable to those of normal Cephalozia: the ♀ bracts bipartite, tristichous and trigonous. The entire andræcium is not half so long as a single ♀ bract, although it consists of 10 pairs of minute bifid monandrous bracts. The perianth is subulate, trigonous, and at the mouth deeply cloven into 6 narrow capillaceous-acuminate valves, or segments—very much as in Pteropsiella, notwithstanding the great difference in the vegetative organs of the two groups.

I found this curious little plant in two localities, not far from the confluence of the Casiquiare and Rio Negro, in Venezuela, growing on moist earth in shade and on little mounds thrown up by mudworms. I had already found a minute Phascoid moss (Ephemerum equinoctiale Spruce) in similar sites; it is the only Phascum known to me that grows on the hot plains of the equator, and at first sight I took the Proto-Cephalozia for a second species of the same genus; for I saw on the lumps of mould only a greenish confervoid film, with large perichaetia standing out of it here and there—very like the Ephemerum serratum on our garden-pots in England. The prothallium of all Cephalozia is narrow and threadlike—very different from the suborbicular prothallium and propagula of Radula, Lejeunea, and many other Hepaticæ: and it approaches the nearest of any among Hepaticæ to the protonema of true
mosses, so that the latter name would not be inapt for it. My original note on Proto-Cephalozia is as follows—"Protonema tufted, consisting of subereect fastigiate subdichotomously branched confervoid filaments, of which the oblong cells are uniseriate, or biseriate only towards the base, &c." If, because some of these filaments bear male flowers at their apex, it be preferred to call them branches of a true (though filiform) frond, or thallus, I shall not demur, although I have been unable to detect any break indicating the passage from prothallium to thallus proper.

Returning once more to Eu-Cephalozia, we pass from the smaller species direct to Cephalozzeilla, distinguished from the previous groups mainly as follows—Stems slender, yet often rigid and wiry; cortical layer not different from the inner layers. Flagella none. Leaves minute, rarely wider than the stem, transverse—or the lower ones succubous—carinate but not always complicate; cells small, often minute. Under-leaves present or absent in varying forms of the same species; in only a few species constant. Female flowers in only a few species invariably cladogenous; in all the others terminal on branches of varying length and on the main stem. The chief character, however, is derived from the perianth, which, instead of being normally trigonous, as in all the other subgenera of Cephalozia, becomes in this 4—5—or 6-angled; although, whenever the angles are reduced to 3 (as happens in nearly every species, and is normal to a very few) the third angle is invariably postical. The capsule is shorter than in most other Cephalozia, and usually oblongo-globose.

It is in this subgenus alone that we encounter a solitary aberration from the postical ramification normal to Cephalozia. In C. Turneri (Hook.) some branches are postical (not flagelliform), but others are decidedly lateral, and axillary to the sideleaves. This species, in fact, might almost as well stand in Jungermania § Sphenolobus, near to J. Helleriana Nees—to which its pectinately-leafy stems, its complicato-equitant toothed leaves, and its constantly 5-angled perianth approximate it—as in Cephalozia; were it not for its unmistakable affinity to such true Cephalozziella as C. dentata (Raddi), C. myriantha Lindberg, &c. [See remarks following my description of C. Turneri.]
It may be asked why I have given such extension to Cephalozia as to include in it certain groups hitherto regarded distinct genera. My idea of a genus is that it should be (wherever possible) a large assemblage of closely-related species. In some cases, either because several species remain still undiscovered, or because many intermediate forms have fallen out of existence—presumably from their unfitness to survive—a genus may be well marked off from its fellows, although it consist of but a few, or even of a solitary, species. For instance, every one will recognise what a wide gap exists between such genera as Radula, Scalia (= Haplomitrium) and Aneura and all their coördinates; and how difficult it is to assign the nearest ally—or indeed any very near allies—to any one of these genera. But in some tribes, of which the Trigonanthea are an example, the wealth of existing and known species may be so great, and so many forms may be nearly conterminous, that the great mass of the species must necessarily be combined into genera resting each on a broad base: e. gr. Cephalozia, Lepidozia, Bazzania, (s. Mastygobryum), &c., &c. Even so, certain small groups may still (for lack of material) remain incombiable with the larger genera, although the acquisition of new species may enable us hereafter to effect a broader synthesis.

For my own part it is indifferent whether my sections of Cephalozia be looked on as mere subgenera, which is my own view; or that some (or all) of them should be held distinct genera. On either view, it will be necessary to recognise their close relationship, which is what I mainly argue for.

Wide-embracing as is the area of Cephalozia, it yet excludes a few species which Dumortier, or others, have heretofore assigned to that genus. One of them is the Jungermania albescens of Hooker (and its var. J. Islandica Nees.) which, by its truly lateral and subpinnate ramification—without a single postical branch—and by some other of its characters, including even its blueish-white colour when dry, is perhaps as nearly allied to Lepidozia reptans and to Anthelia as to Cephalozia. I have therefore separated it as a new genus under the name Pleuroclada.*

*This genus, and a few others, closely related to Cephalozia, will be treated of more fully in the sequel,
Cephalozia.

Jungermania laxifolia Hook. recedes from Cephalozia in having lateral branches, and in being (normally) quite destitute of radicles, the stems rooting at the base by means of short naked flagella. The leaves are complicato-bilobed, and there is no capitate involucre, the uppermost leaves being alternate and often (but not constantly) rather remote from the perianth.* Moreover, the perianths are very narrow at the mouth, and almost closed—not from being plicato-constricted (as is frequent in Cephalozia) but from the proper shape of the constituent valves. The stem innovates repeatedly (sometimes bilaterally) from the base of successive sterile flowers. In most of these particulars, as well as in the minute size and general habit, it agrees with Jungr. myriocarpa Carr., along with which it sometimes grows on moist rocks. Both agree with Cephalozia in the trigonous perianth, with the third angle undermost, and in the monandrous male bracts. J. myriocarpa recedes from J. laxifolia (whose large elongate leaf-cells resemble those of Cephalozia § Alobiella) in the minute reticulation, the large complicato-equitant bracts, and in the entire absence of underleaves, even from the ♀ flowers, whereas in J. laxifolia they are everywhere present. These two species are therefore not very certainly congeners, although both (as it seems to me) are distinct from Cephalozia; and it is with some diffidence I venture to unite them under the generic name Hygrobiella.

Anthelia Dum., certainly analogous (if not nearly related) to J. laxifolia in the complicato-carinate tristichous leaves, differs essentially in the radicellose stems; in the dense polyphyllous involucres; in the perianth, which is truncate and 10-plicate at the mouth; and in the inferior calyptra strewn with sterile pistillidia. In the copious and sub-pinnate ramification it agrees with Pleuroclada, whose leaves, however, are not complicato, and whose perianth, calyptra, &c., are conformable to those of Cephalozia.

Blepharostoma, although at first sight so different from Cephalozia in the quadripartite leaves, with filiform crura, has the involucre and perianth formed on the same plan, the bracts being tristichous and mostly trijugous, and the perianth when young distinctly trigonous (with the third angle postical), although at maturity it becomes nearly

*Hence Dumortier included it in his genus Gymnocolea, for a sketch of whose true character and affinities see below under Cephalozia heterostipa.
Cephalozia.

terete and is trigonous only at the pluriciliate apex. The dichotomous ramification, without a single postical branch, and the constantly terminal ♀ flowers, separate it from *Cephalozia*, and assimilate it pro tanto to *Pleuroclada*. I introduce it here, however, for the sake of comparing it with a small group, almost equally related to *Cephalozia*, *Micro-Lepidozia*, and *Blepharostoma*.

These are minute plants, with threadlike entangled stems, branched only from the underside, and woven into broad thin films very like a spider's web: hence my name for them, *Arachniofissis*. The blueish-or-white-grey colour makes the resemblance more striking. One species I found lining the roof of a cavern in the Peruvian Andes, and, until closely looked at, easily mistaken for the work of a spider. The leaves are capillary, consisting of only a single series of cells (which are 2—6 times as long as broad), and they are either single or twin. In the species with bicentral leaves, the crura are separate to the very base, where they are merely contiguous, but not connate, one leg or filament being inserted slightly lower than, and partly in front of, the other, so that the leaves are to be accounted succulent. Underleaves none, or reduced to two collateral unicellular papillae. The cladogenous tristichous-leaved involucres are essentially of the same type as those of *Cephalozia*, but more finely and numerous divided; and so are the trigonous perianths, but excessively elongate—5 or 6 times as long as broad—and ending in 12 capillary laciniae. Male flowers monandrous.

Although well and easily distinguished from *Blepharostoma*, these plants so resemble it outwardly that I think it probable one or more of the species may have been included in lists of tropical Hepaticae under the name "*Jung. trichophylla*." They are in reality more closely related to *Micro-Lepidozia chomatophylla* n. sp.—a plant I found in some abundance on decayed wood in the forests of the Amazon and Eastern Andes. The latter has, however, all the leafy branches lateral, and only the perichaetia are postical: normal features in all *Lepidozia*. The stem-leaves are tripartite, with the capillary crura connate at the base, and there are (as in every other *Lepidozia*) similar, but smaller underleaves.—*Jung. nematodes* Gottsche in Wright's 'Hep. Cubenses' stands so near to this as to be barely distinguishable as a species. [There is a prior *Lepidozia nemoides* Tayl., from St. Helena, distinct from the Cuban plant, but belonging to the same subgenus. *Jung. conferroides* G., another of
Cephalozia.

Wright's discoveries, is unknown to me: it is possibly an *Arachniopsis.*

Some other genera, closely allied to *Cephalozia*, I have already discussed elsewhere. [Cf. Journ. Bot. 1876, 'On *Anomoclada,*' by R. S.] One of these genera, *Adelanthus* Mitt., is well distinguished by its habit of *Plagiochila*; by its decurvo-secund and (usually) sharply toothed leaves; and by its half-inferior calyptra, strewn with sterile pistillidia; although the cladogenous perichaetium and the 3–5-angled perianth— with the third angle postical, whenever the angles are reduced to three— prove its affinity to *Cephalozia*, especially to the subgenus *Odontoschisma.* *Anomoclada* has exactly the cladogenous trigonous perianth, and the male amenta of *Cephalozia*, but differs from that and most other genera of Jungermanidæ in having all the leafy and flowering branches antical, *i.e.* springing from the upper face of the stem.*

I now proceed to the technical description of the entire genus, its subgenera, and all the species of which I possess adequate examples. A brief indication of their known geographical distribution will be found under each subgenus and species. Any more definite statistical detail is hardly possible until a more thorough search shall have been made in all tropic lands. Whilst absolutely absent from no regions except the extreme alpine and arctic, *Cephalozia* are by far the most abundant in species, and especially in individuals, in the north temperate zone; yet, even there, the minute size of many of the species renders them all but invisible even to expert eyes. In equatorial America, with only two exceptions, they are exceedingly rare and sporadical; and, singularly enough, they are fewer and scarcer in the Andes than in the hot, damp forests of the Amazon, where their chosen habitat is on the decaying trunks, twigs, and even pods, of fallen trees; and on vegetable deposits by streams running in deep shade. But they are very far from being so

*I seize this opportunity to describe the male inflorescence of *Anomoclada*—unknown at the time of my first published account of the plant, but since detected on specimens from the upper Rio Negro, in Venezuela.

conspicuous as the ubiquitous Lejeuneæ and Plagiochila, in proof of which I need only adduce the following facts. Of Cephalozia and its subgenera I know of only 17 species on the Amazon and Andes—all but one (C. Crossii n. sp.) gathered there by myself; whereas of Lejeunea and its subgenera I have gathered with my own hands in the same regions no fewer than 224 species!
CEPHALOZIA Dumortier.

Recueil d'Observations sur les Jungermanniaceæ (1835).

Jungermania § Cephalozia Dum. Syll. (1831).

§ C. Bicuspides Nees Eur. Leberm. (1836).


Lembidium Mitt. in Hook. Handb. N. Zealand Flora (1867).

Pleuroschisma § Odontoschisma Dum. Syll. (1831).

Odontoschisma Dum. Rec. (1835).


Caracter essentialis.

Capsula plus minus oblonga, ab ipsa basi quadrivalvis, facie tota interna elaterifera, parieta bistrato, cellulis interioribus fibris semiannularibus fulcis. Elateres bispiri decidui. Spore minutae.

Descriptio.

Planta depresso-caespitosa, vel supra muscos reptantes, pusilla vel mediocres—rarius minutæ vel majusculæ—plerumque pallide virides et pellucidæ, interdum roseo plus minus pictæ, rarius subopace et fulvae, olivaceo-virides vel luride.

Prothallium angustum, nematoideum fere, simplex vel persæpe subramosum.

Caulis (basi saltem) prostratus, radicellosus, teres vel plano-convexus, in plurimis laxe corticatus, in planum simplex, casu rariore semel bisve bifurcus, in plerisque foliosus, in perpaucis frondosus (foliis omnino nullis nisi ad florescentias), vel foliis valde rudimentariis stipatus, ramos (nisi in unica specie subacauli) e facie postica proferens, alios cauli conformes; alios (persæpe abbreviatus) apice florentes, ♀ vel ♂; alios (in propriis speciebus) stoloniformes pro more subaphylylos et valde radicellosos; radicellæ in omnibus albidae fuscidulæve.

Folia plerumque parva, interdum minuta, in perpaucis rudimentaria, alterna, succuba—interdum fere horizontalia—rarius transversa, vix unquam subincuba; forma varia, sat lata, plerumque biloba (nunquam ab ipsa basi)—rarissimo casu 3—4-loba, lobis subulatis, lanceolatis vel ovatis (numquam capillaceis); pancarum specierum integra et rotundata, retusa, subacuteve, vel alia integra alia bidentata, subcomplicata vel saltem conceava, raro planiuscula, margine in nulla specie recurvo, in omnibus fere subintegerrimo, in paucissimis spinuloso-denticulato. Rete in typicis laxum pellucidum, raro subopacum; cellulae diametro 1/15—1/40 mm mediiæ sc. æquilateri -4—6-gone, in paucis omnes oblongo-quadratae; in aberrantibus (e.g. in Cephaloziellis) parvae minutæve—(diametro 1/50—1/70 mm) magis quadratae sepiumque opacæ; parietae in paucis speciebus ad angulos incrassato, cuticula rarius asperula.
Cephalozia.

Foliola (i.e. folia postica) rarius ad caulem ubique obvia foliis sat minora bifida vel persæpe integra; ad involucrum ♀ tamen semper adstant, magna, bracteis vix minora.

Flores in plurimis speciebus eladogeni, in perpaucis normaliter acrogeni, in aliis situ vario nunc terminales nunc quasi-laterales; dioici vel monoici (autoici—rarissime paroici). Ramus fæmineus in omnibus fere constanter simplicissimus, in paucis sub flore sterili innovationem solitariam—nunquam duas oppositas—proferens.

Bractee ♀ in capitulum congentæ, foliis sat majores, tristichæ, constanter fere tríjuge, semper (imo in sp. frondosis et in subaphyllis) foliaceæ, sat late, bi—(dein 3—5-) lobæ, magis frequenter quam folia dentatae incisæve; bracteology sæpissime bracteis omnibus adjectæ, iisdemque parum minores, intima saltem semper presens persæpeque cum una alterave bractea basi—in aliis speciebus præalte—connata; rete laxum oblongum unistratum, in perpaucis inferne 2—3-stratum. Pistillidia ad 20 breviuscula lageniformia.


Andræcia in plerisque amentum posticum pallidum sistentia, raro in ipsius caulis, ramive majoris, apice mediove spicata; bractæ foliis pro more subminores, plurijuge, assurgenti-secundæ, confertiusculæ, constanter (etiam in sp. frondosis) foliaceæ et bilobæ, basi
antica lobulo incurvo interdum adjecto. *Antheridia* solitaria magna, stipite sub-equilongo suffulta.

*Habitatio.* Loca umbrosa et subhumida in sylvis et rivulorum ripis planitiei et montium humiliorum, ad terram, saxa et praerimis ad truncos putrescentes, diligunt, nullo climate nisi frigidissimo exules, perpaucis alpinis vel arcticis in die cognitis; loca aperta fugiunt, turbariis et sphagnetis exceptis, ubi inter muscos hygro-philos nidulant.

Genus Cephalozia, supra definitum, dividendum est in octo subgenera, quorum clavem analyticam sequentem proposui.

A. Perianthium normale constanter 3-gonum-carinatumve.
  a. Acaules, flore $\varphi$ e prothallii centro orto, amens $\varphi$ prothallii ramos terminantibus ...........................................1. Proto-Cephalozia
  b. Caulescentes.

Caulis utrinque late alatus, frondiformis, foliis nullis nisi ad involucra .......................................................... 2. Pteropsiella

Caulis exalatus, foliis valde rudimentariis, ad squamulas cellulis 2—4 constantes redactis, instructus......................... 3. Zoopsis

Caulis distincte foliosus.

Folia in plurimis integra vel subintegra.

Folia valida suborbiculata, concava, sepe cochlearia, cellulis omnibus ( nisi interdum inferioribus subelongatis) subaequilateris chlorophylo plus minus opacis.

Folia succuba, aliquando fere longitudinalia, rotundata retusave—rarissime apice bidentella; bractee $\varphi$ pro more foliis sat diversae, longiores, tenuiores—interdum subscariosae—ab ipsa basi cellulis solum unistratis conflatae apice bilobae; perianthium leptoderme.........................

Folia transversa, dein subincuba—in aliis succuba, apice vel integra, vel bidentata, vel denticulata; bractee foliis majores, subconformes tamen, apiceque vix magis incisulae, dimidio inferiore (idem ac perianthii carnosi) cellulis bi-tristratis conflatae...............6. Lembidium

Folia tenuia subplana, laxae et pellucide texta, cellulis duplo longioribus quam latis, oblonga lanceolatae, integra, vel raro alia apice fissa alia integra....................4. Alobiella

Folia omnia apice fissa, 2-(rarius 3—4) lobae, cellulis plerumque majusculis, in nulla minutis.......................5. Eucephalozia

B. Perianthium 3—6 gonum, angulus in una et eadem specie numero perspe variabilibus—raro ad tria sola redactis.—Plantae minutulae, constanter eflagellifere; foliis bilobis, idem ac in Eucephalozia, cellulis autom plerumque minutis .......................8. Cephaloziella
Subgenus I.—*PROTO-CEPHALOZIA* Spruce.


1. *Cephalozia ephemeroides* Spruce.

Minuta albicans acaulis, facie *Ephemeri equinoctialis* Spruce. *Protonema* cæspitosum, filamentis confervoides subereectis fastigiatis subdichotome ramosis constans. *Cellulæ* filamentorum uniseriatarum—rarissime basin versus biseriatarum—vix duplo longiores quam latae pellucidae chlorophyllosse. E filamentorum fasciculi basi oritur flos; alia filamenta apice in amenta ♀ abeunt; florescentia igitur monoeica. *Bracteæ* floris ♂ trijugæ tristichæ confertæ suberectæ, intime majusculæ bifide-partitæve integrissime, lamina basali ovata, laciniiis subulatis apice fere capillaris; *bracteola* bracteis aequilongae, magis profunde fissa; *cellulae* magne tenues pellucidae lineari-hexagonæ-parallelogrammæve. *Bracteæ* exteriæ sensim minores, conformes. *Perianthia* involucrum solum dimidio superantia, pellucida, trigono-subulata incurva, ab ore profunde (ad ¼—½ longitudinis) sexfida, laciniiis tenuibus flexuosis capillaceo-acuminatis. Capsula parvula oblonga. *Andracia* bracteis fœmineis plus duplo breviora tenuia recurva; bracteæ sub 10-jugæ minute incurvo-secundæ ovate bifide monandræ.—*Filamenta* .8—1.6 mm longa, *corundem cellulæ* 1/16—1/8 mm long æ, 1/10 mm latae. *Bractæ* ♀ 1.75, *cellulae* 1/12—1/8 mm longæ. *Perianthia* 2.5; capsula .3 × .18 mm.

*Hab.* in sylvis fluvii Negro superioris, locis S. Carlos et Catanacunami, ad terram umbrosam. (R. S. 1854.)

Subgenus II.—*PTEROPSISIELLA* Spruce.

*Planteæ* sat robustæ, pro filicula, *Metzgeria vel Blyttia* quadam facile prætervisæ. *Caulis* validus, utrinque prælate alatus, revéra frondiformis, serpentinus, ramosus et flagelliferus, cladocarpus, folia nulla parte nisi ad florescentias ostendens. *Bracteæ* floris ♂ iis *Proto-Cephaloziae*, conformes,
Pteropsiella


2. Cephalozia frondiformis.


Hab. in Brasilia boreali et Venezuela australi contermina, ad fluvios Negro, Uaupés, Casiquiari, etc., ubi in aggeribus umbrosis, rivorum ripis, trunci semiputridis et fructibus lignosis decisis sat frequenter viget.

This species is fond of growing on the decaying bark of old or prostrate trees, and on other semiputrid vegetable matters. Luxuriant specimens were gathered on fallen pods of Parivoa excelsa. I found it once growing intermixed with male plants of C. integrifolia, from which its olive-green catkins at once distinguished it; C. integrifolia having them white, besides a distinctly leafy stem.

The radicles originate in tubercles (of one or two cells) placed here and there along the underside of the costa; but even the tubercles are not developed unless radicles be needed for attaching the frond at that point. In the male spikes, a few more cells added on to these tubercles transform them into under-leaves, or bracteoles. The fronds, whether primary or secondary, often root also at the attenuated point.

Subgenus III. ZOOPSIS (Hook. fil.)


