ON
CEPHALOZIA
BY
Richard Spruce.
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CEPHALOZIA

(a genus of Hepaticæ)

Its SUBGENERA and SOME ALLIED GENERA.

BY

Richard Spruce.

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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 A few additional species are known to me only by name, and a few others may lurk undistinguished, or as yet unpublished, in our large herbaria; but the material here brought together amply suffices for my purpose.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 in-cubous 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 Hepaticae, 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 (epicladous), 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 Lejeunea, and monandrous only in two or three small sections of that extensive genus; diandrous—very rarely triandrous—in Frullania; polyandrous in some Plagiochila, Tylimanthi, Scapaniae and Gottscheae; &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 Hepaticae 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 (Zooasis) monodactyla, or Zooasis 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 Utrygter 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 Montagne].

"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 Euphorbiaceæ, 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 "Harpanthus 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: "Harpanthus (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 Lichenæ in the solitary genus Lichen. It is therefore essential to the student to know in what author he may find the orginal definition of (for instance) Jungermania bidentata, and often of slight (or of no) importance to him to know who first called it Lophocolea bidentata.*
ERRATA.

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

,, ,, 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 "¾" read "½"
,, 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"
,, 43, ,, 11, from top, for "lacum" read "lacuum"
,, 50, ,, 4, from bottom, for "amæne" read "amœne"
,, 56, ,, 1, after "elongatae" 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 "propiae" read "propriae"
,, 78, ,, 6 from foot, for "tantumodo" read "tantummodo"
,, 77, ,, 10, for "mores" read "more"
,, 91, ,, 18, for "columnis" read "columnis"
,, 91, ,, 21, before "8—1.0" insert "cal"
,, 92, ,, 6, for "Pleuroschima" read "Pleuroschisma"
,, 96, ,, 12 from foot, for "unguiformi" read "unguiformi"
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 “Hepaticæ 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 Hepaticæ:—

<table>
<thead>
<tr>
<th>Cellulae</th>
<th>Diámetro</th>
</tr>
</thead>
<tbody>
<tr>
<td>magna (large)</td>
<td>1/10 mm = 0.10 mm</td>
</tr>
<tr>
<td>majusculæ (rather large)</td>
<td>1/20 mm = 0.05 mm</td>
</tr>
<tr>
<td>mediocres (medium size)</td>
<td>1/30 mm = 0.033 mm</td>
</tr>
<tr>
<td>parvulæ (smallish)</td>
<td>1/40 mm = 0.025 mm</td>
</tr>
<tr>
<td>parvæ (small)</td>
<td>1/50 mm = 0.02 mm</td>
</tr>
<tr>
<td>minutulæ (very small)</td>
<td>1/60 mm = 0.0167 mm</td>
</tr>
<tr>
<td>minutæ (minute)</td>
<td>1/70 mm = 0.0143 mm</td>
</tr>
<tr>
<td>minutissimæ (very minute)</td>
<td>1/80—1/100 mm = 0.0125—0.01 mm</td>
</tr>
</tbody>
</table>
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 Cephalozia 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 trigonus prism. This character, combined with the postical ramification—all the branches springing from the back, or underside, of the stem, and the polyphyllous tristichous involure, 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 polyphyllum undique imbricatum, phyllis dissectis:—Species stipulatae vel exstipulatae, foliis subcurrentibus bifariis explanatis divisis."—and afterwards, in his Recueil d'Observations sur les Jungermaniacées (1835) as a genus, with the following essential character: "Périchèze polyphylle, à phylles laciniées, imbriquées circulairement et involucent la base de la colesule. Colesule sessile dressée renflée contractée et dentée au sommet"; which is a slight modification of the definition given in the Sylloge. 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 \textit{Cephalozia} the \textit{Jungerman...}
of the connate anthophyls, or flower-leaves, by whose union the (primitively) triphyllous perianth becomes a monophyllous coesule. 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 Cephalozia; 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-canaliculate); 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 under-leaves (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 abiétina N., Lophocolea trachyopa 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, amena, &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 incubous 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 *Jungermanideæ* thus divide themselves into two great groups, whereof the one (*Epigonianthæ*) has the third (or odd) angle of the perianth in front, or *antical*; and the other (*Hypogonianthæ*) 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 *Jungermanideæ* 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 succuous, in a few species transverse, in a very few subincubous; horizontal or assurgent, never deflexed, roundish, or subquadrate, 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 subincurved—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 subquadrate, in the subgenus Alohiella, 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. Androecia amenitiform, 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. Gynoecia capitate, usually seated on an abbreviated branch (i.e. cladocarpous), but sometimes terminal on longer branches or on the main
Cephalozia.

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 semiamnular 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 bicuspidata 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 succubous—in some species almost longitudinal, but becoming crowded and nearly (or quite) transverse in the flower-spikes, mostly oblong—in some species rhombo-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 (\(1/15 \text{ mm}\) long), but more commonly moderate (\(1/30-1/40 \text{ mm}\)), 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 § Gymnocolae 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 *Sphagnoecetis* with leaves emarginate or 2—3 dentate at the apex; but, indeed, in our own *Odontoschisma Sphagni* refuse 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 involucres and perianth, the reddish gemmæ 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 Lindenb. 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 boatshaped leaves of the former; but the loosely-imbricated, obliquely-inserted and succuous 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 Gottshe) 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, \( \frac{1}{16} - \frac{1}{12} \text{mm} \) long, and half as broad, which give the plants at first sight more the aspect of Kantia Trichomanis than of Cephalozia. In C. Alobiella integri-folia n. sp., indeed, an incubous leaf is sometimes (though very rarely) interposed among the normal succuous leaves, which makes the resemblance to Kantia more striking. The very long perianths are mostly laciniate at the constricted mouth, and the laciniæ ciliiform. Three of the species are cladoecarpous, but the fourth (C. Al. acroscypha n. sp.) is acroecarpous, 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. bicuspidata, and by the variable leaf-apex—rounded, obliquely acute, or bidentate—unites this subgenus to Eu- cephalozia.

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—aquilateral-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 truncato-conical basal 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 Euceph. micromera—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

*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 bicuspida, 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 foliaceous 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 trijugous. 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 capillaceo-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 Casiquiari 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 Phascioid 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 *Cephaloziae* 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 suberect 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 *Cephaloziaella*, 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-echinant toothed leaves, and its constantly 5-angled perianth approximate it—as in *Cephalozia*; were it not for its unmistakable affinity to such true *Cephaloziella* 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* (= *Haploniitrium*) 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*, (*Mastygobryum*), &c., &c. Even so, certain small groups may still (for lack of material) remain incombable 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.*

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

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*Hence Dumortier included it in his genus *Gymnocolea*, for a sketch of whose true character and affinities see below under *Cephalozia heterostipa*. 
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, Arachniopsis. The blueish-or-whitish-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 bicellular 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 succubous. Underleaves none, or reduced to two collateral unicellular papille. The cladogenous tristichous-leaved involucres are essentially of the same type as those of Cephalozia, but more finely and numerously 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 Hepaticæ under the name "Junj. trichophylla." They are in reality more closely related to Micro-Lepidozia chetophylla 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.—Junj. 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. Junj. conferroides G., another of
Cephalozia.

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

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-second and (usually) sharply toothed leaves; and by its half-inferior calyptra, strewn with sterile pistillidia; although the cladogenous perichætia 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 Jungermanideæ 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 *Lejeunea* 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 Jungermanniaceae (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, pariete bistrato, cellulis interioribus fibris semiannularibus fulcis. Elateres bispiri decidui. Sporae minuta.

Descriptio.

Plantae depresso-caespitosae, vel supra muscos reptantes, pusillae vel mediocres—rarius minuta vel majusculae—plerumque pallide virides et pellucidae, interdum roseo plus minus pictae, rarius subopacae et fulvae, olivaceo-virides vel luride.

Prothallium angustum, nematoideum fere, simplex vel persaepe subramosum.

Caulis (basi saltem) prostratus, radicellosus, teres vel plano-convexus, in plurimis laxe corticatus, in planum simplex, casu rariore semel bisve bifurcus, in plerisque foliosis, 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 (persaepe abbreviatos) apice florentes, ! vel ?; alios (in propriis speciebus) stoloniformes pro more subaphylos et valde radicellosos; radicellae in omnibus albidae fuscidulave.

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, subacutave, vel alia integra alia bidentata, subcomplicata vel saltem concava, rare planiussula, 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 mediae sc. æquilateri -4—6-gone, in paucis omnes oblongo-quadratae; in aberrantibus (e.g. in Cephaloziellis) parvae minuta—(diametro 1/50—1/70 mm) magis quadratae sæpiusque opaque; pariete in paucis speciebus ad angulos incrassato, cuticula rarius asperula.
Foliola (i.e. folia postica) rarius ad caulem ubique obvia foliis sat minora bifida vel persepe integra; ad involucrum φ tamen semper adstant, magna, bracteis vix minora.

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

Bractee c in capitulum congestae, foliis sat majores, tristichae, constanter fere trijugae, semper (imo in sp. frondosis et in subaphyllis) foliaceae, sat latae, bi-(dein 3—5-) lobae, magis frequenter quam folia dentatae incisae; bracteoleae scepissime bracteis omnibus adjecae, iidemque parum minores, intima saltem semper presens perspeque cum una alterave bractea basi—in aliis speciebus praelate—connata; rete laxum oblongum unistratum, in perpaucis inferne 2—3-stratum. Pistillidia ad 20 breviscula lageniformia.


Andrecia in plerisque amentum posticum pallidum sistentia, raro in ipsius caulis, ramive majoris, apice mediove spicata; bractee foliis pro more subminores, plurijugae, assurgentii-secundae, confertiusculæ, constanter (etiam in sp. frondosis) foliaceæ et bilobæ, basi
Cephalozia.


_Habitatio._ Loca umbrosa et subhumida in sylvis et rivulorum ripis planitiei et montium humiliborum, ad terram, saxa et præprimis ad trunços putrescentes, diligunt, nullo climate nisi frigidissimo exules, perpaucis alpinis vel arcticis in die cognitis; loca aperta fugiunt, turbaris et sphagnetis exceptis, ubi inter muscos hygro-philos nidulant.

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

A. Periantlium normale constanter 3-gonum-carinatum ve.

a. Acaules, flore \( \phi \) e prothallii centro orto, amentis \( \phi \) 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, sæpe cochlearia, cellulis omnibus (nisi interdum inferioribus subelongatis) subæquilateris chlorophylo plus minus opacis.

Folia succuba, aliquando fere longitudinalia, rotundata retusave—rarissime apice bidentella; bracteæ \( \nu \) pro more foliis sat diversæ, longiores, tenuiores—interdum subscariosæ—ab ipsa basi cellulis solum unistratis conflatae apice bilobæ; periantlium leptoderme ..................

.................................................. 7. Odontoschisma

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

Folia tenuia subplana, laxe 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) loba, cellulis plerumque majusculis, in nulla minutis ................ 5. Eucephalozia

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


1. Cephalozia ephemeroïdes Spruce.

Minuta albusca, facie *Ephemeris* equinoctialis Spruce. *Porto-\*nema* cæspitosum, filamentis confluvoideis suberectis fastigiatis subdichotome ramosis constans. *Cellula* filamentorum unusiæ -rarissime basin versus biseriata—vix duplo longiores quam latæ pellucidæ chlorophyllæ. E filamentorum fasciculi basi oritur flos; alia filamenta apice in amenta *f* abeunt; florescentia igitur *monoica*. *Bracteæ* floris trijugae tristichæ conferta suberectæ, intima majusculæ bifidæ-partiteæ integerrimae, lamina basali ovata, lacinii subulatis apice fere capillaris; *bracteola* bracteis æquilonga, magis profunde fissa; *cellula* magnæ tennes pellucidæ linear-hexagonæ-parallelogrammæve. *Bracteæ* exteriories sensim minores, conformes. *Perianthia* involucrum superantia, pellucida, trigono-subulata incurva, ab ore profunde (ad *½-⅔* longitudinis) sexfida, lacinii tenuibus flexuosis capillaceo-acuminatis. Capsula parvula oblonga. *Andrœcia* bracteis fœmineis plus duplo breviora tenuia recurva; bractee sub 10-jugæ minutæ incurvo-secundæ ovatae bifidæ monandæ.—*Filamenta* 8—*1.6 mm* longa, corundem *cellulae* *1/16—⅛ mm* longæ, *1/16 mm* latæ. *Bracteæ* *1.75*, *cellulae* *⅛—⅛ mm* longæ. *Perianthia* 2.5; *capsula* *3 × .18 mm*.

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

Subgenus II.—**PTEROPSISIELLA** Spruce.

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

folia tristicha profunde bifida sistentes. *Perianthium prae-
longum linearisubulatum trigono-prismaticum, ore 6-

2. *Cephalozia frondiformis.*

*Pteropsiella frondiformis* Spruce in *Journ. Bot.* 1876.

*Frondes dioicæ* 1—2 pollicares prostratae olivaceo-virides, late line-
ares vel hic illic dilatatae, plane tenues validæ costatæ, apice attenuato
sæpe decurva et radicantes, subtus per intervalla radicellose, et ramos
paucos posticos frondi similes, vel alios flagellares radicellis pallidis
villosos, alios in florem ² vel ³, bracteis foliaceis stipatam, transfor-
matis, proferentes. Caulis (costae) semicylindricus, supra planus 2
vel 3 cell. latus; *cellulae* corticales 6-seriatae magnæ brevi-cylindricæ
subcompressæ pellucidæ, internæ 2—3-plo angustiores sub 20-seriatae
subopacæ. *Lamina* frondis pro more utroque costa latere 4—6 cell.
lata—interdum hic illic ad 12 cell. lata—lævis eeroso-crenulata; *cellulae*
majusculæ elongato-4—6 gonæ, axi majore angulum 70° cum costa for-
mante, pellucide fere vacuae leptodermes, in estate subincrassatæ, mar-
ginalæ longe minores. *Flores* ³ ramulo perbrevi, facie costæ postica
oriundo, sursum curvato, constantes. *Bracteæ* 3-stichæ, 3—4 jugæ, in-
timæ multo majores libere pallide pellucide elongato-areolatae ovatae,
ultra medium bifidae, laciniis tenui-acuminatis denticulatis spinulo-
sisve; bracteolæ bracteis conformes, dimidio minores vel fere æquimagnæ.
*Perianthia* bracteas triplo superantia, incurva, lineari-subulata triquetro-
prismaticæ, ore constripto 6-fida, laciniis capillaceo-acuminatis subspin-
nulosis. *Calyptra* perianthio 4-plo brevior ovalis tenuis. *Capsula* ob-
longo-cylindracea caeteraque omnino *Cephalozia*. *Andraecii* julacei oli-
vaeeo-viridis *bracteæ* 10—20-jugæ confertæ assurgenti-secundæ rectang-
ulari-cuneatae breviter bifidae, segmentis sæpe in cornua brevia per-
rectis, concave, monandæ. *Bracteolæ* interdum adiectæ sunt: parvæ
quadrate bidentatæ, dentibus cellula 1—2 constantibus.
Subgenus III. **ZOOPSIS** (Hook. fil.)