3. CEPHALOZIA ARGENTEAE (Tayl.)


Dioica albi eans nitida prostrata intricata. Caulis ½ pollicaris valdiviusculus, basi aphylla subrhizomatosis, dein semel bisve bifurcatus, interdum simplex, ramos autem, pro more paucos, posticos, caulī similès, sāpe apicē attenduato radicantes, vel totos flagelliformes, alios brevissimos et floriferos, proferens. Cellūs caulis corticāles 8—12-seriātēs magnēs pellucidēs (serierum 2 vel 3 superiorum maximēs), in siccō concavēs (collapsēs, unde caulis scrobiculatus et margaritaceo-splendens evadit); c. internē 8—12-seriātēs angustās subchlorophyllosoes. Foliā brevi spatio dissīta, longitudinalīa, ad cellulas duās maximās sphaeroidēs, in caulis plano collaterales (nece suprapositas) redacta, revera tamen bilōba, quaque cellula (cum collaterali inferne connata) lobulum sīstente. Foliola nullā, nisi pro foliolo papillula rhizophora hic illic subter caule obvia habenda est. Bractēae tristichēs trijugēs (floris fertilis sāpe perparvae, sterili̇s majores) bipartītāe, crūribus subulātis inferne 2 cellulas lātīs—vel altero crure ad processulum redacto; br. posticēs (s. bractēole) subminores, integrae bifidēve, exterieores sāpe minūtāevē vel obsoletē. Perianthium pyriformē, junius apice obtuse trigōnum, maturum ubique teres, unistratum laxe areolatum tenerīrum, ore ad ½ alt. usque in lacinias 6 incurvas fīssum. Capsula oblonga, caretāque omnino Eucephalozicē. Andrēcia ramulo amentiformi constantia; bractēae paucijugēs assurgentī-incurvēs suborbiculātēs bidentatēs, cellulis ad 20 conflatēs, monandīre.

Hab. in insulis australibus: N. Zelandia (J. D. Hooker! exempla pulcherrime fructifera); Tasmania; Ins. Aucklandicīs, etc.

4. CEPHALOZIA SETULOSA (Leitg.)


A priore distincta caracteribus sequentibus. Caulis est magis ramosus, ramique persēpe apicē flagellari radicant, flagellis autem propriēs vix ullīs; cellūs caulis sub 20-seriātēs; sc. corticāles pellucidēs 6-seriātēs—antīcē biseriatē et serierum 2 lateralium maximēs, subglobose (pressione mutuā polyhādrēs), c. autem medio-posticē biseriatēs axīn obvelantes cēteris triplo minores—cellūs axēos sub. 14-seriātēs.
peranguste prismaticæ chlorophyllose. *Folia* brevissimo spatio dissita, *distincte bilobā*, basi cellulis 2 maximis paraboloidiis (cellulis cauliniis anticus equeimagnis) plus minus alte connatis, quaque cellula apiculo incurvo filiformi (e cellula unica 6-plo longiore quam lata, vel rarius e duabus uniseriatis) aucta, constantia. Cætera nonhabui.—*Caulis, cum foliis, *35 *mm latus; cellule* folii basales *08 × *06, e. *apicales unguiformes *08 — *06 *mm longæ.*

_Hab._ Nova Zelandia, etc. cum priore. In insulis Aucklandicis primum legit A. Cunningham.

5. **Cephalozia monodactyla** Spruce.

*Monoica* minutissima subramosa flagellifera cladocarpa. *Caulus* prostrati 5—10*mm* longi filiformes trigono-prismatici, (supra plani sub tus carinati), cellulis 5-seriatis, quarn corticalibus majusculis 4-seriatis pellucidis, internis 1-seriatis tenuissimis chlorophyllose, conflat. _Folia_ spatio cellularum caulis duarum dissita, cellulis 2 constantia, sc. altera inferiore magna truncato-conica, altera superiore 4-plo breviore tenui unguiformi. _Foliola_ O. _Bracteæ* 1—2-jugæ, tristichæ, perianthio triplo breviore, liberæ vel postice subconnatæ, profunde bipartitaæ, laciniiis subulatis elongato-celluloso. _Perianthia_ maxima, follis 16-plo longiora, trigono-subulata, ore profunde 6-fida, laciniiis ellipseiformibus. _Calyptro_ parva tenuis. _Capsula_ oblonga. _Rami_ et cæteris ramis æque magnis; _br. pluri-jugæ_ confertaæ secundæ subulataæ cellulis 5 vel 6 constantes, integrae bifidae, monandro; _bracteolæ* O.—*Caulis* 1/10*mm* latus; cell. 1/20*mm* longæ; _folia* *06; br. *3—4; per* 1.0 × *2* *mm*.

_Hab._ in sylvis *fl.* Negro superioris, juxta cataractas præcipue, in terra nuda sæpeque ad cumulos vermi suus magnis suffossos.

Subgenus IV. **ALOBIELLA** Spruce.

_Plantæ_ mediocres albicantes facie (nisi pro foliis succubis) magis _Kantie_ (*Calypogeie*) quam _Cephalozie_. *Caulis* postice ramosus, ramique foliosi—raro flagellares. _Folia_ fere longitudinaliter inserta, distiche patula, plana integra—raro alia integra alia apice bidentella—laxe pellucide reticulata; _cellulae_ majusculæ vel fere magnæ, subrectangulares, duplo longiores quam latæ. _Foliola_ aliis speciebus præsentia,

§ 1. *Foliola nulla.*


*Hab.* Truncicola et terricola in fluviorum Negro et Uaupès sylvis; etiam in Andibus Peruvianis, alt. 1000 m haud superans.—Inter folia normalia succuba, folium incubum interdum intercalatum est.

7. *Cephalozia macella* Spruce.

Facie et florescentia monoica formis *C. bicuspitatae* macris fere convenit; differt foliiis planis ovato-triangularibus-trapezoidesive apice rotundatis, retusis, oblique acutis (i.e. unidentatis) vel denique truncate-bidentatis, cellulis elongatis; bracteis bifidis, segmentis longe subulatis integerrimis; perianthiiis ore breviuscule trifidis, segmentis 2—3-ciliatis. —*Inter Alobiellam et Eucephaloziam* fere media.

§ 2. Foliola presentia.

8. Cephalozia acroscypha Spruce.


Hab. terrestris in Andibus Peruvianis, alt. 1600 m.

9. Cephalozia Husnoti (Gottsche).


Hab. ad terram in Andibus Peruvianis, alt. 1000 m (R.S.); Insula Martinica (T. Husnot). Planta pulchella cujus fructum perfectum hand invenire potui. Caule folioso siccando deflexis ad Adelanthum accedit, foliorum formâ tamen et texturâ Alobiella perfecta est.

Subgenus V. EUCEPHALOZIA.

Plantæ mediocres, rarò pusillæ vel robustæ, virescentes, rarius fulvæ luride, interdum roseo pictæ, lato caespite crescentes, vel inter muscos palustres reptantes. Caulis plerumque mollis et fragilis, rarius rigidulus, cortice in plerisque e cellulis majusculis pellucidis conflato indutus, in planum simplex, rarissime furcatus, postice plus minus ramosus, in paucis speciebus flagellifer. Folia oblique inserta, rarius subtransversa, caule semper latiora, sæpe sat magna (inter 0:3 et 1.35 mm longa) plus minus oblonga,
concava vel laxe complicata, raro subplana, bifida rarissime 3—4-fida, sinu raro profundo, in alis subacuto, aliis lunato; segmentis apice variis, raro autem vel rotundatis vel cuspidatis; margine integerrimo. Foliola (paucis sp. normaliter praesentia) parva integra bifidave. Cellulæ foliorum magnitudine sat constantes, diametro in diversis speciebus inter \( \frac{1}{20} \) et \( \frac{1}{40} \) mm variantes, raro fere magnæ (\( \frac{1}{15} \) mm) rarissime parvae (\( \frac{1}{45}—\frac{1}{45} \) mm) æquilateri-hexagonæ, vel sæpius quadrato-hexagonæ quadratæve, in plerisque sp. subpellucidæ, pariete in perpaucis ad angulos incrassato, cuticula sub-lævissima; cellulæ bractearum et perianthiorum plerumque submajores rectangulari-oblongæ. Flores dioici, vel monoici, rarissime paroici: \( \circ \) in aliis speciebus constanter cladogeni, in aliis nunc clado-nunc acrogeni, vel omnes fere acrogeni—imo interdum in ipso caule terminalis. Bractææ trijugæ, raro pauciores, intímæ sat magnæ bi-rarius 3—4-fidæ, integerrimæ vel persæpe dentatae, spinulosæ, incissæve, libere vel cum bracteola subconformi, æquilonga vel breviore, basi connatae. Perianthia plus minus alte emersa fusiformia—interdum fere linearia—trigono-prismatica, carinis aliarum specierum omni ætate acutis, aliarum (fructu maturato) subobliteratis non nisi ad apicem discernendis, ore constricto denticulata, setulosa, ciliata, lacinia-tave; pariete, ipsa basi ubi in caulibus ramisse apicem cavum transit excepta, leptodermi, vel in paucis speciebus dimidio saltem inferiore 2—3 cell. crasso. Andræcia spicæ-vel amentiformia, varie posita; rarissime tamen hypogyna, bracteis \( \sigma \) florem fœmineum proxime sequentibus.

Hab. et Distributio. Species Cephalozia typicæ nullis terris, nisi arcticis et alpinis frigidissimis, exules, in Europa et America-boreali præcipue abundant, loca umbrosa subhumida, paucæ palustria, matrice varia, diligentes. In
sylva Amazonica et in Andibus sylvestribus rarius et sporadice occurrunt, idem ac in insulis tropicis tam occidentalis quam orientalis.


A. Foliolis ubique præsentibus.

10. Cephalozia micronera Spruce.

 Dioica cladocarpa minuta prostrata subflagellifera. Caulis plano-convexus, cellulis corticis 6-seriatis, internis 4-seriatis, conflatus, subramosus. Folia subimbricata cuneato-quadrata ad medium acute bifida (v. integra); segmentis subacuminatis, antico minore (sæpe nullo); cellulae medioacres subglobosæ, totius folii sub 10. Foliola ad tuberculum cellula unica, v. 2 collateralibus, constantem redacta. Bracteæ bipartitæ, cruribus lanceolato-subulatis, altero interdum obsoleto. Perianthia magna ovato-subulata obtuse trigona, ore in laciniias 6 subulato-attenuatas profunde fissæ.

Hab. In terra umbrosa humida juxta fl. Negro superiorem.—Species distinctissima hinc ad C. (Zoopsin) monodactylam, hinc ad subgenus Alobiellam, accedit.

11. Cephalozia Serra Spruce.


Hab. in lignis putrescentibus ad fl. Negro et Uapés,

12. Cephalozia ceratophylla Spruce.

 Dioica pallida prostrata, caule interdum furcato, flagellis posticis radicante. Folia subdissita plana rectangularia v. subcuneata, ad ¼ subacute bifida, segmentis subulatis acuminatis sæpius falcato-diver-
Eucephalozia

gentibus (cornua simulantibus); cellulae sat magno quadrato-hexagonae. Foliola 4-plo minora rectangularia ad ½ bifida, segmentis brevisetaceis.

Hab. supra Chilosechum notophyllum Tayl., ab Hookero fil. in ins. Aucklandis lectum, reptans.

B. Foliolis ( nisi ad flores) normaliter nullis.

13. Cephalozia catenulata (Hüben.)

Jungermannia catenulata Hüben ! Hepaticol. German. 169.

Dioica, plerumque cladocarpa eflagellifera, statura habituque C. multiformae, rigidior tamen, colore fulvo plerumque insignis, caule prostrato subpinнатim ramoso radicelloso; cellulae in caulibus diametro sub 6, corticales 14-seriatae internis paulo majores atque pellucidores. Folia parva subimbricata concavula—siccando magis incurva catenam simulantia—ovali-rotunda ad ½ bifida, sinu plus minus obtuso, segmentis patulis vel subconnotentibus acutis; cellulae parvulae subquadratae et subopaci.


Jung. bicuspidata var. ericetorum Nees, Syn. Hep. 139 (fide Gottschei in litt).

Var. β. stipulifera S. foliolis minutis subulatis lanceolatisve hie illic, vel ubique, obviis; bracteis var. magis spinulosis; perianthiiis magis argute carinatis.

Var. γ. pallida S. pallide viridis vix flavicans, valde ramosa ramis subfastigiatis; foliis subdecurrentibus ad ½—4 fissis, segmentis interdum obtusis, cellulis paulo majoribus; bracteis integerrimus; perianthiiis
typicis (cellulis unistratis conflatis, ore ciliolato). (Ceph. pallida nobis in hb.)

Hab. On roting wood, turfy banks, and shady rocks (chiefly of soft sandstone), ascending on mountains almost quite through the wooded region, but nowhere common, although widely distributed in the north temperate zone. England: Tunbridge Wells (r.s.), Blueberry Gill near Whitby (Mr. B. Slater). Scotland: Glen Finnan (Carrington), Banchory (SIM). Ireland: Cromaglown, and other places in the S.W. (Taylor, Moore and r.s.). France: Pic de Ger and other wooded mountains in the Pyrenees, very fine (r.s.); Germany and Sweden, in several localities.—Var. β. Transoudbat, Central Pyrenees, on prostrate trunks (r.s.); Ny. Sweden (Holmgren in hb. Stabler).—Var. γ. Frodsham, Cheshire (G. E. Hunt); Strensall Moor (G. Stabler).

Hübener's minute description of his *Fung. catenulata* (l.c.) agrees so well with the plant above-described, that I cannot doubt the accuracy of the identification. In what follows I have condensed the more salient portions of Hübener's account. He first gathered the plant on turfy earth in bogs, upon the highest point of the Eiffel, between Bonn and Treves; afterward in similar sites in the Vosges. It loves the society of *F. setacea* and *anomala* [in England oftener of *F. setacea* and *Trichomanis*, to which *F. divaricata* is sometimes added]. Stems subopaque, rather rigid and brittle. Leaves assurgent-concave, when dry more incurved, so as exactly to resemble the links of a chain, cloven to the middle, with acute segments, *less transparent than in other species of this series* and composed of *smaller* thick-sided cells [it is the opaque chlorophyll, aggregated in the circumference of the cells, that makes them appear thick-walled]. *Colour dull yellow-green, passing into olive-brown*. Invol. leaves cloven to ⅔ of their length, margins entire [in Mr. Slater's specimens, from near Whitby, they are sometimes, but very rarely, entire; in those of my own gathering, in Ireland, the Pyrenees, &c., they are constantly more or less denticulate or even spinulose]. Perianth distinctly *ciliated* at the mouth.

Thus far Hübener, whose description accords with the plant I have above described, and with no other known to me; the only marked difference being in the entire perichaetial bracts of Hübener's plant—the toothed ones of ours; but when almost every known species of *Cephalozia* varies in the same way, that difference alone, unsupported by any other, cannot be considered to have any weight.

If we turn now to Gottsche and Rabenhorst's 'Hepat. Europ. Exsicc.' for what should be (but unfortunately are not) type-specimens of this species, we find there "*F. catenulata* Hübén," given five times, and comprising under that name *four distinct species* (!) viz.:
No. 301. Jutland (Jensen)—J. Francisci Hook.

No. 433. Feldberge, Baden (Jack) (=Ceph. leucantha nobis.) Later on in the same work, this specimen is referred to J. Francisci, but it is not so, being more closely related to J. divaricata, from which it differs in the ♀ ramuli being mostly abbreviated (cladocarpous) and in the constantly trigonal perianth.

No. 496. Bonn (Dreessen)—J. bicuspidata L.—a small form, with slender branches drawn up among moss.

No. 515. Salem, Baden (Jack)—J. catenulata Vera! Good, fertile specimens, agreeing exactly with the Pyrenean form. Bracts spinulose. Cilia of perianth 8—4 cells long, 1—3 cells wide at the base. —This is probably what Lindberg has called C. serriflora n. sp. in 'Medd. af. Soc. &c. Fennica, 1878': a useless multiplication of synonyms, for, even if the plant were not Hübener's J. catenulata, it is most assuredly Taylor's J. reclusa.

No. 544. Lacus Hornsfon, Suecia (Anstrom)—J. bicuspidata L.—simply the normal form of that species.

To further complicate the question, there is given along with No. 433 Hep. Eur. a figure by Gottsche of a plant of 'J. catenulata,' authenticated by Hübener himself, which is plainly quite different from the specimen to which it is attached; moreover, it has spinoso-dentate bracts, and in other respects agrees neither with Nees's description nor with Hübener's own; nor does it accurately represent any Cephalozia known to me:—an instance (I take it) of an authentic specimen not being necessarily a genuine one.

That this species is also what Taylor, many years after Hübener, described as new, under the name Fung. reclusa, I have his own assurance; although he sent to myself and others both the true species and a common form of F. bicuspidata under the name 'reclusa.' When I visited him at Dunkerron, in 1842, he gave me some doubtful varieties of F. bicuspidata, and numbered them for future reference. Of these he afterwards told me that Nos. 1 and 2 belonged to a distinct species, which he should call Fung. reclusa, the type of which was a certain plant he had gathered in my company at Cromaglown. Of this and others, referred by him to F. reclusa, he enclosed specimens, so that I have from him five packets of real, or supposed, F. reclusa, whereof only two are the true plant, and the other three are F. bicuspidata, viz.:—

"J. reclusa Tayl. MSS.—Cromaglown" (T. T. and R. S. 13 July, 1842) —type-specimens of the true plant—J. catenulata Hübén.
"J. reclusa T. MSS.—Finnehy River, 1843"—J. bicuspidata L.

"J. reclusa T. MSS.—Knockarohila Mt."—J. bicuspidata L.

"J. bicuspidata L.? no. 1.—Knoekarohila"—J. bicuspidata L.

"J. bicuspidata L.? no. 2.—Banks of the Finnehy, Sept. 1840"—J. catenulata hüben.: forma pusilla rigida.

When I pointed out to him that he had sometimes distributed false specimens of "J. reclusa," he excused himself by audaciously asserting that "it was very hard to expect an author to know his own species!" Specimens of the true plant sent by Taylor to Gottsché from Kerry, and others sent to him by myself from Tunbridge Wells and the Pyrenees, were by that savant unhesitatingly referred to J. bicuspidata var. ericetorum Nees (vide "Syn. Hep."). Being myself well satisfied of its distinctness from J. bicuspidata, and knowing nothing at that time of J. catenulata beyond the brief description in "Syn. Hep.", I could do no otherwise than give it in my 'Hepaticæ Pyreneæcæ' (1847) as J. reclusa Tayl. The above description will have made it clear how very different J. catenulata (or reclusa) is from J. bicuspidata, by the tawny colour and greater rigidity of the whole plant; by the dioicus inflorescence; the absence of flagella; the small subopaque closely areolate leaves, and the ciliolate mouth of the perianth.

The var. pallido is quite possibly a distinct species, for the characters, although slight, are constant. To the same form I am disposed to refer No. 269, G, et R. "J. connivens var. conferta": Hungary; No. 173, ejusd. "J. connivens": Yeadon (Carrington); and "J. catenulata": Oeland (Zetterstedt) in h. Stabler.

Since drawing up the foregoing account, I have had the privilege of examining an original specimen of J. hung. catenulata, from Hübener himself, in the herbarium of the late Professor Schimper. It is exactly what I have above considered a "forma pusilla rigida" of C. catenulata, gathered by Taylor on the Finnehy river in Ireland; and its main characters are as follows.—Plants lurid brown, dwarfed—apparently starved—although a few stems and perianths are of normal size. Leaves acutely patent, subassurgent subbrimicate, segments mostly abruptly acute, rarely very acute. Bracts nearly always spinulose, rarely entire. Perianth triquetrous, shortly laciniate at mouth, lacinia about 12, subdenticulate. Male plants usually more branched than female; andræcia terminal; bracts few, as large as, or larger than, adjacent leaves, monandrous.

In the same herbarium there is a specimen marked "J. rubella N.—In Vogeo," apparently in Nees's handwriting, which is precisely the same species as the foregoing, viz.: C. catenulata pusilla. It agrees well enough with Nees's description of C. rubella, except that the lobes of the upper leaves are not toothed but entire. Those toothed "upper leaves," however, may have been bracts of sterile female flowers, which, like those of the fertile flowers, are serrated in this specimen of Schimper's, and so they are described by Nees. The inflorescence is truly dioicus—male plants intermixed with female; whereas Lindberg, who has examined an original specimen of C. rubella Nees, finds it monoicus. It is possible that the "C. rubella" seen by Lindberg and that seen by myself are of different species, but further evidence is needed.

Dioica et monoica, cladocarpa eflagellaris, prostrata radicellosa sat ramosa, albicans, raro in colorem fulvum roseumve vergens. Folia parvula explanato-disticha contigua vel subimbricata oblique ovato-subrotunda, fere vel adusque medium biloba, sinu obtuso vel subacuto, lobis patentibus triangularibus acuminato-acutis; cellulae parvae subquadrato-hexagonalae opacule, paucae juxta caulem submajores magisque pellucidae ocellum quasi sistentes, omnes leptodermes. Foliola nulla nisi ab florescentias. Flores plerumque dioici, interdum tamen autoici. Andrcia longispica, ramum totum pro more tenentia; bracteae ad 10—jugse confertae, foliis concolores et subsequitae, latiores tamen, orbiculatae concavissimae breviter acute—2—S-lobse monandreae. Bractea $tristichse sub S-jugse, intimae foliis duplo longiores, sese conatae, rotundo-quadratae ad $ bilobae, lobis tenuiacuminatis, spina denteve una alterave utrinque armate. Perianthia magna linearia-clavata (i.e. supra medium paulo latiora) altiuscule obtuse 3-carinata, ore constricto inaequaliter setulose, leptodermia nisi prope basin ubi 2 cell. crassa. Capsula alte exserta magna ovali-cylindrica, plus duplo longior quam lata rufo-badia bistrata.—F $35$ $35$ $35$ mm.