3. Cephalozia argentea (Tayl.)


Dioica albicans nitida prostrata intricata. Caulis \( \frac{1}{4} \) pollicaris valdiusculus, basi aphylla subrhizomatosus, dein semel bisve bifurcatus, interdum simplex, ramos autem, pro more paucos, posticos, caull similes, sēpe apice attenuato radicantes, vel toto flagelliformes, alios brevissimos et floriferos, proferens. Cellulae caulis corticales 8—12-seriatae magnae pellucideae (serierum 2 vel 3 superiorum maxima), in sicco conceavae (collapsae, unde caulis scrobiculatus et margaritaceo-splendens evadit); c. internae 8—12-seriatae angustae subchlorophyllosae. Folia brevi spatio dissita, longitudinalia, ad cellulas duas maximas spheroidaeas, in caulis plano collaterales (nee suprapositas) redacta, revera tamen biloba, quaque cellula (cum collaterali inferne connata) lobulum sistente. Foliola nulla, nisi pro foliolo papillula rhizophora hic illlic subter caule obvia habenda est. Bracteae et tristique trijugae (floris fertilis sēpe perparvae, sterilis magiores) bipartitae, cruribus subulatis inferne 2 cellulas latis—vel altero crure ad processulum redacto; br. postice (s. bracteolea) subminores, integre bifideae, exteriores sēpe minutae vel obsoletae. Perianthium pyriforme, junius apice obtuse trignonum, maturum ubique teres, unistratum laxe areolatum tenerimum, ore ad \( \frac{1}{3} \) alt. usque in lacinias 6 incurvas fissum. Capsula oblonga, caeteraque omnino Eucephalozie. Andræcia ramulo amentiformi constantia; bracteæ paucijugae assurgenti-incurvae suborbiculatae bidentatae, cellulis ad 20 conflatae, monandrae.

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

4. Cephalozia setulosa (Leitg.)


A priore distincta caracteribus sequentibus. Caulis est magis ramosus, ramique persepe apice flagellari radicant, flagellis autem pro-priis vix ullis; cellulae caulis sub 20-seriatae; se. corticales pellucideae 6-seriatae—anticæ biseriatae et serierum 2 lateralium maxima, subgloboso (pressione mutua polyhædrea), c. autem medio-postice biseriatae axin obvelantes caeteris triplo minores—cellulae ax eos sub. 14-seriatae.
Zooapis. Alobiella

peranguste prismaticae chlorophylllosae. Folia brevissimo spatio dissita, distincte biloba, basi cellulis 2 maximis paraboloidiis (cellulis caulinis anticis æquimagnis) plus minus alte connatis, quaque cellula apiculo incavo filiformi (e cellula unica 6-plo longiore quam lata, vel rarius e duabus uniseriatis) aucta, constantia. Caetera nonhabui.—Caulis, cum foliis, ·35 mm latus; cellulae folii basales ·08 × ·06, c. 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. Caulis prostrati 5—10 mm longi filiformes trigono-prismatici, (supra plani subtus carinati), cellulis 5-seriatis, quarum corticalibus majusculis 4-seriatis pellucidis, internis 1-seriatis tenuissimis chlorophylllosis, conflati. Folia spatio cellularum caulis duarum dissita, cellulis 2 constantia, sc. altera inferiore magna truncato-conica, altera superiore 4-plo breviore tenui unguiformi. Foliola O. Bracteae ·1—2-jugæ, tristichaæ, perianthio triplo breviores, liberae vel postice subconnatae, profunde bipartitæ, laevissubulatis elongato-cellulosis. Perianthia maxima, folliis 16-plo longiora, trigono-subulata, ore profunde 6-fida, laevissubuliformibus. Calyptra parva tenuis. Capsula oblonga. Rami ♂ caeteris ramis æquimagni; br. plurijugæ confertæ secundæ subulate cellulis 5 vel 6 constantes, integrae bifidæve, monandriae; bracteola 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 praecipue, in terranaepeque ad cumulos vermibus magnis suffossos.

Subgenus IV. ALOBIELLA Spruce.

Plantæ mediocres albicantes facie (nisi pro foliis succubis) magis Kantia (Calypogeiae) quam Cephalozia. 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 aliiis speciebus præsentia,

§ 1. *Foliola nulla.*


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

7. *Cephalozia macella* Spruce.

Facie et florescentia *monoica* formis *C. bicuspidata* macris fere convenit; differt *folii* planis ovato-triangularibus-trapezoideisve apice ro- tundatis, retusis, oblique acutis (i.e. unidentatis) vel denique truncato- bidentatis, *cellulis* elongatis; *bracteis* bifidis, segmentis longe subulatis integerrimis; *perianthii* ore breviscule trifidis, segmentis 2—3-ciliatis. —Inter *Alobiellum* et *Eucephalozium* fere media.

§ 2. Foliola præsentia.

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 haud invenire potui. Caule foliisique sicco deflexis ad Adelanthum accedit, foliorum formâ tam tam et texturâ Alobiella perfecta est.

Subgenus V. EUCEPHALOZIA.

Plantæ mediocre, raro pusillæ vel robustæ, virescentes, rarius fulvæ luridæve, interdum roseo pictæ, lato caespite crescentes, vel inter muscos palustres reptantes. Caulis plerumque mollis et fragilis, rarius rigidulus, cortice in pleurisque 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,
Eucephalozia

concava vel laxe complicata, raro subplana, bifida rarissime 3—4-fida, sinu raro profundo, in aliis subacuto, aliis lunato; segmentis apice variis, raro autem vel rotundatis vel cuspidatis; margine integerrimo. *Foliola* (paucis sp. normaliter præsentia) parva integra bifidave. *Cellulae foliorum* magnitudine sat constantes, diametro in diversis speciebus inter 1/20 et 1/40 mm variantes, raro fere magnæ (1/15 mm) rarissime parvæ (1/45—1/48 mm) æquilateri-hexagonæ, vel sæpius quadrato-hexagonæ quadratæve, in plerisque sp. subpellucidæ, pariete in perpaucis ad angulos incrassato, cuticula sublaevissima; *cellulae bractearum* et perianthiorum plerumque submajores rectangulares-oblongæ. *Flores* dioici, vel monoici, rarissime paroici: ♂ in aliis speciebus constanter cladogeni, in aliis nunc clado-nunc acrogeni, vel omnes fere acrogeni—imo interdum in ipso caule terminales. *Bractæae* trijugæ, raro pauciores, intima sat magnæ bi-rarius 3—4-fidæ, integerrimæ vel persæpe dentatae, spinulosæ, incisave, liberæ vel cum bracteola subconformi, æquilateralæ 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, laciniatæve; pariete, ipsa basi ubi in caulis ramive 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 ♂ florem fœmineum proxime sequentibus.

*Hab. et Distributio.* Species *Cephaloziae* 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 occidentalibus quam orientalibus.


A. Foliolis ubique præsentibus.

10. Cephalozia micromera 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); cellulæ mediocres subglobosæ, totius folii sub 10. Foliola ad tuberculum cellula unica, v. 2 collateralibus, constantem redacta. Bracteæ bipartite, cruribus lanceolato-subulatis, altero interdum obsolete. Perianthia magna ovato-subulata obtuse trigona, ore in lacinis 6 subulato-atnenuatas profunde fissa.

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 Uaupés,

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

_Hab._ supra _Chilosepyrum_ _wotophyllum_ Tayl., ab Hookero fil. in ins. Aucklandicis lectum, reptans.