Obs. I have hesitated a long time whether to admit this plant to specific rank, or to reduce it to a variety of C. catenulata. I have taken the former course for these reasons: C. Virginiana is certainly occasionally monoicus, although the sexes very mostly occupy separate plants (while C. catenulata is invariably dioicus); the large elongate male spikes are a great contrast to the small ones of C. catenulata; the leaves are paler, remarkably flattened, even in the dry state, and their straight lobes are very sharp-pointed; the perianth is proportionately larger, clavate—being widest above the middle, which it is not in C. catenulata—and the contracted mouth is more shortly and unequally setulose or ciliolate.

15. Cephalozia multiflora Spruce, n. sp.

Dioica cladocarpa eflagellifera, humilis, amœne vel pallide viridis, dense depresso-cespitosa—in Sphagnetis laxe reptans—prostrata subramosa, interdum subpinnata, ramis radicellosis apice assurgentem a rhizis, flagellis 0. Caulis subcompressus—supra fere planus, subitus convexus; cellulis 6 vel 7 in diametro; c. corticales 12—14-seriatae majuscule pellucidæ, internæ multo angustiores subopacæ. Folia parva
Eucephalozia


Var. β elata S. major pallide viridis ramosior; folii densioribus, segmentis longioribus acuminatis incurvis.

Hab. On shady, heathy banks, chiefly in woods, and on rotting trunks—more rarely on sandstone rock—often fruiting luxuriantly; also on Sphagna and other bog-mosses, where it is usually sterile. Europe, from Scandinavia to the Pyrenees (which it ascends to 1800 metres on the Hourquette d’Aspin). England: common in woods on a
Eucephalozia

peaty soil near Whitby and Castle Howard, mostly associated with Lepidozia reptans, also on moors and turf-bogs; Tunbridge Wells, on rocks; &c., &c. Wales: Tyn-y-groes, &c. Scotland: Dumfries, and many other places. Ireland: common in Wicklow, Kerry, &c. France, Belgium, Germany, &c.—apparently nowhere uncommon, but (as with us) mostly mistaken for a variety of C. connivens—sometimes for C. catenulata. N. America: U. States and Canada—probably widely distributed. Var. β, Fowleshow Moss, Westmoreland: the male plant alone (G. Stabler).

This is the plant I was taught, in my younger days, by specimens from Taylor Wilson and others, to regard as the true *f. connivens* of Dickson and Hooker; although I did not fail to demur against giving that name to a plant which had neither the large leaf-cells nor the longiciliate perianth shown in Hooker's figure. Specimens of my own gathering, in Terrington Carr, were the first I ever saw of the true "*f. connivens*," which I now find to differ essentially in the monoicous inflorescence, besides the other characters.

*C. multiflora* may be distinguished from *C. bicuspidata* and *connivens*, and from most of their near allies, by the dioecious inflorescence; the small leaves, obtusely cloven to only ⅓ of their length, and rather more closely reticulate; the bracts far less deeply cloven, and rarely into more than two segments; but above all by the fleshy perianth and calyptra, the perianth being 3 cells thick below and 2 cells thick about the middle, and the calyptra 3 cells thick almost up to the very apex; while both these organs in *C. bicuspidata* and *connivens* consist throughout of but a single layer of cells. Moreover, the perianth is merely denticulate at the mouth, while that of *C. connivens* has the almost unique character, among European *Cephalozia*, of terminating in long cilia; the perianth of *C. catenulata* being merely ciliolate, or setose at the apex. *C. multiflora*, when fertile, as in our Castle Howard woods, and especially as Mr. Slater has gathered it in the "gills" near Whitby, well deserves its name; and the widespread tufts, of a pleasant green, copiously studded with the fully ripe and opened capsules, disclosing the cinnamon-coloured spores and elaters, form quite a picture. The purple spores of *C. bicuspidata* afford an additional mark of distinction from that species.

Neither the figures nor the descriptions of Dillenius can be cited with certainty (as it appears to me) for any *Cephalozia*. The specimen in his herbarium corresponding to his tab. 63, f. 4, was found by Hooker "an injured morsel of *f. connivens*"; and Lindberg, who examined the same, calls it *Cephalozia connivens* var. laxa. The figure, however, is plainly that of a common form of *C. bicuspidata* (as indeed Hooker said long ago), and the description seems to have been made from a tuft in which *C. connivens*, *C. bicuspidata*, and *Lepidozia setacea* grew intermixed and were not dis-

*The specimens of this species published in Carr. and Pearson's 'Hep. Brit. Exsicc.', no. 114, are erroneously named "*Cephalozia multiflora* (Huds.) Lindb." seeing that Lindberg's *C. multiflora* is the true *f. connivens* of Dick. and Hooker, and the *f. multiflora* of Hudson is *Lepidozia setacea* (Roth).
Eucephalozia

criminated. Hudson's *f. multiflora* is probably founded partly on Dillenius's description, for he does not appear to have seen the plant, and the only locality he cites (Shooter's Hill) is that of Dillenius; but Linnaeus's character (which he also cites) "J. fronde repente ramosa, foliolis alternis *geminis setaceis aequalibus,*" Mant. H. 310, points definitely to *L. setacea* alone.—Dillenius's tab. 70, f. 13, is represented in his herbarium (according to Lindberg) by true *C. connivens* Dicks., having the autoicous inflorescence and the other characters of that species; but the figure looks more like *C. bicuspidata,* and his specific phrase, "Lichenastrum pinnulis acutissimae bifidis," and the "folia valde acute et profunde incisa" of his description, point to the same species; probably he had both plants under his eye (for they often grow intermixed) and with his imperfect instruments they would certainly be undistinguishable.

16. CEPHALOZIA CRASSIFLORA Spruce.

Monoica, depresso-caespitosa viridis, caule semipollicari repente valido, sectionis diametro 6—8 cellulas lato, compressulo (supra fere plano), cortice pellucido; ramis paucis, nisi ad apicem assurgentem tota longitudine crebere radicellos, aliis stoloniformibus raro flagellaribus. *Folia* valida dissita—raro subimbricata—assurgentia oblique orbiculata concava antice subdecurrentia, apice ad ½—⅓ bifida, sinu acuto, obtuso lunatove, lobulis acutis, vel postico (submajore) obtuso, sæpe conniventibus; *cellulae* majusculæ quadrato-hexagonæ pellucide sat crassæ leptodermæ. *Foliola* nulla, nisi floralia, vel perraro apicem ramorum sterilium versus unum alterumve parvum subulatum. *Flores* φ in ramo pro more perbrevi terminales; *bracteæ* 3-jugæ appressæ, intímæ foliis plus duplo majores, carnosulæ, *basi et paulo altius cellulis bistratis conflatæ,* breviusculæ bis bifidæ; *bracteola* basi utrinque breviter connata, apice emarginato-bi-trifida; *bracteole* exteriore parvæ obsolœtæ. *Perianthia* involucrum triplo superantia angustæ obovato-cylindraceæ, solum apicem versus valde obtuse trigona, ore constricto inæqualiter denticulata, *carnosa,* basi cellulis 3-stratis, medio 2-stratis, conflatæ. *Calyptra* brevis tenuis. *Capsula* oblongo-subcylindrica. *Andræcia* spiaæformia, rami medium—raro totum—tenentia: *br.* folii subminores, basi antica dente incurvo auctæ monandriæ.—F. 55 × ·6; c 1/25—1/20; *br* 1·1—1·3; per 8·5 × 9 mm.

"Jung. bicuspidata L." Spruce in Hep. Pyren. no. 42, pro majore parte.

Hab. In Pyrenæorum jugis altioribus infra portum de Vénasque dicitum, alt. 2600 m, ad rupes humidas ipse legi, mense Sept. 1845.

*C. multiflora* Spruce huic proxima dioïea et longe tenuior est, foliiis duplo minoribus rhomboe-rotundis antice supra caulem in alam longe decurrentibus, segmentis
Eucephalozia apicis angustioribus subulatis; bracteis persæpe alte connatis, cellulis unistratitis conflatis; demum calytra insigniter incrassata.—C. bicuspidata Lun. longius distat foliis ad dimidium usque fissis, segmentis subacuminatis, basi vix decurruntibus; bracteis perianthique strato cellularum unico conflatis, etc.—C. tubulata Tayl., perianthio caruosulo (solum tamen 2 cellulas crasso), nostra similis, dioica est, foliis magnis altr dimidium bilobis, bracteis omnibus tenuibus.—Forsan eadem est C. crassiflora ac Jung., pleniceps Aust. in Proc. Acad. Philad. Dec. 1869 (in White Mountains a cl. Oakes lecta), cui tamen tributa sunt “folia incrassata, segmentis omnibus acutis,” quum in nostra folia involucralia sola basi revera incrassata sunt, caulina autem cellulis unistratis conflata, et lobulus foliorum posticus persæpe obtus-as inventur.

17. Céphalozia bicuspídata.

Jungermannia bicuspídata Linn. Sp. Pl.

sistentia—rarissime in ramo fertili florem ♀ proxime sequentia (i.e. florescentia paroica); bractea foliis parum diversae confertiores assurgentes, sœpe dente antico basi anctœ monandre; bracteola subnullæ.—

\[ F'55 \times 55, 5 \times 4; c \frac{1/25}{1/20}; br 1-3; per 1-8—2-2 \times 5 \text{ mm.} \]


*Hab.* on earth and stones in damp shady places, on decaying trunks, among mosses, &c., in the plains and lower mountains of the entire north temperate zone, rarely passing within the tropics or the arctic circle. Recorded also from the southern hemisphere (Java, Cape of G. H., Falkland Isles, &c.), but the specimens require to be re-examined.

Inter formas speciei vulgatissimæ innumeratas nobis cognitas, magis memorabiles sunt sequentes: 1. *grandiflora*, luxurians, bracteis ♀ maximis squarrosulo-recurvis, sœpe insigniter laciniatis; *hab.* Stockton Forest prope Eboracum.—2. *setulosa*, pusilla, foliis parvis, lobis subapiculatis; perianthiis ore truncato setulosis (setis 2—3 cellulas longis); bractearum lactiniis lato-subulatis acuminatis utrinque 1—2-spinis; *hab.* in valle Mardale com. Westmorland (G. Stabler).

*Ramulus ♀ in hac specie ex ipsius andræcii tergo ortus rarissime inventitur; idem ac in perpaucis aliis Cephalozii, e.g. *C.pygmæa* et *C. obcordata* interdum videmus.*

*[C. alpícola* Massalongo (Epat. Venet. nos. 89 et 131:—Valsesia) seems a compact form of *C. bicuspidata*, with copious leafless flagella; the leafy branches nearly all floriferous, either male or female, so that the leaves are more crowded than the normal stem-or branch-leaves, which are very few in number, yet of the same form as in normal *C. bicuspidata*. Perianth 2 cells thick near the base. Calyptra 2 or 3 cells thick below; but I have seen it only in an unripe state, and one or two inner layers might be absorbed as it filled with the ripening fruit; as happens also in some other species of hepaticæ.]*

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*I have evidence tending to the conclusion that when any Jungermanidea has strayed beyond its usual limits into regions higher either in altitude or latitude, and therefore colder, it is apt to acquire a thickening of its floral envelopes. Thus, the remarkably fleshy perianth of *Pleuroclada albenscens* (Hook) has below the middle 5 layers of cells in Swiss specimens from Schimper, but 8 layers in Greenland specimens from Vahl.—The fleshy perianth and calyptra of *Ceph. multiflora* is however a constant character, at all elevations, even down to the sea-level; whereas in its nearest ally, *C. connivens*, the same organs are never more than a single cell in thickness.*
Eucephalozia

18. Cephalozia Lammersiana Hübn.!


A *C. bicuspidata* L. differt statura 2—3-plo elatiore; colore albicante luridove—nunquam roseo picto; flagellis nullis vel perraris; foliorum laciniis magis inequilatis et acuminatis; foliolis frequentioribus, ad plantas φ præcipue; florescentia dioica, fœminea semper fere in ramo elongato terminali; bracteis lateralibus magis profunde fissis, laciniis integerrimis; perianthiiis majoribus.

*Hab.* locis uliginosis, saxosis humidis, lacum marginibus umbrosis, etc. per insulas Britannicas ut videtur sat vulgata, etiam in tota Europa et America boreali temperata.

This can hardly be considered more than the dioicous and perfect form of *C. bicuspidata*, some even of the smaller forms of which are sometimes in part unisexual. Whether species, subspecies, or variety, it is mostly easy to distinguish from *C. bicuspidata* by its much larger size, tufted growth, the absence of flagella, the dioecious inflorescence, and the female flowers terminating long branches—not on branches so short as to seem lateral, as in *C. bicuspidata*; although even in the latter an elongate fertile branch is sometimes seen. What seems the normal form of *C. Lammersiana* grows in large whitish tufts, and, where male plants are present along with the female, it fruits abundantly. Underleaves are always present in the male plants, not only on the spikes but (more rarely) also on flowerless branches; they are much shorter than the leaves, subulate or ovate-lanceolate, mostly entire, rarely bidentate at the apex. In the female plant they are nearly always confined to the involucres, and sometimes only the uppermost pair of bracts is accompanied by an underleaf or bracteole. This form I have gathered in Eskdale, Yorkshire, by rivulets, especially at the waterfall on the Mirk Esk (Dec. 1841); and Mr. Slater has found it in several other places in the same valley. Mr. Stabler gathers it in bogs adjacent to Morecambe Bay. Sterile specimens from Maize Beck, Teesdale (July, 1843) are large, erect, tufted, dull green, tinged with lurid purple, here and there almost black. Leaves large, very concave, rather narrow at the base, then dilated (especially on the postical margin) so as to be broadly deltoido-ovate; lobes broad, subacuminate. A similar form, as to the colour and the form of the leaves, was found by Dr. D. Moore in a bog on Connor Hill, Ireland.

The E. Bot. plate 2239, "*Jung. bicuspidata*," represents *C. Lammersiana* fairly well; while Hooker’s figure (Brit. Jung. t. 11—copied by Ekart in Syn. Jung. Germ. t. 4, f. 23) is doubtless that of typical *C. bicuspidata*.

Underleaves are very often present, even on flowerless branches of female plants. They begin to appear a good way below the apex, and are ovate-lanceolate, nearly equal to the leaf halved vertically. The uppermost become bifid; and the innermost involucral leaves, or bracts are three, nearly of equal size, the lateral ones being unequally—the medial (or bracteole) equally—bifid: all entire at the margin.—An extended view of the limits of species would probably oblige us to unite both *C. Lammersiana* and *C. tubulata* to *C. bicuspidata*, as subspecies.—[*Jung. albula* Mitt. in Hep. Ind. Or., Journ. L. S. Nov. 1860, p. 93 (in montibus Khasianis subtropicis, alt. 2,—4,000 ped.) according to the description, is exactly *C. Lammersiana*.

19. *Cephalozia extensa*.


*Dioica* cladocarpa esflagellifera, prostrata vel caespitoso-assurgens, radicellosa, e pallido rufescens, pauciramea. *Cellulae caulis* 6 v. 7 in diametro, corticales 12—13-seriatae. *Folia* subtransversa—parum succuba—distiche patula, complicato-concava, inferiōra contigua, superiora confertiora et equitantia, oblonga, ultra ½ biloba, lobis triangulāri-lanceolatis acuminatis, acumine sæpius in apiculum 2—4 cellulas longum attenuato; *cellulae* mediocres leptodermes. *Bracteæ* 3-vel 4-jugae, appresse, intime foliis paulo majores, basi breviter connatae, orbiculatæ, vix ad ½ bilobae, lobis subacuminatis repandis; *bracteola* utrinque unidentata; bracteola secunda conformis nisi edentata, tertia paulo minor obcordato-cuneata, quarta parva ligulata. *Perianthia* bracteis triplo longiora lineari-fusiformia vel sublanceolata, ab ipsa basi altiusceule trigona, ore lato minute setuloso. *Br. ♂* terminales spicatæ, foliis subconformes, magis concave, monandreae.—F ·65 × ·45; c 1/25; br ·8; per 2·3 × 55 mm.

Hab. Observatory Inlet, N.W. coast of America: ♂ and ♀ plants (Scouler). The male plant I have also from the same region, gathered by Douglas, under the name *J. assurgens* Tayl. MSS.
Taylor calls the leaf-segments merely acute, yet his own specimens show them distinctly apiculate, and this, along with the deeper sinus, the absence of flagella and the dioecious inflorescence, affords the most obvious differences from *C. bicuspidata*; while the cladogenous perichaetia separate it from *C. Lammersiana*.

20. **Cephalozia lacinulata** (Jack.)


*Dioica*, pro more cladocarpa eflagellifera pusilla pallida. *Caules* vix ¼ pollicares subramosi radicillosi prostrati. *Folia* parva plus minus dissita—superiora interdum subimbricata, insertione diagonali vel fere longitudinali, subplana cuneato-oblonga-obovatae aliquae vel paulo ultra ½ biloba, lobis late subulatis acutis erectis patentibusve, sinu obtuso raro subacuto; *cellula* fere majusculae subquadratae leptodermes pellucidae. *Foliola* ad papillulas 2 collaterales redacta vel plane nulla. *Ranuli* ± brevissimi, raro subelongati. *Bractea* 3-jugae; intimae liberae foliis duplo longiores ad ¼ bi-(raro tri-) fidei, segmentis subacuminatis integerrimis, rarius grosse 1—2-dentatis; *bracteola* ovata 3—4-fida, segmentis lateralibus minoribus. *Bracteola* 2 extiores multo minores separately integrei. *Perianthia* bracteis 4-plo longiora lineari-fusiformia, supra medium paulo latiora, inferne teretia, apicem versus obtusa trigona, ore constricto 12-laciniate, lacinii bractearum segmentis equilongis sed angustioribus, cellulis magnis oblongo-quadratis pellucidis unistratis conflata. *Calyptra* duplo minor tenuissima. *Capsula* ovalis (juvenilis solum visa). *Pl. 35* paucirameae, tota longitudinal, vel hic illic, antheridio nere; *bracteae* foliis sepe majoribus, latiores, magis acute bilobae, monandreae; bracteolaque ubique adsunt: sat magnae, lanceolatae acuminatae integrei vel inaequaliter bifidulae.—*F* ³·35 × ²·2; *c* ³/²⁴; *br* ⁶—⁷; *per* ²·0—²·5 × ⁸·mm. *Cellulae* cujusque folii sub 30.

**Hab.** On decaying trunks in a wood near Salem, Baden. (Jack, Nov. 1873; Oct. 1875.)

Plantula pulchella! *C. Crossii* nostræ (Andina) peraffinis. Differ antem hæ florescetia monoica; foliis majoribus subcarinatis, segmentis longioribus apice pertenuibus; perianthio ore longiciliato nec laciniate.—*C. connivens* Dicks. multo major est, foliis cellulisque duplo fere majoribus, foliorum sinu plerumque lunato; floribus monoicis; bracteis femineis palmatifidis; perianthii ore ciliatis.—*C. Macounii* Aust. (ex America boreali) et *C. micromera* Spruce (et terris Amazonicis) quoad magnitudinem *C. lacinulata* valde similes, caracteribus longius recedunt.

Monoica, formis C. bicuspidatae minoribus primo visu sat similis, differt flagellorum defectu; foliis angustoribus ultra ½ bifidis, segmentis lanceolatis tenuiacuminatis; præcipue autem perianthio ore ciliis ad 7—8 cellulas longis insigniter fimbriato.

Hab. in rivuli arena juxta Popayan, Andium Bogotensium (Rob. Cross, a. 1877).

22. Cephalozia forficata Spruce.

Cum C. connivente foliorum forma et perianthio longiciliato convenit, distincta tamen florescentia dioica; foliorum sinu orbiculari, segmentis falcatis apice tenui sæpissime forficato-imbricatis; bracteis liberes solum bilobis; perianthio cylindrico tereti apice solo obsolete 3-vel 6-plicato-ore longiciliato.

Hab. in truncis putrescentibus Andium Peruviae orientalium, alt. circiter 1,000 m. (r. s., a. 1855.)

23. Cephalozia Sandvicensis (Mont.)


A C. forficata distat majore rigiditate; foliis ad ½ fere obtuse bilobis, lobis tenuiacuminatis sæpissime porrectis—strictis, nec conniventibus; perianthio breviore ovato-fusiformi tota fere longitudine valde obtuse trigono, ore 12-ciliato.—Folia planissima. Capsula ovali-globosa.


Jung. connivens Dicks. Crypt. IV, t. 11.

Monoica cladocarpa efflagelliferæ pallida pellucida fragilis, radicellis crebris longis albidis arcte repens. Caules subramosi subcompressi; cellulæ corticales sub 8-seriatae internis sat majores fere vacuae. Folia inferiöra superioraque sensim minoræ, media majora subimbricata fere horizontalia, ad insertionem sublongitudinalèm antice longe decurrentia, oblique suborbiculata, apice ad ½ vel fere ad ¼ usque bifida, sinu obtuso lunatove, segmentis triangulari-acuminatis conniventibus; cellulæ sat magna quadrato-hexagonæ fere vacuae. Foliola nulla. Bractæ floris
Eucephalozia


Hab. On wet moors and peatmosses, mostly trailing on Sphagna, Britain, rare or overlooked. Norfolk, marshy place in a wood near Holt (Hooker, 1812); Yorkshire, Terrington Carr, creeping among Sphagnum and Jung. porphyroleuca (r. s. 1847); Gothland and Wheedale, near Whitby (M. B. Slater); Lancashire, Chat Moss (Carr. and Pears. Exsicc.;) Bog near Kelso, N. B. (A. Brotherston); “Gathered by C. Lyell, Esq., upon Sphagnum latifolium in a small bog at the northeast corner of Furzy-lane enclosure, New Forest” (Eng. Bot. 1. c.)—Possibly widely distributed on the continent, but confused with C. multiflora. I did not find it in the Pyrenees, and I have seen no French specimens of the true plant; which, however, is given in G. et R. Hep. Eur. no. 380, from Moorgraben, Salzburg (sauter).

25. Cephalozia curvifolia.


Monoica et dioica clado-(raro acro-) carpa aflaggellifera, dense depresso-cespitosa, virescens, vel sepius albida roseo picta, interdum tota pulchre purpurea. Caules tennes pellucidi subteretes, radicellis albidis validis repentes, rarissime furcati, ramos autem paucos assurgentem arcuatus et facie postica edentes. Cellulæ caulis 4 in sectionis diametro, corticales 8-seriatæ cubicæ vacuae, internæ paulo angustiores sub 5-seriatae parum chlorophyllosoae; omnes cellulæ pariete incrassato. Folia
laxiuscula imbricata assurgentii-subsecunda, succuba, basi perbrevi fere transversa inserta, valde oblique obovata concava, margine antico fere recto, postico basi late semicordata, auriculâ inflexâ (ad Radulae et Lejeuneâ lobuli instar) marginque folio appressâ, ad carinam ventricosâ; ab apice ultra ½ biloba; sinu pro more late lunulare; lobis incurvo-hamatis capillari-cuspidatis, cuspidâe cellulas 8—10 oblongo-quadratas uniseriatast sisteente; cellulae parvulæ quadratae guttulatæ, parieti ad angulos increassato, auriculæ (nisi marginales) subminores.— Folium axillare (ad caulis furcam, ubi adest) acuminatum integrum, altero erure abortiente.— Folium ad caulis ramive elongati apicem interium fere symmetrica, auriculâ inflexâ obsoleta.— Foliola nulla. Ramuli ã pro more brevissimi, bracteas trijugas tristichas cum perianthio solum gerentes; nonnumquam paulo longiores, folia parva paucijuga infra bracteas monstrantes. Bracteeæ intimeæ erectæ oblongæ complicato-bilobæ, lobis subovatis apiculatis, subliberæ, toto margine nisi basin versus minutule inæqualiter spinuloso-denticulatæ; bracteola conformis. Bracteeæ exteriores abrupte minores; omnes bracteeæ exauriculatæ, bracteeolatæ. Perianthia magna sepius medio roseo-purpurea, apice albida, linearia, altetriquetro-prismatica, ore lato truncato hiante—rarius constricto—setulosa, setulis 1—4 cellulas minutas quadratas longis; substantia tenui, cellulis unistratis conflata. Calyptra tenuis. Capsula oblongo-globosa, haud duplo longior quam lata. Andræcia terminalia polyphylla; bracteeæ folii subsimiles magis symmetricæ, cuspidibus strictioribus, auricula postica nulla, antice tamen sépe basi dente antheridium solitarium obvelante auctæ:— Folia 65 × 4 (plica hand explanata); cellulae 1/10 mm.


Novellia curvifolia Mitt. in Godman’s ‘Natural History of the Açores (1870).’

Hab. On rotting trunks and on rocks (chiefly of soft sandstone) throughout Europe, from Lapland to the Pyrenees, but at wide intervals, and nowhere to be called common. In the north it grows in the plains and lower hills; in the south, in the middle wooded zone of the mountains. In the Pyrenees and in Mexico it ascends to 4,—6,006 feet; in the British Isles it descends almost to the sea-level. C. catenulata is
Eucephalozia

its almost constant companion in the Pyrenees; in the S. W. of Ireland; at Tunbridge Wells in England; at Loch Lomond, Glen Finnan, &c., in Scotland. In the British Isles C. curvifolia abounds most at Killarney, and would seem rather rare in the North of England; where however it has been gathered by G. Stabler near Whitby, and in Nuddle Forest (Westmorland); and by J. Nowell near Todmorden. In North America it extends as far south as Mexico. It has been found also in the Azores, and even (according to the authors of 'Syn. Hep.') in South Africa.

This is doubtless one of the most beautiful of all hepaticæ, not only from the elegance and singularity of its form, but from its showy colours of white, rose and purple, assuming a green or olive tint only in deep moist shade; yet it has no character which is not shared by other true Cephalozia beyond the inflexed auricle, or lobule, on the lower side of the leaf, and this quite disappears in the involucral leaves, of both male and female flowers, and even sometimes in the ordinary leaves towards the apex of drawn-out stems and branches.—C. Lammersii has often been mistaken for it, and some even of Hooker's figures have probably been taken from an intermixed plant of that species, although the two are widely different, as may be seen from comparing the descriptions here given. Both Gottsche and Carrington have noted the occasional bifurcation of the stem in C. curvifolia, with a difform (unicellular) leaf at the fork. It is a very rare feature, but I have seen it also in C. tubulata, C. argentea, and two or three others, and it may possibly occur occasionally in every species of the genus.


Dioica, cladocarpa, flagellifera, pusilla viridis dense caespitosa, e caudice repente albido ramoso subaphylo radicelloso caules subramosos edens. Cellulae caulis teretis corticales sub 15 seriatæ, caeteris internis perplicata ovali-orbiculata assurgenti-concava, apice breviter (ad 1/6—1/5 —raro ad 1/4 usque) bidendata, sinu acuto, dentibus obtusis subacutisve conniventibus; cellulae parvulae subæquilateræ leptodermes opace.
Eucephalozia

Foliola duplo breviora ovato-lanceolata obtusa integra, rarius bidentula. Bracteae 3-jugae, intimae foliiis tripo fere maiiores ovato-oblongae, basi erectae, apice ad ½ bifidae, segmentis lanceolatis obtusis recurvo-tortellis; bracteola libera conformis basi hinc vel utrique subbispinosa. Perianthia bracteas duplo excedentia anguste ovato-fusiformia, a basi fere 3- carinata, ore 6-plicata repanda, basi 3 cellulas, medio 2 c., crassa. Calyptra dimidio infero 2 c. crassa. Capsula magna badia ovalicylindrica. Andracia caulis ramive apicem mediumve tenentia; br. folii paulo latiores brevioreseque concavissimae.—E toto habitu, flagellis, foliiis concavis, cellulis parvis, &c., ad Ceph. Odontochisma denudatum distincte accedit. Adveniunt frequenter in planta, praeipue sterili, rami erecti superne sensim parvifolii, apice propagula rosea ferentes, ramis gemmiparis C. denudatae perfecte similares. F. 4 × 85, 85 × 85, 25 × 15; br. 1a. 15 × 8.2 × 1; br. 1a. 9 × 55; per 2.0 × 55; caps. 65 × 35 mm.

Hub. On moors near York, growing chiefly on the sides of recently-cut ditches in moist turfry soil, not infrequent: in fruit on Langwith Moor, 25 May, 1844. Gascony, Landes de Mugriet (r.s. June, 1845). Jutland (Jensen in G. et Rab. Hep. Eur. no. 301, sub nom. "J. catenulata.")—"Norfolk, on Holt and Edgefield heaths (Francis); New Forest (Lyell); Bantry (Miss Hutchins)"; Hook. i.e.

These are all the localities I can at present cite with confidence, and I have seen no English or French specimens, but those of my own gathering, which exactly agree with Hooker's figure. Until I refound the true plant, about 1842, Wilson, Taylor, and most of their contemporaries, had mistaken a variety of F. divaricata for it. (See Wilson in 'Phytologist', I, 337). On the continent it is even yet imperfectly understood, although it certainly exists in Denmark, and has been given in Rabenhorst's 'Hep. Eur.' under the name "Fung. catenulata"; as also on sandy heaths near the foot of the western Pyrenees, where I have gathered it myself. In reality it has very slight affinity with C. divaricata, and in every respect, except the apical notch of the leaves, and the absence of any thickening at the angles of the cells, it is exactly an Odontochisma in miniature.

27. Cephalozia fluitans (Nees.)


Diocca majuscula amene viridis hic illie luride rufa, raro subrosea scariosave. Caules elongati 2—3-pollicares laxe reptantes subramosi flagelliferi statue sève albidi; cellulae caulis in diametro, corticales 14—16-seriatae chlorophylo valde repleto opace, internae vix subminores
Eucephalozia

magis pellucideae, interdum fere vacueae. *Flagella* crebra breviuscula albido-radicellosa, aphylla vel ex parte foliosa. *Folia* majuscule assurgentia-subsecunda distantia, raro subimbricata, oblique inserta, suboblique ovali-ovatove-oblonga, interdum basi subcuneata, parum concava, ab apice ad \(\frac{1}{2}\), raro ad \(\frac{3}{4}\) fere usque biloba—subinde (inferiora praecipue) triloba—sinu acuto angusto, lobis subinaequalibus, postico majore, lanceolatis, apice subcucullato obtusis, raro subacutis, margine repandis; *cellulae* majuscule hexagonae leptoderme vix convexulae laevissime, chlorophyllo copioso subopaceo, inferiores paulo majores subelongates, marginales subquadrates. *Folia* majuscule distantia, cauli appressa eodemque celata, foliis triplo fere breviora, 6-plo longiora quam lata, linearia, interdum lineari-lanceolata-subulatave bifidula, laciniis sepe inaequalongis, altera 3 cellulas, altera 5—6 cellulas, raro in unam coalitis, margine utrinque 1—2 dentatae. *Flores* dioici: ♀ ramulo postico brevi, sub 3 mm longo, basi radicellosa constantes. *Bracteae* laxae 3-jugae 3-stichae, interme foliis vix minores erectae ovato-oblongae canaliculate, ad medium fere bilobaes, lobis acutis subacuminatis; laterales lineae, media (i.e. *bracteola*) utrinque, basin versus 1—2-dentatae, cellulis elongatis inaequalibus conflatae. *Bracteae* extimae triplo minores inaequaliter bidentatae, vel falcatae et integrae; mediae intimae paulo minores subconfuses. *Perianthium* involucrum 2—3-plo superans ovali-cylindraceum, apice solo trigonum, ore truncato-subconstricto fere edentulo, viride, interdum apice rubescens, cellulis unistratibus conflatae. *Capsula* in pedicello lucido basi ovali-bulboso alte extrusa purpurea (sporis repletis nigra) oblonga vel oblongo-cylindrica 4-valvis; *valvulae* lineari-lanceolatae, alternae latiores, cellulis bistratibus lineari-rectangulis, internis ad parietem lateralem nodosis (fibra semiannularis obsoleta vel absorpta) conflatae. *Elateres* mediocres subobtusi hispīri, tubulo hyalino cito dissoluto. *Spora* elateribus paulo latioribus subglobosae minute tuberculose.—*Amenta* ♂ ramulis posticis, femineis æquilongis, constantia, assurgentia, basi radicellis et foliis minutis vacuis vestita; bracteæ propriae pauci-(3—4-) jugæ, confertæ subcapitate, f. caulinis triplo minores, orbiculatæ, concæae breviter acutilobæ, lobulo tertio antico brevi incurvo auctæ; *antheridia* solitaria majuscula globosa pedicellata; *bracteolae* lineares vel ovali-lanceolatae integrae bifidæve sæpius integerrimæ, pro bractearum ratione sat magnæ. Raro adveniunt andræcia in ipso caule; bracteæ paucæ, foliis consecutivæ et vix minores,
antice lobulatæ, antheridium maximum foveentes.—F 1·85 × 1·05, 1·0 × 0·6; c 1/25—1/20; f la ·5 × 0·8; br. int 1·2 × 0·5; br la ·9 × 0·5; per 3·8 × 0·8—9; cal 1·6; caps ·8 × ·3—·4, valvulae ·15—·35 mm late.

Jungermania fluitans Funck. Cr. Gew. no. 593 (ex aquis stagnantibus pratorum alborum (Weisse Wiese) jugi Sudetorum.)


Hab. In the wettest parts of bogs, creeping upon Sphagna and other mosses, sometimes partly floating. North Temperate zone: rare, but probably not entirely excluded from any country. In Germany found first by Funck, in the Sudetic Alps, and distributed by him with Nees's name, Jung. fluitans. Nees, however, afterwards reduced it to a var. of J. inflata, and in his great work gives the following account of its habitat.

"The form d, fluitans, was found by Funck in standing water at the back of Riesengebirge. I myself, with Herr von Flotow, found it on 8 August, 1833, in a similar pool of the Weisse Wiese (White Meadows); and in October of the same year with calyces, gradually passing into the var. γ laxa, as it spread on to drier ground at the margin of the pool. I possess similar transition forms from peat-bogs in the Vosges, through Herr Mougeot." (Eur. Leberm. II. p. 45).—Herr Limpricht has re-found the plant, in Nees's locality, and his specimens, which I have seen in Mr. Stabler's herbarium, quite agree with ours.

Belgium: ad semitas in sylva Arduennæ (Libert in Hüb. Hep. Germ.)

France: In Vogeso (Huebener in hb. Schimp.)

Scandinavia: Eastern Finland, and in the Isle of Aland (s. o. Lindberg).

British Isles: New Forest, Hampshire (c. Lyell, 1813). Fowleshaw Moss, on the shore of Morecambe Bay, Westmorland, growing upon Sphagnum intermedium, along with Cephalozia multiflora and Lammersii (c. stabler, 25 Sept. 1875 § and 9 plants; 3 July, 1877, with ripe fruit). Near Whitby, in Far Wheeldale, creeping over Sphagnum secundum and
tenellum; and on Gothland Moor above Darnholme (Sam. Anderson, 18 Sept. 1875). Delamere Forest, Cheshire (W. Wilson, sub nom. J. inflata var. laxa). Ireland: floating in a bog near Kylemore, Co. Galway, along with C. multiflora and Lammersii (D. Moore).

North America: In Ohio and elsewhere (F. C. Austin).

Var. cæspitans. Planta tota, vel ex parte, luride purpuraseens, caulibus brevioribus confertioribus subassurgentibus. Folia raro ultra \( \frac{1}{2} \) fissa. Foliola linearia subbifida, interdum subobsoleta. Bracteæ inferne erecto-appressæ, superne patulae vel recurvæ. Perianthia prælonga (4·0 × 0·6 mm) fere linearia, dimidio inferiore teretia, superiore trigona, ore subdentula, basi ipsissima 2 cellulas crassa.—Hab. Delamere Forest and New Forest (Vide supra).

This fine plant has been strangely overlooked and misunderstood. There can be no doubt that it was first discovered by Mr. Lyell, in the New Forest, in 1813; and that in November of the same year a very fair figure, made from his specimens, was published in 'English Botany' (t. 2569), but under the false name "Jung. Francisci.' Whoever compares that figure with Hooker's excellent one of his \( J. \) Francisci must see at a glance that the two plants are perfectly distinct; for the E. Bot. plant is thrice the size, and the large flattish leaves are oblong—varying little in width from base to apex—while the lobes are very obtuse and the cells rather large; but the figure of the true \( J. \) Francisci shows minute, almost orbicular, and very concave leaves, with very short subacute segments, and opaque cells only half the size of those of the other. The stipules, clearly shown in Sowerby's figure, are linear and shortly bifid, while those of \( J. \) Francisci vera are ovato-lanceolate. The only important feature omitted from the E. Bot. figure is the flagella, which were possibly wanting from the very short segments of the magnified stem depicted.

In the description appended to that figure, Smith says "The Rev. R. B. Francis first found the present plant near his residence at Holt and Edgefield, Norfolk," and tells no more of its habitat. Knowing that Smith did not always observe the very essential rule of stating the exact source of the plants figured and described in E. Bot., I asked Dr. Trimen to refer to Sowerby's original drawings, preserved in the British Museum. He did so, and found the following note, in Sowerby's handwriting, appended to the drawing of no. 2569: "Jung. bifida. New Forest—C. Lyell, Esq. (D. Turner, Esq.)"—Sir J. E. Smith (said Dr. Trimen) has crossed through "bifida" and written "Francisci." From which it plainly appears that the specimen figured was gathered by Lyell, named \( J. \) bifida by Turner, and re-named \( J. \) Francisci by Smith—one may safely assume without consulting Hooker, the authority for the original \( J. \) Francisci.
The Eng. Bot. figure represents a more compact and tufted form than what is usually found; but richly-fruiting specimens, gathered by the late Mr. Wilson on Delamere Forest, and preserved in his herbarium under the name *F. inflata* var. *laxa*, exactly agree with it.

As no one seems to know what *Jung. bifida*, Schreb. in Schmidel., really was, and it has been referred by succeeding authors to nearly every bifid-leaved *Jungermania*, that name may safely be dismissed.

Ten years after Lyell's specimens were gathered, and figured (but misnamed) in Eng. Bot., the same plant was found by Funck in the Riesengebirge, and the specimens distributed in his excellent 'Exsiccata,' under the name *Jungermania fluitans*, given to them by Nees (l. c.). Yet in 1836, in the 2nd vol. of his *Europa's Lebermoose*, Nees reduced it to *F. inflata* Huds. var. *d. fluitans*. The two species are, with the sole exception of the obtusely-lobed leaves, so utterly unlike, that it is difficult to conceive how a consummate hepaticologist, like Nees, should have ever confused them. It may suffice to contrast their chief characters, which are, for *C. fluitans*, the stem rooting by numerous stout flagella; the branches, whether foliferous or foliferous, all postical; the longer, narrower and more laxly-reticulate leaves; the constant presence of underleaves; the cladocarpous inflorescence; the tristichous female bracts, toothed at the base, and the innermost embracing the perianth; finally the lineari-fusiform, trigonous, thin perianth. But in *F. inflata* there are no flagella; the branches arise variously from the mid-axil of a leaf, or from its postical angle, and the female flowers are borne on the apex of the stem or of long leafy branches; there are no underleaves at all, except very rarely a small subfloral one; the bracts are distinct, conformable to the leaves, and usually remote from the perianth (whence the species becomes the type of Dumortier's spurious genus *Gymnocolea*); and the perianth itself is pyriform, inflated, and obscurely 4—5-licate only at the very apex: it is besides composed of 2 strata of cells up to $\frac{3}{4}$ of its height.

I had never gathered, or even seen, *Cephalozia fluitans*, until my friend, Mr. Stabler, on Nov. 5, 1875, picked it out of Sphagna gathered on Fowlshaw Moss, near Levens, the previous September. By long searching he found on it flowers of both sexes, but neither fruit nor perianths; so that although he felt sure he had got hold of something new, and had a clear perception of its affinities, he was naturally dubious of its exact place. Writing to me, with specimens, two days later, he said "At one time I thought it might be a *Harpanthus*, but the absence of flagella in that genus is opposed to such a notion. Then the cut leaves seem to remove it from *Odontoschisma*. It has some features in common with *Adelanthus*, but still more with *Cephalozia*. . . . The male inflorescence varies considerably. Sometimes the amentum is short, at other times elongate; nay even the apex of the stem may be antheriferous. Each leaf (or bract) which encloses an anther has three lobes, the front lobe reduced to a small tooth." My readers may be interested also with Mr. Stabler's sketch of the site of this remarkable plant. "Fowlshaw Moss covers two or three thousand acres, or perhaps more. It lies on the north side of Morecambe Bay, due north from Milnthorpe, and at its nearest point about two miles away from Levens. It consists of
spongy peat bog, some feet deep, and its surface is very little above high water mark. The Moss and adjacent cultivated land are protected from the sea by banks. There are many grouse on it, and the large seagull builds its nest on some parts of it. *Hypnum Schreberi, Leucobryum glaucum, Jungermania Schraderi and Odontoschisma Sphagni,* all fruit there." By carefully watching his plant, at brief intervals, he was at length rewarded by gathering it in perfect fruit, but not until July, 1877.

The cladogenous, or quasi-lateral, inflorescence satisfied me from the first that the plant must be either a *Cephalozia* or the type of a new genus; so, until a better name could be found for it, it was called and distributed as *Cephalozia cladorhizans* Stabler, and neither of us thought, for a good while, of looking for it among the varieties of *Jungermania inflata* described by Nees; the inflorescence and the possession of flagella and underleaves evidently removing it widely from that species. It was not until after we had got the fruit that, reading over with more care Nees's description of his *J. fluitans* (which he afterwards merged in *J. inflata*), I saw that Mr. Stabler's plant must be the same species; and specimens from Herr Limpricht, gathered in Nees and Funck's original station, removed all doubt of their identity.

The previous history of *Cephalozia fluitans,* up to the time when I made its acquaintance, I have already sketched, with the exception that Lindberg had found the male plant in Finland, and described it in the 'Botaniska Notiser' for 1872 as *Cephalozia obtusiloba* n. sp.; being evidently (like ourselves) unaware that it had been already named and described forty nine years before; and that, ten years earlier still, a good figure of it had been published (but under a false name) in the 'English Botany' of Sowerby and Smith.