**B. Foliolis ( nisi ad flores) normaliter nullis.**

13. _Cephalozia catenulata_ (Hüb.)

_Jungermania catenulata_ Hüb! Hepaticol. German. 169.

_Dioica_, plerumque cladocarpa eflagellifera, statura habituque _C. multiforme_, rigidiore tamen, colore fulvo plerumque insignis, caule prostrato subpinnae ramoso radicellosae; _cellulae_ in caulibus diametro sub 6, corticales 14-seriatae internis paulo maiores atque pellucidiores. _Folia_ parva subimbricata concava—siccando magis incurva catenam simulatiam—ovali-rotunda ad ½ bifida, sinu plus minus obtuso, segmentis patulis vel subconniventibus acutis; _cellulae_ parvae subquadrato rhombicæeve leptodermæae et subopacas. _Foliola_ (nisi in var. _β_) nulla. _Rami_ breves, raro subelongati. _Bractææ_ intimae folii duo longiores, oblongæ ad ½ bifidae, segmentis subulato-acuminatis, margini hic illic denticulatæ spinuloseve, raro subintegræae; _bracteola_ libera conformis. _Perianthia_ alte emersa, lineari-fusiformia 4-plo longiora quam lata, cellulis unistratis conflata, tota longitudine alte 3-carinata, ore constricto setosa vel ciliolata. _Calyptra_ tenuiss. _Capsula_ rufobadia ovali-cylindrica. _Andracia_ in ramo apicalia julacea; _bracteæ_ paucijugae folii æquimagnæ, _bracteolis_ adjectis.—_Folia_ ·8 ·2, ·25 ·17: c ¾/45—1/40; _br lá intima_ 6 ·35; _per. _1·3 ·35mm.


_Jung. bicuspidea_ var. _ericetorum_ Nees, Syn. Hep. 139 (fide Gottschei in litt).

Var. _β. stipulifera_ S. foliolis minutis subulatis lanceolatisve hic illic, vel ubique, obvis; _bracteis_ magis spinulosae; _perianthiiis_ magis argute carinatis.

Var. _γ. pallida_ S. pallide viridis vix flavicans, valde ramosa ramis subfastigiatis; folii subdecurrentibus ad ½—¾ fissis, segmentis interdum obtusis, cellulis paulo majoribus; _bracteis integerrimis;_ _perianthiiis_
typicis (cellulis unistratis conflatīs, ore ciliolato). (Ceph. pallida nobis in hb.)

_Hab._ On rotting 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.), Blaeberry Gill near Whitby (M. 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. Transoubåt, 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 anomal_a [in England oftener of _F._ setacea and Trichomanis, to which _F._ divaricata is sometimes added]. Stems subopaque, rather rigid and brittle. Leaves assurgenti-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 1⁄3 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 Hüb.” given five times, and comprising under that name _four distinct species_ (!) viz.:
No. 301. *Jutland (Jensén)=J. Francisci Hook.*

No. 488. *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 trigonous perianth.

No. 496. *Bonn (Dreesen)=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 3—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*.


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 *Jung. reclusa*, I have his own assurance; although he sent to myself and others both the true species and a common form of *J. bicuspidata* under the name "*reclusa.*" When I visited him at Dunkerron, in 1842, he gave me some doubtful varieties of *J. 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 *Jung. 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 *J. reclusa*, he enclosed specimens, so that I have from him five packets of real, or supposed, *J. reclusa*, whereof only two are the true plant, and the other three are *J. bicuspidata*, viz.:

Eucephalozia

“J. reclusa T. MSS.—Finnehy River, 1843” = J. bicuspidata L.
“J. reclusa T. MSS.—Knockavohila Mt.” = J. bicuspidata L.
“J. bicuspidata L.? no. 1.—Knockavohila” = J. bicuspidata L.
“J. bicuspidata L.? no. 2.—Banks of the Finnehy, Sept. 1840” = J. catenulata Huben.: 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 ‘Heptacea Pyrenaeae’ (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. pallida 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”: Hungaria; No. 173, ejusd. “J. connivens”: Yeadon (Carrington); and “J. catenulata”: Oeland (Zetterstedt) in lb. Stabler.

Since drawing up the foregoing account, I have had the privilege of examining an original specimen of J. unc. catenulata, from Hüben 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, sub-assurgent subimbricate, segments mostly abruptly acute, rarely very acute. Bracts nearly always spinulose, rarely entire. Perianth triquetrous, shortly laciniate at mouth, laciniae about 12, subdenticulate. Male plants usually more branched than female; androceia 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 Vogeso,” 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. rubelia, 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 esflagellaris, 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 subquadrate-hexagonae opacule, paucæ juxta caulem submajores magisque pellucide ocellum quasi sistentes, omnes leptodermes. Foliola nulla nisi ab florescentias. Flores plerumque dioici, interdum tamen autoici. Andracia longispica, ramum totum pro more tenentia; bractæ ad 10-jugæ confertæ assurgentæ, folii concolores et subtequilongæ, latiores tamen, orbiculatae concavissimæ breviter acute 2—3-lobae monandrae. Bractæ triarticulæ sub 3-jugæ, intimae foliis duplo longioræ, sepe connamæ, rotundo-quadratae ad ½ bilobaæ, lobis tenui-acuminatæ, spinæ dentæve una alterave utrinque armatae. Perianthia magna lineari-clavata (i.e. supra medium paulo latiora) altiuscule obtuse 3-carinata, ore constricto inequaliter setulose, leptodermia nisi prope basin ubi 2 cell. crassa. Capsula alte exserta magna ovali-cylindrica, plus duplo longior quam lata rufo-badia bistrata.—F. ²5 × ²; c. ¹/₄₅; br. ⁵—6; per. ²·6 × ⁵; caps. ⁶ × ²⁵, ⁷₅ × ³₅ mm.

Hub. on decaying timber near Portsmouth, Virginia. (Hb. Schimper, without contributor’s name).

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 ciliate.

15. Cephalozia multiflora Spruce, n. sp.

Dioica cladocarpa esflagellifera, humilis, amœne vel pallide viridis, dense depresso-cæspitosa—in Sphagnetis laxè reptans—prostrata subramosa, interdum subpinnata, ramis radicellosis apice assurgentæ arhizis, flagellis 0. Caulis subcompressus—supra fere planus, subtus convexus, cellulis 6 vel 7 in diametro; c. corticales ¹₂—¹₄-seriatae majusculæ pellucide, internæ multo angustiores subopace. Folia parva
Eucephalozia subimbricata—in pl. sterili sepe distantia—subassurgentia, rhombo-rotunda, antice decurrentia, ab apice ad ½ alt. bifida, sinu obtuso rarius lunato, segmentis conniventibus acutis vel subacuminatis; cellulae mediocres leptoderme pellucide, chlorophyllo parco, quadrato-hexagonae, subconformes, inferiores submajores. Flores dioici: $ in ramo perbrevi terminales. Bracteae subtrijugae tristichæ, intimæ foliis 3—4-plo majores tenues, oblongo-rotundæ ad ½ bifidæ—raro trifidæ vel bis bifidæ—segmentis acutatis integerrimis; bracteola subconformis sepe cum bracteis in excipulum altum connata, medio utrinque in angulum dentemve dilatata. Perianthia lineari-fusiformia, juniora triplicata, adulta solum apicem versus trigona, ore subconstricto denticulata setulosave (setulis solum 1 vel 2 cellulas longis), carnosa, basin versus cellulas 3-stratis, medio 2-stratis, conflata. Calyptra duplo brevior ovaliglobosa carnosa, tota fere longitudine cellulis 3-stratis constans. Capsula oblongo-cylindrica haud alte pedicellata. Spore pulchre cinnamomeae. Andraeia rami apicem—rarius medium—tenentia: bractee plurijugæ subsecundæ foliis aequimagneis, ad ¼ usque acute bifidæ, canaliculato-concave, antheridiis solitariis.—F·3×4; ε $^{1/28−1/25};$ invol 1.1; per 2.1×7; caps·45×2 mm.


Var. β elata S. major pallide viridis ramosior; foliis 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
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*, Fowlshaw 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 *Fung. 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 \( \frac{1}{2} \) 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 it 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. 69, 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-
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criminated. Hudson's *E. 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, foliis alternis geminis setaceis æqualibus," Mant. II. 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 acutissime 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.


*Monoica*, depresso-cespitosa viridis, caule semipolicari repente valido, sectionis diametro 6—8 cellulas lato, compressulo (supra fere plano), cortice pellucido; ramis paucis, nisi ad apicem assurgentem tota longitudine crebre radicellosum, aliis stoloniformibus rariss flagellaribus. *Folia* valida dissita—raro subimbricata—assurgentia oblique orbiculata concava antice subdecurrentia, apice ad ⅓—⅔ bifida, sinu acuto, obtuso lunatove, lobulis acutis, vel postico (submajore) obtuso, sepe conniventibus; *cellulae* majusculae quadrato-hexagonalæ pellucidae sat crassæ leptoderms. *Foliola* nulla, nisi floralia, vel perraro apicem ramorum sterilium versus unum alterumve parvum subulatum. *Flores* 9 in ramo pro more perbrevi terminales; *bracteæ* 3-jugæ appressæ, intimæ foliis plus duplo majores, carnosulae, basi et paulo altius cellulis bistratis conflatæ, brevisscule bis bifidae; *bracteola* basi utrinque breviter connata, apice emarginato-bi-trifida; *bracteola* exteriæ parvae obsoletæ. *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, conflata. *Calyx* brevis tenuis. *Capsula* oblongo-subcylindrica. *Androcæa* spicæformia, rami medium—raro totum—tenentia: br. folii subminores, basi antica dente incurvo auctae monandæ.—F. 55 x 6; *c* 1/25—1/30; *br* 1:1—1:3; *per* 3:5 x 9 mm.

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

Hab. In Pyrenæorum jugis altioribus infra portum de Vénasque dictum, alt. 2600 m, ad rupeis humidas ipsæ legi, mense Sept. 1845.

*C. multiflora* Spruce huic proxima dioïca et longe teñitor est, foliis duplo minoribus rhombo-rotundis antice supra caulem in alam longe decurrentibus, segmentis
apicis angustioribus subulatis subacuminatis; bracteis persæpe alte connotatis, cellulis unistratis conflatis; demum calyptra insigniter incrassata.—C. bicuspidata L. longius distat foliis ad dimidium usque fissis, segmentis subacuminatis, basi vix decurrentibus; bracteis perianthioque strato cellularum unico conflatis, etc.—C. tubulata Tayl., perianthio carnosulo (olum tamen 2 cellulæ crasso), nostræ similis, dioica est, foliis magnis ultra dimidium bilobis, bracteis omnibus tennibus.—Forsan eadem est C. crassiflora ac füng. pleniceps Aust. in Proc. Acad. Philad. Dec. 1869 (in White Mountains a cl. Oakes lecta), cui tamen tributa sunt “folia incrassata, segmentis omnibus acutis,” quæ in nostra involucralia sola basi revera incrassata sunt, caulina autem cellulis unistratis conflata, et lobulus foliorum posticus persæpe obtusus inventur.

17. Cephalozia dicuspidata.

Jungermanitá bicuspidata Linn. Sp. Pl.

Monoica, clado-ct acrocarpa flagellifera, prostrata vel assurgenti-caespitosa, virescens, interdum roseo picta, rarius albicans luridave. Caules \( \frac{1}{4} \)-1-policæres vage ramosi, ramique radicelli vel apice assurgente arhizi, alií flagellares radicantes. Cellulae caulis subteretis sub 6 in diametro, corticæs sub 10-seriatæ magnæ pellucidæ, interiores multo angustiores subpace. Folia inferiora parva distantia, superiora majora subimbricata, basi diagonalis—vel, ubi convertiora, fere transversa—inserita, ovato-orniculata, ab apice ad medium fere vel usque biloba, concava interdum complicata, lobis conniventibus patentibusve ovato-lancæolatis vel subtriangularibus, postico acuto, antico parum angustiores subacuminato interdum breviapiculato; cellulae majusculæ quadrato-5—6-goneæ pellucidæ, sat crasse, pariete autem tenui. Foliola pro more nulla nisi ad florescentiam feminéam. Rami 9 brevissimi, rarius plus minus elongati. Bractæ sub 8-jugæ, intimæ foliis mediis triplo fere longiores, sublibræ, ad \( \frac{1}{8} \) bilobæ, lobis lanceolatis acuminatis, integerrimæ vel basin versus 1—2-spine, rarius sublaciniate; bracteola conformis; bracteolæ extiores minores lanceolatae spinulosae raro bifide, interdum obsoletæ. Innovatio sub flore sterili rarissimo casu—sub fl. fertili nunquam—provenit.) Perianthia foliis 4-plo longiora lineari-prismaticæ vel subfusiformia, ore consticto v. raro hiante denticulata setulosave, primum ab ipsa basi tricarinata, in etate inferne sub-teretia superne trigona, laxæ areolatae, virescentia albidave, interdum basi pulchre purpurea, apice canescencia, tota longitudine (nisi ipsissima basi) cellulis unistratis conflata. Calyptra parvula tenuis. Capsula foliis caulinis sublongior cylindraceo-oblonga. Spóra purpurea. An- dracia spicæformia, in rami medio apiceve positæ, vel ramum totum
sistentia—rarissime in ramo fertili florem ♀ proxime sequentia (i.e. florescentia paroica); bracteae foliiis parum diversae confertiores assur- gentes, sepe dente antico basi auctae monandreae; bracteola subnullae.—
F $\cdot 55 \times 0.55$, $0.5 \times 0.4$; e $\frac{1}{25}-\frac{1}{20}$; br $1.8$; per $1.8-2.2 \times 0.5$ 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 vulgarissimae innumerarbas nobis cognitas, magis memorabiles sunt sequentes: 1. grandiflora, luxurians, bracteis ♀ maximis squarrosulo-recursis, sepe insigniter laciniatis; hab. Stockton Forest prope Eboracum.—2. setulosa, pusilla, foliis parvis, lobis subapiculatis; perianthiiis ore truncato setulosis (setis 2—3 cellulas longis); bracte-a-rum laciniiis 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 invenitur; idem ac in perpaucis aliis Cephaloziis, e.g. C. pygmaea et C. ob-cordata interdum videmus.

[C. alpícola Massalongo (Epat. Venet. nos. 89 et 131:—Valsesia) seems a compact form of C. bicuspidadata, 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. bicuspidadata. 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.]*

*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 albeccens (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.
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18. Cephalozia Lammersiana Hüben!