* Dioica,* majuscula depresso-æspitosa e viridi rufescens badiave, interdum aurantiaca, fragilis. *Caules* ½—1-pollicares intricati validi flexuosi, tota longitudine albido-radicellosi, simplices vel persepe semel bisve dichotomi—apice novello semper fere bifurcati—interdum (nec semper) ramos posticos stoloniformes breves radicellarios ex parte foliosos (raro omnino aphyllos) proferentes. *Cellulae caulis* 7 vel 8 in diametro, corticales 20—22-seriatae subquadrae subopace, internæ subangustiores magis pellucidae. *Folia* basi diagonalis inserta, inferiora distantia patula oblonga v. cuneato-oblonga, ad ½ subacuta biloba, lobis obtusatis rotundatis, sepe decolora; superiora approximata et plus minus imbricata—florem 6 et caulis furcas versus præcipue—intensius colorata, latiora, cuneata assurgentis-concava sepe ad ½ usque biloba, persepeque 3—vel etiam 4—loba, angulata vel obsolete denticulata, lobis solum obtusi, interdum subacutis, sub-æqualibus, vel altero externo—nunc antico, nunc postico—minore; *cellulae* sat parvae 4—6 gone subleptodermes, ad angulos vix sub-
incrassatae, chlorophyllum subopace, inferiores parum elongatae—Folium axillare (ad caulis furcam) anticum, cæteris paulo minus, ovatum integrum, raro basi hinc dente auctum. Foliola parva minutave, interdum obsoleta, raro plane deficientia, colorata, linearia subulatave, integra, rarius bifida, segmentis erectis angustis. Nonnumquam inter foliola normalia advenit alterum monstrorum, folii subæquilongum, falcato-ligulatum vel informe.—Flores dicoci: 9 in caule terminales; pistillidio 10—16. Bracteæ 2—3-jugæ, laxæ imbricatae, concavæ, latiores quam longæ, 3—4-lobae, lobis subacutis, obtusis vel rotundatis; bracteolæ bracteis sat minores oblique ovato-lanceolatae integrae vel profunde biloba. Perianthia alte emersa viridia pyriformia compressula valde obscure trigona, ore breviter 6-loba, lobis inciso-2—4-dentatis, dentibus omnibus sub 18, brevisubulatula insæquimagnis; cellulae quadratae opacæ pachydermæ unistratae, nisi ipsa basi et perpaulo altius ubi bistratae.—F. inferiora *6 × 4; superiora (biloba) *8 × 65, (8—4-loba, et bracteæ 9) *6 × 8, 75 × 8; c. media 1/18—1/40; per 3·0 × 1·4 mm.


I owe to Dr. Carrington the suggestion that the Swiss plant last cited is the same as C. heterostipa. It is noted by him in 'British Hepaticæ' p. 13, in these words: "No. 135 [a misprint for 137] in my copy of G. and Rab. is not Nardia sphacelata but some undescribed species, allied to Cephalozia catenulata Dum. (C. turgida MSS.)."

I have examined the specimen here alluded to, and find it remote enough from C. catenulata, but probably a small dark coloured form of C. heterostipa. As it is the male plant, of which I have not yet seen British specimens, I append a brief description of it. When the fertile plant is found we may be able to decide the question of its identity with C. heterostipa.*

Minor, e rufo nigricans, cæspitoso-subramosa, caule ramisque tota fere longitudine antheridiiferis. Folia caulina propria perrara, subplana patentia—fere squarrosa—cuneata, ad ¾ longit. usque 2—3-loba, lobis obtusis raro subacutis, cellulis 1/14—1/40 mm longis. Andracia spicata; bracteæ plurijugæ 35 mm longæ, concavæ breviter bifidae, antheridium solitarium magnum stipitatum foventes. Bracteola (sive hypophylla)

* In Mr. Stabler's copy of G. and R. Hep. Eur., No. 135 is really in great part a small Sarcoscyphus—apparently S. alpinus—but there is also a slight admixture of the Cephalozia.
This curious species brings us into actual contact with Jungermania, through the § Gymnocolea Dum. of the latter. Its characters, however, preponderate on the side of Cephalozia, viz. 1, its obvious similarity and affinity to C. fluitans, from which it is mainly distinguished by being acrocarpous; 2, by its branches (besides the bifurcation of the stem) being postical and mostly flagelliform; 3, by the distinct, though lax, polyphylous involucres, and the constant presence of postical bracts, or bracteoles; 4, by the perianth being visibly (although very obtusely) trigonous upwards, and rather wide-mouthed.

In habit and foliage J. Gymnocolea inflata is so wonderfully like this species on the one hand and C. fluitans on the other that we may well understand how all three should have been confounded under the name "Jungermania inflata." Gymnocolea has actually a few points in common with the Cephalozia, and especially with the § Subluridae, whereof the most important are the solitary antheridia and the bilobed leaves, with usually very obtuse lobes. Jung. G. turbinata var. acutiloba mihi, has quite the habit and the tender widely-reticulate leaves of such a Cephalozia as C. connivens; but both it and J. G. inflata differ essentially from Cephalozia, in the variable insertion of the branches; in the uppermost leaves being usually so remote from the perianth, and so little modified as to scarcely merit being called "involucral;" in the turgid perianths, 3—5-ricane or corrugate only at the minute mouth—when barren often quite astomous, (which is perhaps the reason why they have remained unfertilised).

Subgenus VI. LEMBIDIUM (Mitt.)

In Hooker's Handbook of the New Zealand Flora, 754 (1867).

Plantulae Odontoschismati, et præcipue O. denudato, sub-similes, virides, pallidæ rufulæve, cæspitosæ. Caules val-idi succulentî, cellulis 8 in diametro, corticalibus 20—24-seriatis, internis subconformibus, conflati, a basi rhizoma-tosa plerumque flagellifera suberecti, parum ramosi, clado-carpi, ramis omnibus posticis apice nutantibus. Folia in-sertione transversa, vel plane succuba—raro subincuba, lata, valida, cymbiformi-concava, apice bifidula, vel in eadem stirpe varia, sc. integra, bidentula, vel paucidenticu-lata; cellulae medii folii mediores leptodermes, inferiores
Lembidium


29. Cephalozia Boschiana.


Lembidium—Odontochisma

**Cephalozia heteromorpha** (Lehm. Hep. Cap. sub Junc. a. 1829; Syn. Hep. 131) foliis subtortundis concavis laxe textis, aliis subemarginatis, aliis integris, **C. Boschi** certe proxima, differt caule eflagellari et foliolis vel subulatis integris vel ovatis bidentatis.—[Junc. rhizantha Mont. in Crypt. Cub. C. heteromorpha vicina dicitur, foliis autem ad ½ usque bilobis, lobis (idem ac bracteum) obtusis, exemplo C. fluidantis extenuatum simulare mihi videretur.]


Subgenus VII. **ODONTOCHISMA** Dumort. Recueil, 1835 (genus).†

*Sphagnoecetis* Nees in Syn. Hep. a. 1845.

**Jungermania** Dicks. etc.

**Plantæ** sat robustæ, virides lurideæ, interdum roseæ, raro albidæ, in plagas latas unistratas arcte intricatas diffuse, vel supra muscos reptantes iisdemque persepe in caespitem densum implexæ. **Caules** validi subteretes, vel prostrati vel per saltus arcuantes et a matrice liberi, ad nodos

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* Mitten, in Hooker's 'Handbook' l. c. attributes "a loosely cellular coat" to the stem. There is however none such, and the "looseness" exists solely in the author's perceptions.

† Confer etiam Lindberg, in Notiser ur Sällsk. pro F. et Flora Fennica (1874); et Spruce, in Journal of Botany (1876).

30. Cephalolozia Sphagni.


Dioica, caule elongato subæquifoliato, ope flagellorum arcuato-radicante, ramis gemmiparis nullis. Folia subhorizontaliter patula vel assurgentí-secunda ovato-rotunda-oblongave, rotundata retusulave, sub-concava, plus minus distincte marginata; cellulae medioeres subopacæ, pariete ad angulos incrassato, cuticula verruculosa. Foliola nulla vel perrara, minuta ovata integra bifidave. Bracteæ 9 foliis submajores sæpissimeque pellicidiores recurvulae cuneato-oblongæ ad ½ fere bifidæ integerrimæ. Perianthia foliiis 3—6-plo longiora subulato-fusiformia trigona albida roseave unistrata, ore vel in lacinias sub 6, ciliatis, fissa,


Hab. In ericetis humidis totius Europæ et Americæ borealis, supra muscos palustres repens; etiam in sylvis fluminum Amazonum et Orinoci ad arborum radices. In Abyssinia pulchra specimen legit W. Schimper.

31. Cephalozia denudata.


Jungermania Sphagni Hook. et al. ex p.

Sphagnoecetis communis β macrior Nees in Syn. Hep.

Pleuroschisma (Odontoschisma) denudatum Dum. Syll.

Odontoschisma denudatum Lindberg.

Hab. in iisdem terris ac prior, supra truncos cariosos, decurtatos vel prostratos, præcipue, rarius in terra saxisve vel inter muscos in ericetis. In America australi, ad latera Andium Peruvianorum, alt. circ. 1200m, semel inveni.

32. Cephalozia obtundata Spruce.

Monoica cladocarpa eflagellifera humilis, caule elongato prostrato subramoso, ramis sœpe apice tenui radicantibus, nullo tamen subaphyllo. Cellula in caulis diametro sub octo; c. corticales 22-seriatae inerassatæ opacæ; interiores externis æquimagnæ vel imo latiores lep-todermes subpellucidæ. Folia parvula oblique inserta vel fere longi-
Odontochisma—Cephalozia

tudinalia, subcontigua, patula planiuscula, obcordato-rotunda obovatave; cellulae minutulae (1/60—1/50 mm) quadrato-hexagonæ leptodermes subopace verruculose. Foliola 0. Andrecia postica amentiformia julacea, semper fere ramosa, axi primaria sola masculæ; bractææ propriae foliis duplo fere minores orbiculatae concave integre monandriæ; ramuli alii feminini, alii neutri quorum bractææ steriles elongato-oblongæ emarginatae bifidulæ canaliculato-equitantæ. Flores vel ramulo brevi cauligeno constantes, vel ad spicam ♂ axillares, nempe ramulum e bractææ masculæ axilla ortum sistentes; bractææ subbijugæ, foliis caulinis æquilongæ recurvo-patulæ ovales breviter bifidæ—subinde 3—4-fide—lobis acutis, cum bracteola lanceolata integra subconnatae.

Hab. in imis truncis fl Casiquiare inundatis.—Stirps singularis, facie foliisquæ fere Odont. Sphagni minoris, florescentia monoica—interdum quasi gynandra—defecta flagellorum caet. car. diversa.

Other plants that have been referred to this group are probably either forms of one or other of the two common species, such as Sphagnocetis stolonifera Lindenb. et G., which from Gottsche's detailed description in 'Mexic. Leverm.,' can hardly be more than a variety of O. denudatum; or else they really belong to some other genus. Of this latter category is (apparently) Sphagnocetis variabilis L. et G. Syn. Hep. 688, also a Mexican plant, which departs essentially from the generic character in having several (complura) antheridia together in the repando-dentate, and at the apex incised, bracts of its minute male catkins. But if the flowers are really monandrous, (and not oligandrous, as the description seems to indicate) then the remaining characters are not incompatible with a small Odontoschisma; coming very near to our Cephalozia (Odont.) obcordata.

Subgenus VIII. CEPHALOZIELLA.

Plantaæ pusillæ minutæve, sœpe supra muscos, vel alias hepaticas, cæspite denso subrugido reptantes. Caulis pro plantula sæpissime validus, basi in plerisque subrugidotosus, flagellis autem orbatus; cellulae corticales 10—20-seriatae ab internis haud diversæ. Folia inferiora dissipata suboblique inserta (succuba); superiora magis conferta, fere vel exacte transversa, longitudine (1—15 mm) caulis latitudinem raro excedentia, persœpe cuneata ad vel ultra ½ bifida, carinata, segmentis vel subcomplicatis vel divergentibus, integerrima, vel in aliis sp. subdenticulata, raro spinulosa;
Cephaloziella

Cellulae parvae—minutae (diam. \(1/50 - 1/70\) mm) subquadratae, guttulatae. Foliola valde variabilia, interdum in una et eadem specie nunc ubique praesentia, nunc ex p. vel omnino obsoleta; semper (ubi adsunt) parva angusta integra bifidave. Flores in plerisque dioici, in paucis monoici; \(\phi\) persæpe in ipso caule terminales, in alii sp. cladogeni, vel situ variabiles. Bracteae sat magna 3-jugæ (vel plures) bilobæ, 3-stichæ, persæpe cum bracteola conformi alte con- natae, lobis in plerisque denticulatis spinulosisve. Peri- anthia plerumque elongata et angusta, leptodermia, acute prismaticæ, carinis raro ad 3 reductis, plerumque 3, 4, 5, etiamve 6 in eadem specie, ore denticulato ciliolatove raro submutico. Calyptra tenuis. Capsula oblongo-globosa. Andræcia ipsius caulis, ramive majoris, partem sistentia, medialia apicaliæ; bracteæ foliis haud minores, iisdem consecutivæ, rarissime ad ramulum tenuem posticum redactæ.

—Hab. et distr. Species haud numerosæ in terra, saxis, truncis putridis, maximeque in alii muscis epiphytice vigent; una earum (C. divaricata) per totam zonam temperatum borealem vulgata est, et in montes sat alte ascendit; altera (C. exiliflora) eodem peraffinis sed constanter acrocarpica, in Australia temperata inventa est. Cæteræ species adhuc cognitæ rarius occurunt; omnes fere Europææ vel Boreali- Americææ; unicum Amazonicam et Subandinam primum in Lejeunea parasitantem, postea in terra inveni.

Cephaloziella a cæteris Cephalozia subgeneribus distincta caule constanter esflagelliferò; foliis vix longioribus quam caulis est latus, superi- oribus saltem insertione transversis; perianthii tota longitudine pluri (3—6) carinatis, carinis in perpaucis speciebus ad 3 solas reductis. Ad Eucephaloziæ sine dubio magis accedit, præcipe ad species esflagelliferas e.g. C. catenulatam, &c.). Quoad flores \(\phi\) in plerisque in caule ramove longiore terminales cum C. Lammersiana Häbl. convenit; illa tamen foliis magnis valde laxæ cellulosis et caule laxæ corticato longe diversa est.
Cephaloziella

33. Cephalozia divaricata.

*Jung. divaricata* Sm. Eng. Bot. t. 719 (a. 1800) et t. 2463.


*Foliola* aut nulla, nisi ad florescentiam, aut (in vars.) hic illic vel ubique præsentia, lancelata lirate, inferioraque v. transversa, cuneato-vel rotundo-quadrata, adnsque (raro Paulo ultra) dimidium bifida; lobis complicatis v. divergentibus, ovato-triangularibus acutis vel subacuminatis—raro ex parte (f. inferi-orum preecipue) obtusis, integerrimis, rarius denticulo uno alterove armatis; *cellulis* minutis subquadrisatis ab internis liaud diversis, paucirameo, radielloso eflagellifero.


*a.normalis* (=*J. divaricata* Neesii et *Syn. Hep.* 135 = "J.* byssacea* Roth."


Hab. on the ground, on stones, on decaying wood, or overrunning other liverworts and mosses, but always in a humid site, whether shaded or exposed. Probably dispersed throughout the north temperate and arctic zones; in the southern, and between the tropics, replaced by closely allied but distinct species. It abounds equally in plains and in mountains, but rarely ascends above the subalpine region.

The angles of the perianth in this species are very rarely reduced to 3, but are more usually 4, 5, or even 6. When only 3, the third angle is invariably postical; and when there are 4 angles, the fourth is usually added on to one of the lateral faces, making the perianth asymmetrically quadrangular, or trapeziform, on the section. Very rarely indeed is the fourth angle medi-antical, and the perianth symmetrically prismatic. When both lateral faces are keeled along the middle, the perianth becomes 5-gonal, with the widest face in front; and if this face also show a medial ridge, then the perianth is 6-gonal. Examples of all these forms of perianth I have seen in the same tuft, in specimens gathered by myself in Stockton Forest, and in others from near Warrington, gathered by the late Mr. Wilson.

The male and female plants often grow so interlaced that, unless great care be used in disentangling them, a male plant may seem organically united to a female when in reality it adheres only by its radicles. I have, however, twice found a truly monoicous plant, once in specimens from Woolston Moss (w. Wilson), and again in others from Witherslack, Westmorland (g. stabler); although every other plant in the tufts was unisexual. I look on these instances as reversions to a prior bisexual condition, such as occasionally occurs in every dioicous plant sufficiently well known; and not as contravening the normal dioicity of the species.

After reiterated examination of all the materials in my possession, I can only fall back on my original opinion (expressed in my paper on Teesdale Mosses, Ann. Nat. Hist. 1843, and again in that on the Mosses of the Pyrenees, 1849), viz. that all the forms agreeing in the dioicous inflorescence and the other characters above detailed, belong to but one species; especially that the presence of stipules—formerly relied on as the main distinction of C. Starkii from C. divaricata—is, taken by itself, no character at all. Gottsche's specimens of Jung. Starkii, from Rolandsgrube, near Hamburg, are stipuliferous throughout; while those from Luhrup have stipules only in the involucres. Similar, and intermediate forms, I possess from various parts of our islands, gathered by myself, Wilson, and others.

A tufted form of C. divaricata, from Stockton Forest, has the fertile stems thickened upwards, and narrow obtuse leaf-lobes; there are also underleaves. But in this form, as well as in original specimens of Jung. Grimsulana Jack (whose chief character is said to be the obtuse-lobed leaves) acute lobes also occur; and as there is no other tangible difference, I can only regard them forms of C. divaricata.
Cephaloziella

34. CEPHALOZIA BILoba Lindberg MSS.

Cephaloziella biloba Lindberg MSS; Dioica acrocarpa pusilla viridissima. Caules semipollicares simplices vel ramos posticos perpaucos edens, crassiusculus, fragilis, opacus, radicellosus. Folia parva distantia late patentia cuneata, obovata vel subquadrata, subcarinata, ad vel paulo ultra ¼ acute biloba, lobis ovato-lanceolatis, apice pro more acutis incurvulis; cellule minutæ quadratae subopace. Foliola nulla, vel rara: parvula lanceolata. Flores in caule terminales, assurgentes. Bractee tres, unijuga, folii submajores, tenere pellucidæ, in excipulum perianthii basin arcte amplectens, ore breviter 6—8-lobum erosulumque, alte connatae. Perianthium alte emersum, clavatum vel anguste pyriforme 5-carinatum, ore truncato scarioso repandulo. Calyptra pyriformis. Capsula oblongo-globosa. —F • 2 × .2; c 1/80—1/70; per 1.0—1.2 mm.

Hab. Fennia prope Helsingfors, supra Dicrana palustria repens. (LINDBERG !)—Species ambigua, ramis posticis inter Cephalozias prope C. divaricatam cernæ collocanda, bracteis autem solum unijugis inter congeneres singularis.

35. CEPHALOZIA INTEGRERRIMA Lindberg,


Monoica (autoica) acrocarpa pusilla, virens, inferne pallida, tenerrima. Caules perbreves parum et breviter ramosi, ramique radicellis creberrimis albidis repentes. Folia imbricata parva—ramorum sœpe minuta, flores versus majora et rotundiora—caulina media cuneata vel cuneato-quadrata, ad ¼ acute biloba, subcarinata, lobis patentibus obtusissimis; celluleae minutæ leptoderms quadrato-vel rhombo-hexagonæ, marginales quadratae. Foliola nulla. Flores in caule ramisque terminales; bracteeae subtrijugæ tristichæ, folii sat majores, latitudine variae, sœpe prælatæ, apice bilobæ vel truncato-trilobæ, lobis interdum retusis, intime in excipulum perianthio arcte appressum connatae. Perianthium alte emersum, lineare vel subclavatum, semper fere incurvum, 3—4-plicatum, ore lato repando demum plurifido. Capsula oblonga. Andræcia ramum totum fere tenentia; bracteeae bilobæ, lobo postico majore persœpe retuso, monandreae.

Hab. in lacús Ladoga insula, cum C. myriantha Lindberg mixta, ubi detexit cl. s. o. LINDBERG.
Oephaloziella

Huic affinis est C. exiliflora Tayl., differt autem flore, dioica; statura paulo majore et validiore; caule a basi rhizomatosa suberecto; foliis acutilobis; foliolis semper præsentibus; perianthiis brevibus obovato-oblongis.

36. Cephalozia Jackii Limpr. MSS.

Paroica pusilla, magn. C. divaricatae, acro-et cladocarpa pallide viridis, apicibus florentibus sepe purpurascens. Caules breves fragiles, ramique (pauci) prostrati radicellosi, apice assurgentes, aliis ramis elongatis minuti foliis, nullo flagellari radicante. Folia inferiora—ramorum sterilium praecipue—distantia minuta cuneata, superiora, flores versus, imbricata cuneato-quadrata vel subrotunda, omnia subcarinata, usque ad acute biloba, lobis ovato-triangularibus acutis; cellulae parvulae subpellucidae subelongatae 4—6-gonae, ad angulos vix incassatae. Foliola duplo breviora, inferiora linearia lanceolatæ, superiora ovato-lanceolata raro apice fissa. Involucra ovato-juliformia; bracteæ 3—5-jugæ, foliis sat majores, oblongo-orbiculatae concavæ minus profunde bilobae, plus minus denticulate, antheridium singulum foventes, intimæ (mediante bractea postica, lateralibus paulo minore) in excipulum alte connatæ. Perianthia bracteis duplo longiora oblonga vel ovato-oblonga obtuse 4—5-gona-rarissime solum 3-gona) ore scarioso truncato repando demum varie fissa. Capsula oblonga.—F. inferiora 1 x 1, 15 x 12; e 13/40; br 3 x 25, 4 x 3; per 7 x 25 mm.