A C. bicuspidata L. differt statura 2—3-plo elatiore; colore albicante luridove—nunquam roseo picto; flagellis nullis vel perraris; foliorum laciniiis magis inequilatis et acuminatis; foliis frequentioribus, ad plantas precipue; florescentia dioica, feminina semper fere in ramo elongato terminali; bracteis lateralibus magis profunde fissis, laciniiis integerrimis; perianthii 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 dioicus 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 dioicus 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 deltoideo-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 doubtful 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 efflagellifera, prostrata vel cæspitoso-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, inferiorea contigua, superiora confertiora et equitantia, oblonga, ultra ½ biloba, lobis triangulari-lanceolatis acuminatis, acumine sæpius in apiculum 2—4 cellulas longum attenuato; *cellulae* mediocres leptodermes. *Bractæ* 3-vel 4-jugæ, appressæ, intime foliis paulo majores, basi breviter connatæ, orbiculatæ, vix ad ½ bilobæ, lobis subacuminatis repandis; *bracteola* utrique unidentata; bracteola secunda conformis nisi edentata, tertia paulo minor obcordato-cuneata, quarta parva ligulata. *Perianthia* bracteis triplo longiora lineariei-fusiformia vel sublanceolata, ab ipsa basi altiuscule trigona, ore lato minute setuloso. *Br. ♀ terminales spicatæ*, foliis subconformes, magis concavæ, monandrae.—*F* •65 × •45; e 1/25; br •8; per 2·3 × 55 mm.

*Hub.* 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 dioicus 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 ½ pollicares subramosis radicellosi prostrati. _Folia_ parva plus minus dissita—superiora interdum subimbricata, insertione diagonali vel fere longitudinali, subplana cuneato-oblonga-ovatae adusque vel paulo ultra ½ biloba, lobis late subulatis acutis erectis patentibusve, sinu obtuso raro subacuto; _cellula_ vix majusculae subquadrateae leptodermeae. _Foliola* ad papillulas 2 collaterales redacta vel plane nulla. _Ramuli_ ⅔ brevissimi, raro subadjacentes. _Bracteae_ 3-jugae; intima liberæ foliis duplo longiores ad ¼ bi-(raro tri-) fideae, segmentis subacuminatis integerrimis, rarius grosse 1—2-dentatis; _bracteola_ ovata 3—4-fida, segmentis lateralis minoribus. _Bracteolae_ 2 extiores multo minores sæpius integrae. _Perianthia_ bracteis 4-plo longiora lineari-fusiformia, supra medium paulo latiora, inferne teretia, apicem versus obtusa trigona, ore consticto 12-laciniatum, laciniis bractearum segmentis æquilongis sed angustioribus, cellulis magnis oblongo-quadratis pellucideae. _Calyptra_ duplo minor tenuissima. _Capsula_ ovalis (juvenilis solum visa). _Pl. 3_ paucirameæ, tota longitudine, vel hic illic, antheridiiferae; _bractea_ foliis sæpe majores, latiores, magis acute bilobae, monandreae; _bracteola_ ubique adsunt: sat magnea, lanceolatae acuminatæ integrae vel inæqualiter bifidulæ.—*F* · 35 × · 2; _c_ ½; _br_ · 6—· 7; _per_ 2·0—2·5 × · 8 mm. _Cellulae_ eujusque folii sub 30.

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

Plantula pulchella! _C. Crossii* nostræ (Andinæ) peraffinis. Differt autem hæc florescentia monoica; foliis majoribus subcarinatis, segmentis longioribus apice pertenuibus; perianthio ore longiciliato nec laciniato.—_C. connivens_ Dicks. multo major est, foliis cellulisque duplo fere majoribus, foliorum sinu plerunque lunato; floribus monoicis; bracteis feminœs palmatifidis; perianthiis ore ciliatis.—_C. Macounii_ Aust. (ex America boreali) et _C. micromera_ Spruce (e terris Amazoniciis) quoad magnitudinem _C. lacinulatae_ valde similis, characteribus longius reecedunt.

Monoica, formis C. bicuspidatae minoribus primo visu sat similis, differt flagellorum defectu; foliis angustoribus ultra 2 bifidis, segmentis lanceolatis tenuiacuminatis; præcipe 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 sæpissimis forficato-imbricatis; bracteis liberis solam 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.


Hab. Ins. Sandvicensibus. Mexico (Liebm.); Antillanis fere omnibus. Cuba (Wright!)


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

Monoica cladocarpa eflagellifera pallida pellucida fragilis, radicellis crebris longis albidis arcte repens. Caules subramosi subcompressi; cellulae corticales sub 8-seriatae internis sat majores fere vacuae. Folia inferiora superioraque sensim minora, media majora subimbricata fere horizontalia, ad insertionem sublongitudinalem antice longe decurrentia, oblique suborbiculata, apice ad ½ vel fere ad ½ usque bifida, sinu obtuso lunatove, segmentis triangulari-acuminatis conniventibus; cellulae sat magnae quadrato-hexagonae fere vacuae. Foliola nulla. Bracteæ floris
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8-jugae, intimae foliis vix duplo longiores ovales profunde 3—5-fide (normaliter bis bifidæ), laciniis lanceolato-subulatis acuminatis, margine integerrimæ vel subspinulosæ; bracteola fere libera profunde bifida, margine externo 1—2-spinosa. Perianthia alte emersa longe pyriformis-fusiformia teretia, apicem versus obtuse trigona, cellulis elongatis unistratis conflata, ore subconstricto longiciliata demum triloba; cilia cujusque lobi sub 4, cellulis 5 linearibus saepius uniseriatis constantia, ciliolis paucis spinulisque interjectis. Calyptra brevis tenuis. Capsula oblongo-globosa. Andmcia conspicua, ramum totum vel saepe apicem solum tenentia; hr. 8—10-jugae foliis paulo minores concavae ad bifidae, saepe dente lobulove antico auctae, monandrae; bracteolae juro more nullae. — F 5 x 5; br. 8; per 2.5—4.0 x 1.0, cilia '4—5; caps. 5 x 5 mm.


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 Wheeldale, 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-(rado acro-) carpa eflagellifera, dense depresso-espitosa, virescens, vel sapius albida roseo picta, interdum tota pulchre purpurea. Cellulæ caulis 4 in sectionis diametro, corticales 8-seriatae cubicae vacuae, internæ paulo angustiores sub 5-seriatae parum chlorophyllosæ; omnes cellulæ parietè incrassato. Folia
laxiuscule imbricata assurgentisubsecunda, succuba, basi perbrevifere
transversa inserta, valde oblique obovata concava, margine antico fere
recto, postico basi late semicordata, auriculâ inflexâ (ad Radulae et
Lejennæ lobuli instar) margineque folio appressâ, ad carinam ventricosâ;
ab apice ultra ± biloba; sinu pro more late lunulari; lobis incurvo-
hamatis capillari-cuspidatis, cuspidce cellulas 8—10 oblongo-quadratas
uniseriatus sistente; cellulae parvulae quadratae guttulatae, parieti ad
angulos incrassato, auriculæ (nisi marginales) subminores.—*Folium
axillare* (ad caulis furcam, ubi adest) acminatum integrum, altero eruc
abortiente.—*Folia* ad caulis ramifie elongati apicem interdum fere
symmetrica, auricula inflexa obsoleta.—*Foliola* nulla. *Ramuli* ei pro
more brevissimi, bracteas trijugas tristiclias cum perianthio solum
gerentes; nonnumquam paulo longiores, folia parva paucijuga infra
bracteas monstrantes. *Bractee* intimae erectae oblongae complicato-
bilobæ, lobis subovatis apiculatis, subliberae, toto margine nisi basin
versus minutule spinuloso-denticulatae; bracteola conformis. *Bractee*
exteriores abrupte minores; omnes bractee exauriculatae, bracteolatae.
*Perianthia* magna sæpus medio roseo-purpurea, apice albida, linearia,
alte triquetro-prismaticæ, 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. *Andracea* terminalia
polyphylla; bractee foliis subsimiles magis symmetricæ, cuspidibus
strictioribus, auricula postica nulla, antice tamen sepe basi dente
antheridium solitarium obvelante aucte;—*Folia* 65 × 4 (plica haud
explana); cellulae $\frac{1}{40}$ mm.