Hab. Germany: near Custrin, in fine fruit, Sept. 1888 (Flotow); on sandy paths in woods near Salem, Baden, in fruit, July, 1873 (Jack); by the railway near Deutsch-Landsberg in Styria—young plants, purely ♂, May, 1875 (Limpricht).

Obs. Jack's specimens are more slender and longer, and the perianth often linear-elongate; but in foliage and inflorescence they accord with Flotow's specimens, although in both there occur occasionally purely male plants, with the andræcia occupying the medial portion of a stem or branch. The Deutsch-Landsberg plants, so far as I have examined them, are solely males: very young, with mostly unbranched stems; the andræcia occupying their upper half, and sometimes topped by a few normal antheraceous leaves, but never by a female flower.

37. Cephalozia exiliflora.


Dioica acrocarpa eflagellifera dense caespitosa pellucida pallide viridis, apice rufo-badia; caule subramoso vel simplice, basi prostrato et rhizo-
Cephaloziella

matoso, dein suberecto crassiusculo folioso et radiceloso. Caeteris caracteribus, quoad foliola praecipue, C. divaricatae Starkii sat similis, differt autem folii latioribus quam longis, cellulis paulo majoribus; florescentia, tam mascula quam feminina, semper in ipso caule terminali; bracteis (alte connatis) integrissimis; praesertim perianthio brevi obovato-oblongo subinflato 3—5-carinato purpureo-badio, apice scarioso subedentato. Caules ♂ sepe tota longitudine antheridiiferi; bracteae equitantes denticulatæ vel subspinulosae.

_Hab._ Swan River, Australia, on charred wood (T. Drummond).

38. _Cephalozia Macounii._

_Jung._ Macounii Aust. in Proc. Acad. Philad. 1869.

_Dioica_ cladocarpa eflagellifera; caule tenui pellucido flexuoso radiceloso crebris ramoso. _Folia_ viridia, contigua vel subimbricata, late patentia cuneata vel subimbricata, ad vel paulo ultra ½ bifida, sinu lato obtusato lunatove, lobis patulis subdiffergentibus late subulatis (basi 2—4 cell. latis) pro more acutis; _cellulis_ parvis subulatis subpellucidis. _Foliola_ 0. _Bractæ_ 2—3-jugae tristichæ appressæ liberæ vel subconnatæ, vix ad ½ usque 2—3-lobæ irregulariter spinulosæ. _Perianthia_ parvula albida leptodermia, obovato-vel-ovato-fusiformia, obtuse trigona, ore subconstricto setuloso ciliolato. _Andracæ_ caulis ramifer apicem mediumve tenentia.—_F. 15 × 1_; per 75 × 25 mm.

_Hab._ Canada, on rotting trunks (Macoun).

[ _C. Sullivantii_ Aust. l. c. (= _Jung._ divaricatae Sulliv. Musc. Allegh. 239; on rotten wood in Ohio, New Jersey, Canada, &c.) quoad habitum et minutiam _C. micromere_ nostræ persimilarum, et cellulis autem praeminutis et perianthiis ore longe alius, _Cephalozia_ vera videtur, _C. Macounii_ affinis sed longe minor et stipuliferæ; mihi tamen solum et speciminius mancis male cognita.]

39. _Cephalozia Leucantha_ Spruce.

_Dioica_, semper fere cladocarpa, albescens, magn. _C. divaricatae._ _Caules_ prostrati, ♂ cum ♂ sepe arcæ implexi, tenues elongati flexuosí subramosi radicellosi, flagellis nullis. _Folia_ parva valde distantia, patula vel assurgentia, oblonga vel quadrato-rotunda, adusque vel ultra ½ bifida, sinu acuto obtusove, lobis sepe inæqualibus lato-subulatis (basi 3—4 cell. latis) acutis subacuminatis, _parallelis vel conniventes_; _cellulæ_ minutulae subquadratæ, inferiores parum elongatae. _Foliola_ 0. _Bractæ_
Cephalozia

floris ♂ intimae folii 3—4-plo majores, plus minus connatae, orbiculatae subdenticulatae 2—3-lobae, lobis brevibus acuminatis. *Perianthia* pro plantula maxima, folii 10-plo longiora ovato-lanceolato-fusiformia vel sublinearia, albida leptodermia, superne 3-(raro 4-) gona, ore minute sæpeque obsolete setuloso. *Calyptro* tenuis. *Capsula* magna, dimidium perianthium sæpe adequans, oblongo-cylindrica badia. *Andrecia* brevia, vix unquam ramulum totum tenentia, terminalia medieave, julacea; *bracteis* folii majores arcte imbricatis orbiculatis concavissimis carinatis, ad ½ bi-trilobae monandri; *bracteis* minutae lineari-subulatis. — F — 2 *—* 13; c 1/6°; br ♀ ♀ 75; per 2.0 *—* 0.5; br ♀ ♀ 25 mm.

"Jungermania catenulata" G. et R. Hep. Eur. no. 438 (nec Hüben.)

*J. catenulata var. lignicola* Limpr, MSS.

Hab. Germany: Feldberge, Baden (Jack, 1866); Riesengebirge, on decaying trunks in St. Peter's beechwood, and in upper Elbedale (Im-richt, Aug. 1871, ♀ ♀ ♀ et fr.) Scotland: Potarch near Banchory, in very fine fruit, on rotting wood, along with *C. C. catenulata* and *curvifolia* (t. sim).

*C. Macounii* Aust., huic proxima, facile distincta est folii minoribus subimbricatis cuneatis carinatis, sinu apicis latiore sæpe lunato; bracteis spinulosis; *perianthio* triplofero breviore subobovato; andreciis—e bracteis masculis acutilobis superiore prominulis—cristulatis nec julaceis.

*C. catenulata* Huëben. longius distat statura majore, colore fulvo; folii subimbricatis latioribus concavulis—in sicco incurvis et catenulam simulantibus—cellulis latioribus; præcipueque autem perianthio alte triplicato ore distincte ciliolato.

*C. leucantha*, pro foliorum insertione plus minus diagonali—vix unquam exacte transversa—et perianthio cladogeno constanter fere trigono, melius forsan inter Eucephaloziis militaverit, eandem rationem cum *C. multiflora* monstrans ac *C. lacinulata* Jack cum *C. connivente* Dicks.— *C. multiflora* autem certe valde distincta folii majoribus rhomboe-rotundis decurrentibus, ad ½ solum fissis, sinu pro m. lunularis, cellulis majoribus; perianthio (quoad folia multo breviore) et calyptra carnosulis, &c. &c.

40. Cephalozia pygmaea Spruce.

Hab. ad terram umbrosam in Andibus Peruvianis, alt. 1200 m. (a. s. Nov. 1855).


C. rubella Nees., europaea, huic floresc. monoica (vide Lindbergii) conveniens, distat foliis subrotundis ad 1/2 solum fissis, superioribus subdenticulatis, et perianthio oblongo, ore constricto subintegerrimo.—C. rhizantha Mont., corticola in ins. Cuba, differt foliis solum ad 1/2 bifidis; bracteis emarginatis v. breviter trilobis; perianthio oblongo ore crenulato.

41. CEPHALOZIA MYRIANThA Lindberg, Meddel. af. Soc. Fenn. I.


Hab. Finland, chiefly near Helsingfors; and Sweden (Lindberg).

42. CEPHALOZIA ELACHISTÀ (Jack).


Monoica clado-et acrocarpa pusilla pallida tenerrima prostrata; caule e basi rhizomatosa subaphylla paucirameo. Folia distantiæ—solum versus ramorum fertilium apicem subimbricata—ovalia, profunde acute biloba, lobis lato-subulatis acuminatis incurvis, dente uno alterove armata; cellulae parvæ subquadrate pellucidæ subleptodermes. Foliola minuta, sæpius bifida, segmentis-brevisetaceis; interdum nulla. Amenta ♂ in caule terminalia, vel ramum totum fere tenentia; bracteæ angustæ sæpius denticulatæ, lobis acuminatis sursum secundis. Rami ♀ breves

* C. rubella Nees", in hb. Schimperiano asservata, eadem est ac C. catenulata Hüben.

Hab. loca cava torfacea prope Salem in ditione Badensi, ubi cl. Jack detexit, a. 1870—2. Hibernia, in rupe irrorata juxta lacum Lough Bray (s. o. LINDBERG, 1873); Brandon Mt. &c. (p. moore). Finlandia (LINDBERG).

43. CEPHALOZIA Massalongi Spruce.


A C. elachista distat florescentia dioica, statura elatiore, caule prælongo; foliis fere bipartitis, cruribus distantier valide spinulosæ; foliolis ubique præsentibus subulatis lanceolatisve integris bifidisve subspinulosis. Cætera non aderant.

Hab. Italia: Riva, Valsesia (Massalongo, l.c.)

44. CEPHALOZIA dentata (Raddi).


Dioica? a prioribus duabus differe videtur caule brevi; foliis superiores confertis—juxta fl. φ comatis—late patulis, vix paulo ultra ½ bilobis, toto ambitu grosse spinuloso-dentatis, lobis multo latioribus; foliolis sursum increcentibus integris dentatis; bracteis insigniter spinoso-dentatis.

Hab. in sylvis humidis Italiae (Raddi). Gallia austro-occidentalis, in arenosis juxta St. Sever (r. s.) 1846.

45. CEPHALOZIA Turneri.


Monoica et dioica, acro-(rarius clado-) carpa, eflagellifera, pusilla depresso-caespitosa fragilis pallide rufa apice virescens. Caules a basi prostrata subradicellosa assurgentes subramosi, ramique polphylli teretes. Cellulae caulis pluristratæ tenuissimæ, interiores opace, corticales cæteris paulo latiores subpellucidæ. Folia pectinato-disticha conferta et equitantia, adusque vel ultra ½ complicato-biloba, toto margine argute inæqualiter, sēpeque subduplo, dentato-serrata, lobis ovatis vel ovato-
Cephaloziella

lanceolatis acutis apiculatis, lobo antico erecto caulique subparallelo, postico (parum latiore) angulo sub 60° patente; cellulae minuta quadrato-hexagonae plane pulchre guttulatae, pariete ad angulos valde incrassato, endochromio parco. Foliola nulla. Flores in ramo sæpius elongato terminales, innovatione nulla suffulti. Bracteæ propius uni-tri-jugæ intimæ foliis duplo fere majores, basi antica connatae, spinoso-dentatae bilobæ, lobis subacuminatis acantis; bracteola cum altera bractea alta connata ovata subacuminata integra bilobave spinoso-dentata. (Folia bracteis proxime sequentia cæteris foliis submajoris, basi libera tamen, foliolo nullo adjecto.) Perianthia alte emersæ tenuia, cellulis unistratis (nisi ut in ipsa basi ad angulos interdum bistratis) conflata, linearia (basi perpaulo angustata) pentagono-prismatica, carinis altiusculis, apice rotundata, ore fere clauso obscure ciliolata. Calyptra tenuis. Capsula ovalis. Andraea in eadem, vel sæpius in diversa, stirpe, medium ramum pro more tenentia; bracteæ assurgentes plurijugæ foliis subconformes—imo interdum majores—monandric.—F. 25 × 2; e 1/70—1/60; br. 4; per 1.0 × 25 mm.

Hab. Sandy or loamy situations, under shade of bushes, or on ditch-banks, nearly always associated with Atrichum undulatum, Diplophyllum albicans, and sometimes with Nardia scalaris and N. Funkii. S.W. of Ireland: Bantry (Miss Hutchins); Cromaglown (s. o. Lindberg). England: Sussex, Tilgate Forest, (Edw. Jenner, May, 1842; G. Davies, 1879). France: Dept. of Maine-and-Loire (Guepin); rock on the bank of the Maine near Cholet, also on a ditch-bank in the Cholet woods in fruit (Brin et Camus, 1878); near Vire, Normandy, with Nardia Funkii (Hb. Schimper); Canary Isles (Webb). Africa: near Tangier (Salzmann).

Rami plerique laterales, e folii media axilla ori, quando caulís furcatus evadit), frequentiès lobo postico solo velati; adveniant rarius rami postici, e caulis tergo—extra foliorum bases—exunctes. Caulis ipso apice fructifer; rami fertiles interdum abbreviati, sæpius elongati.

In speciminibus a cl. Lindbergio lectis bracteæ intimæ cum bracteola biloba in excipulum alte connatae; exteriores minus alæ—vel uno solo latere—connatae.

Obs. A curious and beautiful little plant, standing on the confines of several genera. Except for its similarity to Cephalosia dentata—in habit, and in its toothed complicate leaves—and for the occasional occurrence of of a postical branch, there is little to identify it with Cephalosia. Its toothed, pectinato-distichous leaves bring it very near to Jungermania Helleriana, on the one hand, and Anthelia phylilacantha on the other. By Dumortier, indeed, it was placed in Anthelia: a genus sufficiently distinguished from C. Turneri and every other Cephalosia by the unfertilised pistillidia being carried up by the fertilised one, i.e. by the calyptra; and by the perianth being ro-plicate at the mouth.
APPENDIX

de generibus nonnullis Cephaloziæ affinis.

HYGROBIELLA nov. gen.

Hygrobiella

subconformes, monandrace.—Hab. et distr. Species paucæ nobis cognitæ Europæ incolæ sunt, locis montosis super saxa madida vigentes.

1. Hygrobiella laxifolia (Hook.)


Dioica pusilla pallide viridis cespitosa. Caulis pollicaris suberectus subteres, cellulis angustis (6 in diametro transverso), corticalibus sub 14-seriatis internis perpalo latioribus, constans, basi sæpe valde ramosus; alii rami breves flagellares, aphylli vel microphylli, radicantes, alii assurgentes fastigiato-corymbosi inferne pauci-distantifolii superne (fertiles præcipe) subconfertifolii. Radicellæ persepe omnino nullæ, raro paucissimæ (1—3 nae) ad flagellæ caulemve adstant.

Folia transversa erecta, inferiora minuta ovato-subulata pleraque integra; superiора increasentia subimbricata ovalia et ovali-lanceolata complicato-canaliculata et equitantia, apice ad ⅔—⅔ bifida, segmentis obtusis acuieque, alia solum emarginata; cellulae majuscule pellucide leptodermes, rectangulari-hexagonæ subduplo longiores quam latæ. Foliola foliis parum minora subconformia nisi sæpe integra vel solum emarginata. Flores dioici: 2 in caule ramove brevi longioreve, sæpe iteratim innovando, terminales. Bractææ 2—3-jugæ, perianthii basin amplexentæ vel subremote, foliis caulini similis, sæpe autem multo majores, breviter bifide, inaequiloba, repandæ, ad axin a basi ad medium fere usque cellulis bistratis conflatis (ex eo quasi costatee); genitalia paucæ. Perianthia magna, lanceolato-fusiformia— in fructu sæpe elongata fereque linearia—alte trigona, ore angusto fere clauso vix subdenticulata, a basi ad apicem fere usque cellulis bi-(ad carinas sæpe tri-) stratis conflata. Calypttra duplo brevior angustiorque, clavata, ⅔ inferiore 2 e. crassa, demum apice inaequaliter bivalvis, pistillilidiis sterilibus basi circundata. Pedicellus perianthio plus duplo longior, e. 16-seriatis, sc. cellulis periphericis 12-seriatis, axialibus (majoribus) 4-seriatis, conflatus. Capsula anguste oblonga, rufo-badia bistrata; cellulae stratorum subaequimagnæ irregulariter tesselatæ, oblongo-4-6-gonæ, parietibus lateralibus columnis trabeculisve paucis fulcis, fibris semiannularibus strati interioris nullis vel perraris et subobsoletis. Elateres breves obtusi bispiri. Sporæ eodem diametro ac elaterum, globosæ sublaevæ. Andracia terminalia brevia—raro ramum
totum tenentia; bracteae foliis conformes, vel majores et latiores, monandrae.—Folia \( \cdot 35 \times \cdot 15 \); \( f^{1/20} \). \( f^{1/2} \) \( \cdot 35 \times \cdot 12 \); br \( 1.65 \times \cdot 55 \), (cellulae bractearum \( 1/16 \) \( \cdot 1/12 \) mm longae); per \( 2.0 \times 0.5 \) mm.


Cephalozia laxifolia Lindberg Musc. Scand. 1879.

Stirps singularis, a Cephalozii certe diversa habitu peculiari; ramis foliosis lateralibus, defectu radicellarum fere absoluto; floribus femineis constanter terminalibus. Cellulis elongatis cum Alobiellis congruit; foliis majusculis semper praesentibus ad Eucephalozias subturidas accedit; foliis complicatis ad Cephaloziolum; ab omnibus tamen caracteribus expositis recedit.

Hab. in moist places, especially on rocks by streams, not ascending high in the hills; apparently confined to the north of Europe. British Isles, not rare, but local; Teesdale and Eskdale (R. S. and M. E. Slater); Westmorland (G. Stabler*): Wales (Wilson and others); Scotland: Clockmaben, near Banchory, gathered by T. Sim with fruit in perfect state, which is exceedingly rare. Ireland, Co. Kerry (T. Taylor, D. Moore, R.S.). North Germany. Sweden. Greenland.

In specimens from Brandon Mt. (Ireland) and from Teesdale, Eskdale, &c., the branches mostly originate from the leafless lower portion of the stem, and (as there are no radicles to indicate the underside of the stem) it is difficult to ascertain on what face of the stem they are fixed; but where they do spring from a leafy part of it they are lateral, and axillary to the side-leaves. Scotch specimens, from Pearson, are more leafy, and the branches are very distinctly lateral. Subfloral innovations are either lateral or postical, and are often repeatedly innovant and floriferous; as in the following species.

2. Hygrobiella myriocarpa (Carr.)


Dioica pusilla rufula dense cæspitosa. Caules \( 4-1-4 \) -polaires intexti rigidiusculi obtuse quadranguli, basi nuda rhizomatosi divergenti-

*Mr. Stabler has lately (May 17, 1882) succeeded in finding H. laxifolia in fruit in Mardale.
Hygrobiella

ramosi—interdum subbrachiati; aliiis ramis lateralisubus, basi aphyllis superne foliosis, aliiis (inferioribus) posticis nudis flagellaribus et radicellis nullis vel perraris. Cellulae caulis diametri 6 vel 7, corticales 20-seriate subquadratae, internis perpaulo majores, primum magis pellucidae, in etate opacæ. Folia caulis ramorumque inferiora dissita minuta erecta appressa (exinde segre visibilita) ovato-quadrata, complicata—arte explanata subcuneata—ad ¾ bifida, lobis acutis; superiora abrupte multo majora, confertiora et equitantia, in bracteas ♀ transeuntia; cellulae minutæ subquadratae leptodermæ subpellucideae. Foliola omnino nulla. Flores ♀ terminales, in ramo sepe iteratim innovando-prolifero, innovationibus lateralisubus, raro posticis, interdum binis oppositis elongato. Bracteæ pro plantula magnæ, 2—3-jugæ, distichæ, arcte conduplicateæ et æquitantes, carina recta ad angulum 45° et caule extante, intimæ maximæ, foliis caulinis 4 plu majores, quadrato-oblongae, basi subcordatae, apice vix ad ¼ usque bifidae, lobis obtusatis, raro subacutis; exterores sensim minores in folia transseuntes.

Perianthia semiemersa, oblonga, a facie subcompressa, valde obtuse trigona (angulo tertio postico) antice profunde unisulca—demum probabiliter subplana, apice lato rotundata, ore parvulo denticulata vel setulosa, setulis 1—4 cellulas longis. Æteræ haud visa.—Folia ♀12 × 08 et minora; cell. 1/65; bract. int. lobus posticus ♀3 × 25 1/3 l. anticus ♀4 × 2: per ♀65 × 35 mm.


This curious little plant differs from H. laxifolia in the total absence of underleaves and in the dense reticulation; but in most other respects it is a miniature counterpart of that species; and they agree so perfectly in habit and in all essential characters that I can hardly doubt they should stand in the same genus. I have cut transverse sections of several perianths of H. myriocarpa, and have found them uniformly trigonous, with the third angle at the back, as in H. laxifolia and in all Cephalozia. The furrow along the middle of the upper face of the perianth, with a slight ridge or keel on each side of it, quite corresponds to what is seen in immature, or unfertilised, perianths of several Cephalozia; in their case it is nearly always flattened out at
maturity by the swelling of the enclosed fruit; and the same would possibly ensue with *H. myriocarpa*, of which we have as yet only the young and barren perianth.*

3. **Hygrobiella Nevicensis** (Carr.)


Pallida, hie illie rubescens, sicco sordide flavida, caespitosa. Caules sesquipollicares suberecti, cellulis pellucidis sub 6-stratis (diametro 12 cellulas constante), corticalibus 24-seriatis elongatis, internis vix diversis, conflati, basi nuda rhizomatosi, flagella postica arhisa edentes, superne sparsifolii, pro mores simplices, rarissimo casu ramum unum alterumve lateralem edentes. *Folia* distantia erecto-patula parva ovato-rotunda subcomplicato-concava, basi subcordata, margine supra medium in angulum, raro indentem, protracta, apice ad ¼—½ acute biloba, lobis acutis subacuminatis, superiora brevius fissa, lobis sub-obtusis; cellulae minutae quadrato-hexagonae leptodermes, convexule, chlorophyllo parco. *Foliola* nulla. *Flores* utriusque sexus ignoti.—*Folia* 35 × 35; *cellula* 1/70 mm.


A *Cephalozia divaricata* caule flagellifero arhizo et foliis brevilobis distat, et inter *Hygrobiellas* sine dubio collocanda. Cum *Cephalozia biloba*, Lindberg, habitu et magnitudine fere convenit; differt autem hæc caule radicelloso eflagellifero et foliis magis profunde fissis.

**PLEUROCLADA** nov. gen.

Ab affini *Hygrobiella* differt colore glaucescente; *caule tota* longitudine subæquisoliate, basi nec rhizomatoso nec flagellifero, subpinnatim ramoso; *ramis* omnibus laterali-bus, basi folio caulino difformi (monolobo) stipatis; *foliis*

*Since this account was drawn up, Mr. Pearson has found among his Westmorland specimens, gathered in June of last year, a ripe capsule, and has favoured me with the following measurements and details of its structure.*

*Capsula* badia oblongo-globosa; *valvulae* 4 × 175 mm tenues bistratae, cellulis strati interioris fibris semiannularibus paucis depictis. *Pedicellus* diametro 1, apice 12 mm. *Elateres* 1 × 0.1 mm rufo-badii bispiri. *Sporae* diam. 0.175 mm pallide badæ.
Pleuroclada

concaissimis (vix complicatis; perianthiiis carnosissimis, inferne 8 cellulas crassis; innovatione subflorali nulla.—Hab. et Distr. Unica species nobis cognita ad saxa humectata in montibus Europæ et Grænlandiæ rarius occurit.

Pleuroclada albescens (Hook).

Jungermania albescens Hook. Brit. Jung. t. 72 et suppl. t. 4

Dioica depresse-cæspitosa stratificata albescens virescensve, siccando caulescens. Caules pollicares raro longiores procumbentes intricati, laxe subpinnati, interdum ex parte dichotomi, parce radicellosi, eflagelliferi, validi, ovali-teretes, cellularum stratis 5 concentricis subæqualium conflati, opaci; rami stricti subfastigiati. Folia subdissita patula, insertione fere transversa, parum succuba orbiculata, concaissimais, fere semisphærica, adusque vel panlo biloba, lobis ovato triovatoangularibus acutis, sinu angusto acuto subobtusove; cellulae mediocres quadrato-hexagonæ crassæ, subleptodermæ tamen, fere planæ, endochromio parco subpellucidæ. Foliolum axillare—e cujus gremio ramus oritur—ex parte cauli, ex parte ramo adnatum, caeteris foliis diversum, late ovatum, basi subcordatum, apice acutum nec bifidum. Foliolum subcontigua appressa subplana, foliis vix breviora, late ovata vel ovato-lanceolata acuta vel subacuminata, raro obtusa, intrinque supra basin valide unidentata, alto vel utroque dente interdum sololeto.

Flores dioici: in ramo brevi longioreve—pro pedicelli receptione ad involucrum basin usque excavavato—terminales, innovatione propria nulla suffultis, assurgentibus, basi sæpe valde radicellosi. Bracteæ 3-jugæ apresso-convolutæ, extimæ foliis submajores, intimæ triplo fere majores, basi libere vel breviter connatae, oblongo-quadratae, ad ½ bifidæ, raro trifidae, segmentis subacuminatis acutis; bracteola subminores apice integrae bifiduleve, basi utrinque grosse 1—3-dentatae. Perianthia alte emersa, foliis caulinis 7 plo longiora, clavata vel lineari-fusiformia, alte trigona, ore constricto sepe scarioso demum lacera erosaque, substantia firma, basin versus 5—8 cellulas crassæ, medio 2—4 cell., ad ½ alt. 2 cell., solum juxta apicem 1 cellulam solam crassam; cellulae magne elongatae pellucide. Calyptra pyriformis tenuis, basi sola 2 cell. crassa ibidemque pistillidiiis sterilibus sub 8 brevinsculis lageniformibus obsita, superne unistrata. Capsula perianthio 4—5 plo brevier alter exserta
cyllindraceo-oblonga; valvulae lineariae-lanceolatae ovales; idem ac elateres sporaæque purpureo-badiae; cellulis bistratis, interioribus fibra annulari—sæpe ex p. dissoluta et ad trabeculas reductæ—impletis conflatae. Pedicellus sat crassus, cellulis magnis, demum 4—5 plo longioribus quam latissimis, prismatico-cylindricis, corticis 8—9-seriatis primum chlorophylo repletis posteriorius evacuatis, internis æquimagnis 4—5-seriatis ab initio subvacuosis. Elateres capsula 4 plo breviorens filiformibus utrinque obtusi, fibra spiralis duplici angusta impleti. Sporæ latitudine elaterum globosæ laves. Andracia...—Folia 5 × 5 •65 × •65, •55 × •65; e 1/30; f 1a·6 × 3, •5 × •38, •55 × •4—•45; bract. ext. •75 × •7, int. 1.3 × •9; per 4•0 × •7—•85; pedic 10.0—15•0; caps •8 × •5; elat. •2—•25 mm.

Var. scotica, foliis paulo latioribus quam longissimis, ad ½ alt. solum bilobis; foliolis latissimis, ovatis, hinc vel sæpissimis utrinque unidentatis, superioribus sæpe bifidulis. Jung albescens Hook. (typus).


Hab. var. scotica, in montibus Scoticis (Clava! GREVILLE); in alpibus Helvetica (GRIMSEL! SCHIMPER: specimina ditissime fertilia); in alpibus Tyrolensibus! (Jack in G. et R. &c. 35 et 468.)

Var. islandica, in Ærølandia! (VAHL); in rivuli ripa Laponiae Umensis! Angstr. in G et Rab. Hep. Eur. 386.)—Exempla Schimperiana, quod folia valde concava perpaulo ultra ½ fissa, inter has duas formas intermedia sunt. Perianthia paulo minus crassa quam in stirpe Ærølandica.

Obs. In G. et Rab. Hep. Eur. exsiccat. under no. 386, (Jung. islandica) Dr. Gottsch has the following remark. "Richard Spruce has proposed, in his 'Musci and Hepaticæ of the Pyrenæes', in the 3rd volume of Trans. Bot. Soc. Edinb. (1849) his herbarium name Trigonanthus for the Jungermania bicuspides; but all the plants enumerated under it he still distinguishes by the old name, Jungermania. Our specimens were sent by Angström as Trigonanthus islandicus, in accordance with the proposed nomenclature of R. Spruce". This is an instance of a conclusion drawn from insufficient premises; for, even in my first attempt to separate Trigonanthus from Jungermania, I was careful to exclude J. albescens (i.e. islandica) from the list of typical species. I noted, even then, an approach of J. albescens to Lepidozia reptans, in the bluish-white tinge of the dried specimens, the pinnate branching, with a difform leaf subtending each branch, and the concave leaves with connivent lobes.
Comparison of fruiting specimens reveals another character common to both, namely the fleshy perianth; but the uniformly acrogenous female flowers of *J. albovens*, and the cladogenous flowers of *Lep. reptans*—to say nothing of other important differences in the leaves, &c.—forbid their union in the same genus. Both the glaucous hue and the terminal inflorescence are found in *Anthelia*, which is perhaps the nearest ally of *Pleuroclada*; although *Hygrobiella laxifolia* also stands in very close relation to it. There is no *Cephalozia* which much resembles it in either habit or character, or that could possibly be mistaken for it. Of all the Jungermanidæ it has perhaps the most fleshy perianth, sometimes as many as eight cells in thickness below the middle.

**ANTHELIA** Dumort.

Recueil d' Obs. sur les Jungerm. I, p. 18 (1835).

*Plantæ* pusillæ vel robustiusculæ, dense cæspitosa, e viridi olivaceove glaucescentes. *Caules* validi, cellulis pluristratis conformibus opacis conflatî, inæqualiter pinnati, ramique tristichè foliati (exinde ad speciem trigono-prismatici); *omnes rami laterales*—nullo folio difforni stipati—basi interdum denudati vel minutifolii; *flagellis* nullis; *radicellis* in statu juvenili sat copiosis, in adulto interdum rariusibus. *Folia* tristicha transversa, sat lata, complicatocarinata, ubi magis conferta equitantia, ad vel ultra ½ biloba, lobis subacuminatis, integerrima vel sæpius (superiora præcipue) denticulata vel spinulosa—interdum ipsa facie spinoso-muricata; *cellulae* parvæ pellucidæ quadrato-hexagonalæ—axiales subelongatæ—pariete plus minus incrassato. *F. postica* (s. foliola) lateralibus conformia et vix paulo minora; in aliis speciebus autem sat minora peræpeque apice integra. *Flores* dioici, raro paroici, terminales: *innovatione* sæpe suffulti. *Bractæ* plurijugæ, pro more in capitulum congestæ, foliis sensim majores; cæterum vix diversæ, nisi interdum trilobæ, margine magis valide dentatae, raro connatae. *Perianthia* libera emersa oblonga, basi sola 2 cell. crassa, superne tenuia, a facie subcompressâ, antice profunde unisulca, utroque sulcæ margine superne
Anthelia

carinata, postice 3-(2-) carinata, apice e carinulis utraque facie adjectis 10—8-PLICATA; ore vel hiante, vel e plicis subconstricto denticulata, demum in lacinias plures breves fissa. Calyptra ovoideo-globosa, 2 vel 3 cell. crassa, infera, apicemque versus pistillidiis paucis et squamulis raris minutis obsita. Capsula in pedicello perianthio 3—4 plo longiore subglobosa, bist rata; cellulæ rectangulares, pariete exteriorum trabeculis, interiorum fibris semiannularibus, fulcitæ. Andraecia in stirpe simpliciore terminalia, spicata; bracteae monandrea.—Hab. et Distrib. Ad rupes madidas in subalpinis et alpinis, ad nives æternas usque ascendens, per Europam medium et borealem; unica species in insula Madeira cresit.

Jungermania L. Fl. Lapp. (1737).


A. Folia omnia facie inermia, postica lateralibus subæquimagna.

1. Anthelia julacea (Lightf.)


Dioica sat robusta, colore (in sicco præcipue) glaucescente, sæpe mucore vel confervis infesta, pauciradicellosa. Folia arcte æquantia—raro dissita—oblonga, ad § usque biloba, lobis ovato-lanceolatis acutis subacuminatisve, integerrimis vel eroso-denticulatis, utroque laterè recurvis; cellulae diametro $\frac{1}{250}$ mm. axiales subelongatæ, basales bistratae. Folia postica lateralibus subæqualia. Bracteae foliis sensim majores, magis denticulatæ, basi et altius cellulis 3—2-stratis conflatae. Perianthia oblonga.

Var. β, clavuligera Nees, humilis, caule iteratim innovando-florifero, ad fl. ♀ basin sat radicellosa, ramis insiniter clavatis (e foliis densissimis, inferioribus minutis, superne increscentibus et in bracteas transeuntibus). Folia subintegerrima.
Anthelia

Hab. on moist rocks in the higher mountains of the northern hemisphere, from the Pyrenees and Italy to Lapland, Spitzbergen, Iceland and Greenland. Var. β in the same sites as the type: not unfrequent in the Northern Alps; Pyrenees, near the snowline on Mt. Crabioules (r. s. Sept. 1845).*

2. Anthelia juratzkana (Limpr.)


Paroica, A. julacea minor, pallida, apice virens vel glaucescens, subramosa, tota fere longitudine radicellosa. Folia foliolaque ii A. julacea parum diversa, in exemplis Suecicis sæpe ad ½ solum fissa, segmentis triangularibus; in Styriacis et Scotiais autem ad vel ultra ⅔ fissa, segmentis angustioribus subaequantibus; cellulae (1/35—1/30 mm) ii A. julacea majores et pellucidores. Bractex floris bisexualis (in ipso caule terminalis) plurijugae, laxiuscula capitatae, foliis sensim majores, coniformes nisi basi latiore ventricosa antheridiifera, apice paucispinulosa. (Flores ramos terminantes persepe tenuiores et unisexuales, i.e. fœminei.) Perianthia ovato-oblonga; cætera ii A. julacea conformia.

J. nivalis Sw. in Schleich. exsiccat. no. 1803 (a. 1821); Wahl. Flor. Suec., pro parte.

Hab. in summo monte Warscheneck Austriæ superioris alt. 2200 m detexit cl. Juratzka! Suecia (Swartz, Wahlenberg, &c.). Lapponia Pitensis, in alpe Tjûtjalsk (Lindberg! 1856). In Monte Grimsel Helvetæ, cum Marsupella phacelata (Schimper! 1847). On moist rocks below the summit of Ilen Nevis in fruit, Aug. 1880 (w. west!)

Obs. Apart from the inflorescence, A. juratzkana differs from A. julacea by characters so slight that it may well be the two are merely forms of a single species; as in the analogous Blepharostoma trichophyllum, where dioicus and paroicus inflorescences certainly coexist. [See below my description of that species.]

However that may be, there is no evidence to show that either Swartz or Wahlenberg discriminated between the two forms, and did not equally include the Æ. julacea of Lightfoot, as well as Æ. juratzkana, under their name "Æ. nivalis"; so that, whether species or variety, to Limpricht belongs the honour of first distinguishing Æ. juratzkana by its inflorescence.

* This is the form I and others have always identified with the var. clavuligera of Nees, and it certainly accords better with his phrase "exigua, caulibus rigidis confertis, ramulis brevibus clavatis, foliis densissime imbricatis", than does A. juratzkana, which Lindberg considers synonymous with that variety.
B. Folia lateralia echinata, postica laevia lateralisbus sat minora.

3. Anthelia phyllacantha (Massal.)

Cephaloziæ phyllacantha Massalongo Epat. Ital. exsicc. no. 53.

Dicotylica, pusilla viridis in sieco glauca, dense caespitosa, radicellis longis albidis intexta, pinnatim subramosa, ramis omnibus e foliorum lateraliium axilla ortis. Folia subrotunda, subcomplicata, ad ½ biloba, lobis ovato-lanceolatis acuminatis, margine subrecurvo spinulosa, facie externa e cellulis in papillam spinulamve alte prominulis echinata; cellulae parvae subequilaterae. Foliola paulo minora, tenuiora, facie lacia, margine spinulosa, apice (integro bifidove) ciliata. Flores φ (juveniles) terminales; bracteæ confrertæ capitatae, folii longiores subconformes, nullibi inerassatae. Perianthia . . . . .

Hab. Mountains of North Italy: Alagna, Valsesia (Massalongo)—Habit almost of Cephaloziæ Turneri, but stems much longer, densely packed, and pinnately branched, all the branches being lateral. The leaves of C. Turneri are spinulose at the margin, as in Anthelia phyllacantha, but smooth (not echinate) on the surface, and there are no underleaves; yet it is certainly in these two species that the two genera approach most nearly.

4. Anthelia asperifolia. (Tayl.)


Hab. Insula Madeira, unde e Dicksono habuit Taylor.

Obs. Mitten’s genus Chandonanthus—founded (in ignoram of Dumortier’s prior name Anthelia) for the reception of J. julacea, J. setiformis Ehrh., J. squarrosa Hook. and J. hirtella Web.—Lindberg (‘Hepaticæ in Hibernia lectæ’, p. 517) proposes
to reserve for \textit{J. squarrosa}, and possibly \textit{J. setiformis} (\textit{?} and \textit{J. hirtella}), because he finds the sterile pistillidia in \textit{J. squarrosa} limited to the base of the calyptra, and not scattered over its whole surface as in \textit{J. julacea} (which he would regard the type of \textit{Anthelia}). As I have not seen fertile specimens of any of Lindberg's \textit{Chandonanthi}, I am unable to form an opinion as to the validity of this difference as a generic distinction. Like many other characters, it is sometimes constant through large groups of species, or entire genera; while in other groups, two species so closely allied in every other particular as to be generically inseparable, may have, the one a perfectly free calyptra, the other a calyptra more or less veiled by the adherent thalamus, or receptacle. (That the calyptra itself is always truly gynogenous, is so plain to observation as to need no proof.) In \textit{Marsupella} (or \textit{Sarcoscyphus})—including its subgenus \textit{Acolea} (or \textit{Gymnomitrimn} \textit{N.})—we find some species with free, others with adherent receptacles. In \textit{Nardia} (\textit{Alicularia}) \textit{scalaris}, \textit{N. hænatosticta}, \textit{N. (Eucalyx) succulenta} (\textit{L.} et \textit{L. sub Jung}), &c. the sterile pistillidia stand around the base of the calyptra, and to a variable (but never to a great) height on its surface; but in the curious \textit{Alicularia Breidleri} \textit{Limpr.} the few sterile pistillidia are found \textit{near the apex of the calyptra}; wherefore, if that alone were a valid generic distinction, this species ought to be separated from \textit{Alicularia}.

Lindberg finds the female bracts of \textit{Anthelia julacea} adnate to the lower part of the perianth, as in \textit{Nardia}; but I can detect no adhesion above the base of the perianth: certainly none greater than is often observable in such \textit{Jungermannia} as \textit{J. spherocarpa}, \textit{J. lurida}, and others.

**ARACHNIOPSIS** nov. gen.

\textit{Plantæ} pusillæ confervoidæe griseo-vel cœruleo-virescentes, ad telaranææ instar late intextæ. \textit{Canæles} filiformes laxæ corticati, postice ramosi et radicellosi. \textit{Folia} capillacea strictæ, cellulæ cylindræcis, 2—6 plo longioribus quam latis, uniseriatis constantia et vel unicerca vel in aliis speciebus bicrura; cruribus ab ipsissima basi discretis, altero (antico) paulo inferioris inserto. \textit{Foliola} 0 vel subnulla. \textit{Flores} cladogeni; \textit{bractææ} 3-stichæ, 3—5-jugæ, intimæ liberae vel subconnatae, pro more quadripartitæ, laciniis capillaceis e limbo basali angusto ortis. \textit{Pistillidia} sub 12. \textit{Perianthia} prælonga, linearia, superne (saltem) trigona, ore longe 12-laciniato-ciliata. \textit{Calyptra} tenuis libera. \textit{Capsula} oblonga, cæteraque iis \textit{Cephalozææ} conformia. \textit{Andræææ} terminalia; \textit{bractææ} foliis conformes incurvæ monandræ.—\textit{Hab. et Dis-
trib. Loca umbrosa humida ad terram et ligna semiputrida juxta fluvios Negro et Uaupés, in Brasilia boreali; rarius in Andibus Peruvianis sylvaticis.

a. Folia unicrura.

1. Arachniopsis Pecten Spruce.


Hab. Ad fl. Negro et Uaupés cataractas in terra rupibusque humidis umbrosis.

Obs. The cells of the stem are usually opposite (i.e. collateral); but towards the top of the branches the cortical cells of the upper face sometimes become alternate. The hairlike leaves—each of 4 or 5 cells that are three or four times as long as broad—spring from the marginal junction of two consecutive cortical cells; and they stand, on each side of the stem, two (very rarely three) cells apart.

b. Folia bicrura.

2. Arachniopsis coactilis Spruce.


Hab. ad fluvios Uaupés et Negro.

Var. capillacea S. Foliorum crura tenuissima, cellulis haud numerosis (6—8) sed praelongis, 3—6-plo longioribus quam latis, constantia. —In monte Campana Andium Peruviae, ubi ad speluncae parietes tanquam aranacdl telarum instar dilatatur.

Var. filifolia S. Foliorum crura longissima (1.5—1.8 mm) e cellulis 10—14, duplo (raro triplo) longioribus quam latis, conflata. Perianthia praelonga (2.3 x 0.4 mm) tereti-fusiformia, ore angusto triplicata. Bracteae intimae perianthio perpaulo breviore. —Ad Panuré fluvii Uaupés hanc formam insignem—forsan pro specie propria habendam.—legi.
3. Arachniopsis dissotricha Spruce.


Hab. ad fluvium Uaupés, in rivuli ripis umbrosis, arborum radices investiens.

Descriptionem Blepharostomatis adjicio, ut conferatur hoc cum Arachniopi.

BLEPHAROSTOMA Dumort, Recueil (1835).

Plantaæ humiles cæspitosæ vel super muscos vagantes. Caules tennes opaci, cellulis in diametro sub 5, extimis brevioribus; radicellosi subdichotome ramosi, ramis panceis longis patulis, omnibus lateralibus, flagellis nullis. Folia transversa vel paululum incuba, ad basin fere ipsam 4-partita; crura capillacea stricta subparallela, cellulis sub 12 uniseriatis conflata, postico subbreviore, mediis raro bifurcis; cellulaæ mediocres oblongo-quadratae leptoderms sat chlorophyllosæ subævissimæ.—Folium caulis bifurcatione praepositum cætæris difforme, sæpius crure unico prælongo con- stans, vel tripartitum, crure antico longiore. Foliola foliis ½ breviora, 3-crura. Flores paroici et dioici, terminales. Andræcii bracteæ sub 8-jugæ, foliis æquimagnæ, incurvæ 6-partitæ, cruribus mediis 2 vel 3 bifurcis, monandrae. Bracteæ tristichæ subtrijugæ, intime foliis ½ longiores, verticillatæ, minime connatae, profunde 4-fidæ (pagina basali 4—6 cell. alta); lobis vel bis dichotomis vel plurifidis, laciniis filiformibus. Bracteæ exteriæ minus fissæ; in
Blepharostoma

flore paroico basi turgidæ et antheridiifere. Perianthia alte emersa, albida, cellulis subelongatis, unistratis conflata, pyriformi-cylindrica, primitus valde obtuse triplicata, demum inflata fereque teretia, apice constricto solo trigona, ore breviter plurilaciniata. Calyptra alte emersa, albida, cellulis subelongatis, unistratis conflata, pyriformi-cylindrica, primitus valde obtuse triplicata, de-mum inflata fereque teretia, apice constricto solo trigona, ore breviter plurilaciniata. Capsula calyptram fere adequans, cylindrico-oblonga 4-valvis pertenuis bistrata; cellulae ad parietem lateralem nodis paucis fulcitæ, fibris autem semiannularibus carentes. Elateres maximi bispiri obtusissimi, folliculo tenuissimo cito dissoluto. Sporæ majusculæ læves.—Hab. et Distr. Unica species adhuc nobis cognita, Bl. trichophyllum (L.) in tota zona temperata boreali crescit, et in montes sylvestres alte ascendit; rupes humidas et truncos putrescentes amat. —Dimensiones (plantæ Pyrenaicæ e sylva Transoubat): Folia 5; f. 1. 35; c. 1. 30—1. 23; br. int. 8; per 1. 8 x 6; cal. 9 . 55; caps 8 x 5 mm.