*Nowellia 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
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 Naddle 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 diform (unicentral) 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 subaphyillo radicellosi caules subramosos edens. Cellula caulis teretis corticales sub 15 seriatae, caeteris internis perpaulo majores, omnes opacæ. Folia parva rigida dissita vel sub-imbricata ovali-orniculata assurgenti-concava, apice breviter (ad 1/6 — 1/3 —raro ad ½ usque) bidendata, sinu acuto, dentibus obtusis subacutisve conniventibus; cellulae parvulæ subærquilatæ. leptodermæ opacæ.
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Foliola duplo breviora ovato-lanceolata obtusa integra, rarius bidentula. Bracteae 3-jugae, intima foliis triplo fere majores ovato-oblongae, basi erectae, apice ad ½ bifidae, segmentis lanceolatis obtusis recurvo-tortellis; bracteola libera conformis basi hinc vel utrinque 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. Andræcia caulis ramivo apicem mediumve tenentia; br. foliis paulo latiores brevioresque concavissimæ.—E toto habitu, flagellis, foliis concavis, cellulis parvis, &c., ad Ceph. Odontochisma denudatum distincte accedit. Adveniunt frequenter in planta, praecipue sterilis, rami erecti superne sensim parvifolii, apice propagula rosea ferentes, ramis gemmiparis C. denudatae perfecte similres. F \( \cdot 4 \times 35, \cdot 35 \times \cdot 35, \cdot 25 \times \cdot 15; \) e \( \frac{1}{40}; \) \( f \cdot 15 \times \cdot 8, \cdot 2 \times \cdot 1; \) br \( \frac{1}{35} \cdot 9 \times \cdot 55; \) per \( 2 \cdot 0 \times \cdot 55; \) caps. \( \cdot 65 \times \cdot 35 \text{ mm.} \)

Hab. On moors near York, growing chiefly on the sides of recently-cut ditches in moist turfy 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. l.c.

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 \( J. \) divaricata for it. (See Wilson in ‘Phytologist’, I, 937). 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 ‘\( J. \) unc. 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.)


Dioica majuscula amene viridis hic illic luride rufa, raro subrosea scariosave. Caules elongati 2—3-pollicares laxe reptantes subramosi flagelliferi atate sœpe albidi; cellulae caulis 8 in diametro, corticales 14—16-seriatæ chlorophyllo valde repleto opaque, internæ vix subminores
Eucephalozia

magis pellucidæ, interdum fere vacue. Flagella crebra breviuscula albido-radicallosa, aphylla vel ex parte foliosa. Folia majuscula assurgentia-subsecunda distantia, raro subimbriticata, oblique inserta, suboblique ovali-ovatove-oblonga, interdum basi subcuneata, parum concava, ab apice ad ½, raro ad ⅓ fere usque biloba—subinde (inferiora præcipue) triloba—sinu acuto angusto, lobis subinæqualibus, postico majore, lanceolatis, apice subcuneulato obtusatis, raro subacutis, margin repandis; cellulae majusculæ hexagonæ leptodermes vix convexulæ lævissimæ, chlorophyllo copioso subapice, inferiores paulo majores subelongatae, marginales subquadratae. Foliola distantia, cauli appressa eodemque celata, foliis triplo fere breviora, 6-pllo elongiora quam lata, linearia, interdum lineari-lanceolata-subulatave bifidula, laciniis sæpe inæquilongis, altera 3 cellulas, altera 5—6c. longa, raro in unam coalitis, margin utrinque 1—2. dentata. Flores dioici: $\,$ramulo postico brevi, sub 3 mm longo, basi radicellosa constantes. Bracteæ laxæ 3-jugæ 3-stichæ, intimæ foliis vix minores erectæ ovato-oblongæ canaliculatae, ad medium fere bilobæ, lobis acutis subacuminatis; laterales hinc, media (i.e. bracteola) utrinque, basin versus 1—2-dentata, cellulis elongatis subpellucidis conflatæ. Bracteæ extimæ triplo minores inæqualiter bidentatae, vel falcatae et integræ; medæ intimis paulo minores subconformes. Perianthium involucrum 2—3 plo superans ovali-cylindraceum, apice solo trigonum, ore truncato-subconstricto fere edentulo, viride, interdum apice rubescens, cellulis unistratis conflatum. Calyptra 2-3 plo brevior, vix angustior, longe pyriformis tenuis, basi sola cell. 2v. 3 crassa. Capsula in pedicello pellucidæ basi ovali-bulboso alte exsæta purpurea (sporis repletis nigra) oblonga vel oblongo-cylindrica 4-valvis; valvulae lineari-lanceolatae, alternæ latiores, cellulis bistrati linear-rectangulis, internis ad parietem lateralem nodosis (fibra semiannulari obsoleta vel absortæ) conflatæ. Elateres mediocres subobtusi hispive, tubulo hyalino cito dissoluto. Spore clateribus paulo latiorès subglobosæ minute tuberculose.—Amenta ♀ ramulis posticis, fæmineis æquilongis, constantia, assurgentia, basi radicellis et foliis minutis vacuis vestita; bractææ proprie pauci-(3—4.) jugæ, confertæ subcapitatae, f. caulinis triplo minores, orbiculatae, concave breviter acutilobæ, lobulo tertio antico brevi incurvo auctæ; antheridia solitaria majuscula globosa pedicellata; bracteolæ lineares vel ovali-lanceolatae integre bifidææ sæpius integerrimæ, pro bractearnm ratione sat magnæ. Raro adveniunt andrœcia in ipso caule; bractææ paucæ, foliis consecutivæ et vix minores,
antice lobulatae, antheridium maximum foventes.—F 1·35 × 1·05, 1·0 × 6; c 1/25—1/30; f ßa 5 × 08; br. int 1·2 × 5; br. ßa 9 × 5; per 3·8 × 8—9; cal 1·6; caps 8 × 3—4, valvula 15—35 mm latæ.

*Jungermania* fluitans Funck. Cr. Gew. no. 598 (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 3 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 (Hurrener in hb. Schimp.)

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

*British Isles:* New Forest, Hampshire (c. Lyell, 1813). *Fowlshaw Moss,* on the shore of *Morecambe Bay,* Westmorland, growing upon *Sphagnum intermedium,* along with *Cephalozia multiflora* and *Lammersii* (c. stabler, 25 Sept. 1875 γ and φ plants; 3 July, 1877, with ripe fruit). Near Whitby, in *Far Wheeldale,* creeping over *Sphagnum subsecundum* 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. caespitans. Planta tota, vel ex parte, luride purpurascens, caulibus brevioribus confertioribus subassurgentibus. Folia raro ultra ¼ fissa. Foliola linearia subbifida, interdum subobsoleta. Bractea inferne erecto-appressæ, superne patulæ vel recurvæ. Perianthia prælonga (4·0 × 0·6 mm) fere linearia, dimidio inferiore teretia, superiore trigona, ore subdenticula, 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 F. 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 F. 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 F. Francisci verna are ovato-lanceolate. The only important feature omitted from the E. Bot. figure is the flagella, which were possibly wanting from the very short fragments 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 F. bifida by Turner, and re-named F. Francisci by Smith—one may safely assume without consulting Hooker, the authority for the original F. 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 *E. 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 specimen distributed in his excellent 'Exsicata,' under the name *Jungermania inflata*, given to them by Nees (l. c.). Yet in 1836, in the 2nd vol. of his *Europa's Lebensmoose*, Nees reduced it to *E. inflata* Huds. as 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 confounded 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 cladocarps inflorose; the tristichous female bracts, toothed at the base, and the innermost embracing the perianth; finally the linear-fusiform, trigonous, thin perianth. But in *Jung. 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 distichous, 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-plicate only at the very apex: it is besides composed of 2 strata of cells up to \( \frac{1}{6} \) 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 Fowlishaw 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 *Cephaloza*. . . . . . . . The male inflorescence varies considerably. Sometimes the amentum is short, at other times elongate; may 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. "Fowlishaw 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
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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 gronsce 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.