Jungermania L. Fl. Suec. (1745).


Ptilidium Mitt. in Journ. L. Soc. (1861).

Chætopsis Mitt. in Journ. L. Soc. (1864).

Obs. The leaves are inserted almost transversely on the stem, but have (if anything) a slight tendency to be incibus. Those of the main stem have nearly always 4 laciniae, or crura, and the underleaves 3 crura; on slender branches where the leaves have but 3 crura, the underleaves have but 2; and the crura of the under-leaves are always one, or a few cellules shorter than those of the sideleaves.

As to the inflorescence, specimens from the Pyrenees are paroicous; English and Irish ones sometimes paroicous, but very often unisexual; and specimens gathered by Douglas at Observatory Inlet in N. W. America are, so far as I have seen, constantly dioicous. In the last, the cauline leaves have the crura (especially the two medial ones) often forked, and the female bracts are very numerousy divided; but I can detect no really essential difference.
The five genera above-described, with the exception of Anthelia, all belong to a tribe called in my MSS. Trigonantheae, because of the leading character. It comprises the following genera.

Tribus TRIGONANTHEÆ.

Mytilopsis S.
Micropterygium Nees.
Bazzania Gray.
Lepidozia Dumort.
Eulepidozia S.
Microlepidozia S.
Blepharostoma Dum.
Arachniopsis S.
Cephalozia Dum,
   Zoopsis H. f. et T.
   Pteropsiella S.
   Protocephalozia S.
   Alobiella S.
   Eucephalozia S.
   Cephalozietella S.
   Lembidium Mitt.
   Odontochisma Dum.
Adelanthus Mitt.
Anomoclada S.
Hygrobiella S.
Pleuroclada S.

Linnaeus aptly compared the multifarious affinities of genera in an order, and of species in a genus, to the contact of limitrophous countries on a map. Hence, in the collocation of genera in linear series, he often found himself unable to follow his own rule "quae difficilius distinguuntur, propius collocentur". I cannot flatter myself that I have been more successful in the above list of Trigonantheæ. The linear arrangement of the subgenera and species of Cephalozia itself cannot be effected without some dislocation of affinities. Eucephalozia approaches, by certain of its species, more or less nearly to other sections of Cephalozia, and through them to sections more remote and to various distinct genera: thus by
Trigonantheæ

**Eucephalozia micromera** to Zoopsis, Arachniopsis, Blepharostoma, Microlepidozia, &c.

... "... conivens" to Alobiella, Pteropsiella, Protocephalozia.

... "... catenulata" to Cephaloziaella, Hygrobiella, Jungermania & Sphenolobus, Marsupella.

... "... Francisci and fluitans" to Odontoschiisma, Lembidium, Adelanthus, Anomoclada.

... "... fluitans and heterostipa" to Jungermania § Gymnocolea.

In estimating affinities, to rely on the absolute importance of any individual character is almost certain to mislead us, and to close our eyes to the true relations of genera and species. Thus there can be no doubt that the succubous-leaved Cephalozia is far more nearly allied to the incubous-leaved Lepidozia than to Jungermania, although the disposition of the leaves on the stem is the same in Jungermania as in Cephalozia. Moreover, all distinction between succubous and incubous fades away when we come on species whose leaves are exactly transverse in insertion, or so nearly transverse that it is difficult to ascertain which basal-angle stands higher on the stem. Almost the same thing may be asserted of every pair of contrasted characters, and especially of "clado-carpos" and "acrocarpos;" seeing that the two modes become quite mixed up in Cephalozia, where the normally cladogenous fruit is, in many species, occasionally acrogenous, and is even in some species, such as C. acroscypha S., C. exiliflora Tayl. and C. biloba Lindb., constantly terminal on the main axis.

Not only in Cephalozia but in nearly every other genus of Trigonantheæ are the ♀ flowers monandrous. In Bazzania, however, the majority of the species are diandrous; yet a few are monandrous, and in a few others the antheridia are either solitary or twin; while in Adelanthus decurvus Mitt. the normally large solitary antheridium is occasionally replaced by a pair of small ones. A thinwalled capsule, of two layers, the cells of the inner layer strengthened by semiannular fibres—apparently remnants of a continuous spiral—is also a feature common to all the tribe except Lepidozia and Bazzania, which have a much stouter capsule, usually of 4 layers in the former and of 5 in the latter. These two genera comprise the most robust and most highly-
developed plants of the tribe. They abound throughout the tropics and the southern hemisphere, nor are they absent from the northern. In Bazzania every known species is dioicus, and they are as numerous and almost as difficult to define as those of Rubus among phanerogams. Of the fine genus Micropterygium, whose complicate leaves, broadly winged at the keel, are in some sort analogous to those of Fissidens among mosses, I found an aberrant member, which may either rank as a sub-genus, or better perhaps as a distinct genus. Instead of the pinnately-branched stems, the unequally-bilobed leaves, the constantly-present underleaves, and the trigonous perianth of Micropterygium, we have here very flat and frond-like stems with few branches, springing from the underside as in Cephalozia; leaves so equally and closely complicate that they resemble in miniature a slightly-gaping bivalve shell, such as that of the mussel (whence my name, Mytilopsis); underleaves entirely wanting; perianths usually 4-angled below and 8-plicate at the apex. I add a description of this curious and beautiful plant.

MYTILOPSIS nov. gen.

longiusculi laxe bispiri. *Spora* diametro elaterum tuberculosae.

Species unica, *Mytylopsis albifrons* S., habitat in montibus Andium Peruvianorum orientalium *Campana*, *Guayrapurina*, &c. alt. 1000 metr. supra mare, locis cavis umbrosis, ubi ad folia emortua saxaque latos cespites efformat.—Albescens, albedo-viridis, rarius roseo picta, opaca rigidinacula fragilis. Caules fertiles (cum foliis 20—27-jugis) linearilanceolati, steriles (cum foliis sub 40-jugis) lineares, raro apice attenuati et radicantes; rami nulli paucice et paucifolii, alii flagellares radiciferi. Folia subcontigua, vel ubi densiora equitantia, arte explicata cordato-oblonga, toto margine erosore-repanda scaberulaque, apice subacuto incisula; lamellae lineari-robomboideae, antea dimidio superiore posteriorem ala ad carinam solum 1—3 cellulas latas superans; cellulae praeminutæ subrotundæ leviter 6-sinuatæ, trigonis magnis ad angulos incrassatae, carinam versus oblongo-hexagonae, omnes convexulae et minute verruculose. *Perianthia* foliis 2—3plio longiora, obtusangula, reticulatae, eodem ac bractearum laxe rectangulari rhomboideove subscarioso. *Capsulae* cellulae tesselatae, ad parietes laterales columnae trabeculisve paucis fulcite. *Bracteæ* paucijugæ minutæ concave apice bidentes. —Caules 5—15 mm longi, cum foliis 1·2 mm lati; foliæ laminae 65 × 3; cellulae 75 × 5, br. laminae 9 × 5; per 2·0 × 6; 1·35 × 5, 8—1·0; capsulae 8 × 5; elat 25 mm.

Genera huic affinia, sc. *Lepidozia*, *Micropterygium*, *Bazzania*, omnia foliolis sat magnis et conspicuis ad caulem et ramos gaudent. In duobus prioribus ramificatio normalis pinnata est, in tertio dichotoma; si casu rarioe adveniit ramus posticus, ad caulis primarii instar ramulosus est.—In *Mytilopsi* autem omnes rami (*Cephaloziæ quem ad modum*) postici sunt, et foliola nullibis ( nisi ad flores) obvia. Ramus 8 interdum elongatus, infra involuerum tamen aphyllus. Folia caulina ad carinam valde fissilia, raro apice revera subbifida; flagellorum minuta cochleata bifidula.

Obs. The branches spring from the middle of the underside of the stem. The leaves veil the stem at both front and back, and their bases imbricate those of the opposite side of the stem; so that the branches also are veiled at their insertion by the leaf-bases on both sides, but are never axillary to them, as the pinnate branches of *Micropterygium* are.
I cannot close this memoir without some mention of previous attempts at a tribal arrangement of the plants I have been discussing. Dumortier's tribes are mostly founded on such vague notions of structure and affinity, and show such eccentric combinations of genera, that their adoption becomes impossible. Thus, his Chiloscypheæ comprises—besides Chiloscypus and Coleochila Dum. (=Mylia Gray)—Pleuroschima Dum. (=Bazzania Gray), Odontoschisma, Lepidozia; while Cephalozia is relegated to his tribe Jungermaniae, along with Jungermania, Lophocolea, &c.!

Lindberg, the latest systematiser of Hepaticæ, has proposed a tribe Lepidozieæ*, whose first half, comprising Lepidozia, Bazzania, Odontoschisma, and Cephalozia, is a natural group of genera; but the second half: Lophocolea, Pedinophyllum, Chiloscypus, and Harpanthus, belongs to a distinct tribe, differing from the former in habit, ramification, and especially in the perianth being laterally (and not frontally) compressed; as I have already shewn at greater length (ante, p. 2—5).

Nees's Trichomanoidæ (Hep. Eur. I, III & IV, and Syn. Hep. p. XIX et 197), consisting of Calypogea N. (=Kantia Gray), Lepidozia, Mastigobryum, Micropterygium and Physiotium, is really (when the last genus, Physiotium, is eliminated) a natural group, if it can only be proved that his Calypogea (=Kantia Gray) is a marsupial extension of Mastigobryum (= Bazzania Gray). For it is probable that there is not in Nature any separate tribe of pouch-fruited Jungermaniaeæ (= Marsupio-carpeæ = Geocalyceæ = Saccogynææ), but that almost every tribe may have a genus (or genera) of marsupial species, and that, where none such is known to exist, it is either because it has hitherto eluded our search, or has succumbed to other plants in the struggle for place, or has not yet been evolved. The transitional stage, between suprater­raneous and subterraneous perianths, is to be found in those genera whose floral whors are more or more or less adnate to each other into


† This curious genus, the Pleurozia of Dumortier, has not yet found its true place in the system. With Radula and Madotto­ca, where it is sometimes placed, it has little real affinity. In the form and structure of the perianth, and its included organs, there is very great similarity to Jungermania § Anastrophyllum. Even the blood-red foliage is a frequent feature in both groups. Yet in the insertion and structure of their leaves they are (apparently) so very different as to preclude the idea of their juxtaposition in the same tribe.
a fleshy cup, which is apt to become turgid and gibbous at the rooting base. A further extension downwards results in a pouch, which buries itself in the matrix.*

Thus, *Acrobolbus* Nees (≡*Gymnanthe* Tayl. pro p.) is the direct continuation of such *Nardia* ( Allocariae) as *N. hamatosticta* (N.), *N. Lescurii* Aust. and *N. Breidleri* (Limp.), whose gibbous, rooting involucre is the precursor of the pendulous bulbiform pouch of *Acrobolbus Wilsoni*; while the vegetative organs are of the same type in both genera. *Southbya* S., as to its stem and foliage, is the exact antitype of *Calypogeia* Raddi (≡*Gongylanthus* N. ≡*Podanthe* Tayl. ≡*Lindigina* Gottsch. ≡*Lethocolea* Mitt. ≡*Gymnanthe*, ex p. Syn. Hep.). It has the same fragile stems, creeping by numerous pale radicles; the opposite, densely-packed, broad and tender leaves, which are usually rounded or retuse at the apex, more rarely obsoletely 2—3-dentate, or paucidenticulate. In both genera the involucre adheres at the base to the perianth; only in *Calypogeia* it is prolonged into a pouch. So great is the external resemblance between the two genera, that, when I found two species of *Calypogeia* in the Andes, I at first unhesitatingly referred them to *Southbya*; and it was not until some time afterwards, when I had succeeded in disintering the subterraneous pouches, that I ascertained the true affinity of the species. In every *Calypogeia* I have been able to examine, the calyptra is perfectly free from the perianth, in which the genus differs essentially from *Acrobolbus*, whose calyptra is adherent; besides that the leaves of the latter are alternate, loosely set on the stem, and rather deeply bifid or trifid, as in *Nardia Lescurii*, *N. Breidleri*, Jung. (*Lophozia*) capitata,

*See also Gottsch'e admirable memoir "On the fructification of the Junggmanica Geocalycea," in the 21st volume of the Transactions of the Imperial German Academy "Naturae Curiosorum."

† I add a list of all the species of *Calypogeia* at present known to me.

*C. ericetorum* Raddi.  
*C. flagellifera* Raddi.  
*C. Liebmanniana* (Gottsche, Lindigina).  
*C. Müllerî* (Gottsche, Lindigina).  
*C. Granatensis* (Gottsche, Lindigina).  
*C. oniscoides* Spruce.  
*C. euthemona* Spruce.  
*C. Bustillosii* (Mont., Gymnanthe)
Although it is exceedingly probable that *Kantia* (=*Calypogeia* § B Raddi, Nees) is a marsupial form of *Trigonanthecæ*, it is difficult to fix on any one genus of that tribe of which it may be the direct descendant. Its nearest existing ally seems to be *Bazzania* (i.e. *Mastigobryum*), and two species of *Kantia* are actually described and figured in Gottsche and Lindenberg's monograph as *Mastigobrya*, the one on tab. 2 as *M. alternifolium* Nees, from Java and Nepal; the other on tab. 3 as *M. cellulosum* (=*Jung. cellulosa* Spreng.) from the West Indies. As I have myself gathered the latter in the Andes I can speak of it with confidence. Both species differ essentially from *Mastigobryum* in the entire absence of a dichotomous ramification and of flagella, and agree with *Kantia* in every particular, especially in the presence of long stout cauline radicles—often clubbed at the end—such as are never seen in *Mastigobryum*. No true species of the latter, indeed, shews any near approach to *Kantia*, or any sign of an adherent (much less of a pouchcd) involucre.

*Kantia* agrees with *Cephalozia* in having all the branches, whether foliiferous or floriferous, postical, axillary to the underleaves; in the monandrous ♂ bracts and the 2-layered capsule. In aspect and leaf-structure it is very like some species of the section *Alobiella*; but the leaves are constantly incubous, while in *Alobiella* they are succubous, and only in *Al. integrifolia*, which has the leaves almost longitudinally inserted, is an incubous leaf very rarely interposed among normally succubous ones.

The only genus of *Trigonanthecæ* which has an involucre partially adherent to the perianth is *Anomoclada*; and, in reality, when viewed from above, *Anomoclada mucosa* shows considerable external resemblance to *Kantia*, but differs essentially in having all the leafy and flowering branches antical, and only the rooting flagella postical, and in the succubous leaves.

In offering a *resumé* of my speculations on this subject, I do not claim for it more than a provisional importance. If, for the sake of com-

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Capenses:
*C. scariosa* (Lehm., *Jungermania*; *Gymnomitrium* sc. Syn. Hep.)
*C. renifolia* (Mitt., *Lindigina*).

Oceanicae et Australienses:
*C. squamata* (Tayl., *Podanthe*; *Lethocolea Drummondii* Mitt.)
*C. prostrata* (Mitt., *Lindigina*).
parison, we call those genera that have the involucre free, Hypocoleae; those with the involucre growing upon, or adherent to, the perianth, Epicoleae; and those which have the united involucre and perianth prolonged into a pendulous pouch, Marsupiocoleae, or Marsupiocarpeae, we get the following conspectus of the

Affinities of Marsupial Hepaticae.

**JUNGERMANIACEÆ**

<table>
<thead>
<tr>
<th>Hypocoleae</th>
<th>Epicoleae</th>
<th>Marsupiocoleae</th>
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<tr>
<td><strong>Acrocarpicae:</strong></td>
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<tr>
<td>Jung. § Sphenolobus Ldbg...Marsupella Dum.......</td>
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<tr>
<td>Liochlna N..............</td>
<td>Syphyomitra S.</td>
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<tr>
<td>Plagiochila Dum. ..........</td>
<td>Tylinanthus Mitt.</td>
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<tr>
<td>Scapania Dum........... { Schistochila Dum. } ......Balantiopsis Mitt.</td>
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<td>? Ptilidium N......... Lepidolena Dum. ..........</td>
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<tr>
<td>Herberta Gray...</td>
<td>Lepicolea Dum. ...</td>
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<tr>
<td>= Sendtueria N. } ...... { Chatocolea S. ...... } ......</td>
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<tr>
<td>Leiomitra Lindberg.....Trichocolea Dum. ..........</td>
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**Cladocarpicae:**

| Chiloscyphus Dum. ......Harthanus N............... { Geocalyx N.* | ? Saccogyna Dum. |
| | |
| ? Adelanthus Mitt. ...... | Marsupidium Mitt. |
| Bazzania Gray......... | Anomoclada S....... { Kanta Gray |
| Cephalozia § Aloibella S. } .......... | = Calypogeia N. |

* I cannot yet agree with Professor Lindberg in combining Geocalyx and Saccogyna into a single genus, nor am I quite satisfied that Chiloscyphus and Harpanthus are the true precursors of Saccogyna. The opposite leaves and some other features would almost lead one to regard the latter a cladocarpous extension of Leioscyphus and Southbya. Geocalyx, on the other hand, inclines more towards Lophocolea.
ADDENDUM.

38.* Cephalozia æraria Pearson MSS.

Dioica cladocarpa minuta, fulva vel pallide badia, dense depresso-cæspitosa. Caules ¼-pollicares flexuosi, radicellis crebris intexti, sat validi, parce ramosi, ramisque subhyalinæ foliosi. Cellulæ caulis 8 in diametro, corticæ sub 15-seriæ internis paulo majores. Folia dis-sita, squarrose fere patentia, minuta, subcuneata, obscure carinata, profunde (ad ¾) biloba, subintegerrima, sinu acuto obtusove angulum rectum includente; lobis ovatis lanceolatisve, basi 2—4 cellulæ latis, subacuminatis cellulâque unicâ conicâ (duplo longiore quam latâ) persæpe in -curva apiculatis; cellulae minuta oblongæ pellucidae insigniter guttulatæ, parietæ ad angulos præcipue incassato, cuticula asperula. Foliola variabilia, inferiora sæpe minuta obsoletave, superiora foliis subduplo breviora lanceolata, interdum cum folio proximo in folium trilobum connata, supra minora raro biloba folisque vix minoræ. Genitalia paucia. Cætera haud visa.—Folia 125—15 longa, 125 lata (inter lobulorum apices mensa); e 1/70—1/60; br ·25 mm.


Hab. At the mouth of an old copper-mine near Tyn-y-Groes, North Wales (w. h. Pearson, April, 1877).

C. Macounii Aust., proxime affinis, distat colora viridi; caule tenui crebre ramoso; foliis subimbricatis sinu plerumque lunulato, lobis apiculâ linguiformi carentibus, cellulæ subquadraitis; foliis nullis.—C. divaricata certe diversa flore ò acrogeno; foliis distincte carinatis, raro ultra ½ fissis, lobis exunguiculatis, cellulæ quadratis reticulatis (ne guttulatis).

Through the kindness of the discoverer I am enabled to add this new species to my list. It differs essentially from C. divaricata in being still more minute; in the deeply bifid leaves whose narrow segments end in a claw-like apiculus, the guttulate areolation, and especially in the cladogenous inflorescence (which brings it near C. Macounii).—A plant gathered lately by Messrs. Pearson and Stanley, in similar sites near Beddgelert, seems distinct by the greener colour; the leaves cloven only to the middle, with broader segments wanting the apiculus, the frequently denticulate margins and the reticulate cells; and it is possibly distinct also from C. divaricata.
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ERRATA.

Page 2, line 7, after "ciliatis," add "Colesula sessilis...ore ciliis longis articulatis aucta"

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" " " 11, for "setacea" put "setaceum"
" 3, " 17, for "contiguous" read "connate"
" 19, " 14, for "orti" read "ortæ"
" " " 6, from foot, for "trijuga" read "trijugæ"
" 21, " 14, after "denticulatum "dele "—"
" 24, " 14, for "½" read "¼"
" 27, " last, for "axeos" read "axis;" after "sub" dele ".
" 29, " 13, for "quaque" read "quoque"
" 32, " 11, from foot, for "sine" read "sinu"
" 41, " 11, for "sublaciniate" read "sublaciniatæ"
" 48, " 11, from top, for "lacum" read "lacuum"
" 50, " 4, from bottom, for "amæne" read "amæne"
" 56, " 1, after "elongatæ" put period
" " " 1, of note, for "185" read "187"
" 59, " 17, for "concervato" read "coacervato"
" " et seq. for "Odontochisma" read "Odontoschisma"
" 66, " 19, after "I." put ";"
" 67, " 20, for ":" put "("
" 70, " 8, for inv. commas put asterisk
" 72, " 5, for "propiæ" read "propiæ"
" 73, " 6, from foot, for "tantumodo" read "tantummodo"
" 77, " 10, for "mores" read "more"
" 91, " 18, for "coltunnis" read "columns"
" 91, " 21, before "8—1.0" insert "cal"
" 92, " 6, for "Pleuroschima" read "Pleuroschisma"
" 96, " 12, from foot, for "unguiformi" read "unguiformi"