28. Cephalozia heterostipa Catt. et Spruce, n. sp.

Dioica, majuscula depresso-caespitosa e viridi rufescens badiave, interdum aurantiaca, fragilis. Caulis 1/2—1-pollicares intricati validi flexuosi, tota longitudine albido-radicellosi, simplices vel persæpe semel bisve dichotomi—apice novello semper fere bifurcati—interdum (nei semper) ramos posticos stoloniformes breves radicellosos ex parte foliosos (raro omnino aphylos) proferentes. Cellula caulis 7 vel 8 in diametro, corticales 20—22-seriatae subquadrateæ subopaceæ, internæ subangustiores magis pellucideæ. Folia basi diagonali inserta, inferiora distantia patula oblonga v. cuneato-oblonga, ad 1/2 subacute biloba, lobis obtusatis rotundatisæ, sœpe decolora; superiora approximata et plus minus imbricata—flore quæ et caulis furcas versus praecipue—intensius colorata, latiora, cuneata assurgentì-concava sœpe ad 1/2 usque biloba, persepeque 3-vel etiam 4-loba, angulata vel obsolete denticulata, lobis solum obtusis, interdum subacutis, sub-æqualibus, vel altero externo—nunc antico, nunc postico—minore; cellulaæ sat parvæ 4—6 gonoæ subleptodermes, ad angulos vix sub-
Eucephalozia

increassatæ, chlorophyllo subopacæ, inferiores parum elongatæ—Folium axillare (ad caulis furcam) anticum, cæteris paulo minus, ovatum integrum, raro basi hinc dente auctum. Foliola parva minutave, interdum ob-soleta, raro plane deficietia, colorata, linearia subulatave, integra, rarius bifida, segmentis erectis angustis. Nonnumquam inter foliola normalia advenit alterum monstrorum, foliis subæquilongum, falcato-ligulatum vel informe.—Flores dioici: ♀ in caule terminales; pistillidia 10—16. Bractæ 2—3-jugæ, laxe imbricatae, concave, latiores quam longæ, 3—4-lobae, lobis subacutis, obtusis vel rotundatis; bracteolæ bracteis sat minores oblique ovato-lanceolatae integræ vel profunde bilobae. Perianthia alte emersa viridia pyriformia compressula valde obscure trigona, ore breviter 6-loba, lobis inciso-2—4-dentatis, dentibus omnibus sub 18, brevisubulatibus inæquimagnis; cellulae quadratae opaca pachy-dermes unistrate, nisi ipsa basi et perpaulo altius ubi bistratæ.—F. inferiora '6 × '4; superiora (biloba) '8 × '65, (3—4-loba, et bractæ ♀) '6 × '8, '75 × '8; c. mediae 1/48—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 sphaelata 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, caespitoso-subramosa, caule ramisque tota fere longitudine antheridiiferis. Folia caulina propria verraca, subplanæ patentia—fere squarrosa—cuneata, ad ¼ longit. usque 2—3-loba, lobis obtusis raro subacutis, cellulis 1/44—1/40 mm longis. Andracia spicata; bractæ plurijugæ 35 mm longæ, concavæ breviter bifidae, antheridium solitarium magnum stipitatum foventes. Bracteolæ (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, polyphyllous 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. *Jungh. 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-plicate 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-similès, virides, pallidæ rufulæve, cæspitosæ. *Caules validi succulentì, cellulis 8 in diametro, corticalibus 20—24-seriatis, internis subconformibus, conflati, a basi rhizomatosa plerumque flagellifera suberecti, parum ramosi, cladocarpi, ramis omnibus posticis apice nutantibus. *Folia insertione transversa, vel plane succuba—raro subincuba, lata, valida, cymbiformi-concava, apice bifidula, vel in eadem stirpe varia, sc. integra, bidentula, vel paucidenticulata; cellulae medii folii mediocres leptodermes, inferiores
Lembidium


29. *Cephalozia* Boschiana.


Lembidium—Odontochisma


Cellule in folii medio basiique magnæ oblongo-4—6-gonæ pellucide, superiores et submarginales triplo minores hexagonæ æquilaterales opace (chlorophyllo in cellulae angulis concervato) facillime disruptae.—Altera species est Lembidium ventrosum Mitt. Journ. Linn. Soc. 1876, ex insula Kerguelen, prioribus diversa folii orbiculatis apice rotundatis retusulisse concavissimis, cellulis minoribus; foliolis triangularibus subemarginatis; ramulo fem. Insigniter incrassato, &c.—Omnès hæc, Ceph. rhizantha excepta, sine dubio arcte affines sunt, hinc cum Encephalozis subluridis, illinc cum Odontochismatibus oscilantes; carateribus suis (primo visu genericis) omnibus in alii Cephalozis subgeneribus vel constanter vel casu obviis; sc. bracteis perianthiisque carnosis in C. crassiflora, perianthiis solis in C. Francisci; ramis nutantibus et foliis pro more integris in C. (Alobiella) lancifolia; folii transversis in pluribus, &c. &c.; ideoque genus proprium vix sistentes.

Subgenus VII. ODONTOCHISMA Dumort. Récueil, 1835 (genus).‡


Jungermania Dicks. etc.

Plantæ sat robustæ, virides luridæve, interdum roseæ, raro albide, in plagas latas unistratas arcte intricatas diffuse, vel supra muscos reptantes iisdemque persæpe in cæspitem densum imp lexæ. Caules validi subteretes, vel prostrati vel per saltus arcuantes et a matrice liberi, ad nodos

* 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 Natiser ur Sällsk. pro F. et Flora Fennica (1874); et Spruce, in Journal of Botany (1876).
Odontochisma


30. Cephalolozia Sphagni.


Dioica, caule elongato subæquifoliato, ope flagellorum arcuato-radicalter, ramis gemmiparis nullis. Folia subhorizontaliter patula vel assurgenti-secunda ovato-rotunda-oblongave, rotundata retusulave, subconcaeva, plus minus distincte marginata; cellulae mediocres subopacæ, pariete ad angulos incrassato, cuticula verruculosa. Foliola nulla vel perrara, minuta ovata integra bifidave. Bractææ ♀ foliis submajores sæpissimeque pellucidiæ recurvulæ cuneato-oblongæ ad ½ fere bifidæ integerrimæ. Perianthìa foliis 3—6-plo longiora subbulato-fusiformia trigona albida roseave unistrata, ore vel in lacinias sub 6, ciliatis, fissa,
Odontochisma

vel clausa et rima laterali hiantia—rarissime infra apicem circumscissa. 
Calyptra tenuis. Capsula cylindrico-oblonga.


Hab. In ericetis humidis totius Europæ et Americæ borealis, supra muscos palustris repens; etiam in sylvis fluminum Amazonum et Orinoci ad arborum radices. In Abyssinia pulchra specimina 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 obcordata Spruce.

Monoica cladocarpa eflagellifera humilis, caule elongato prostrato subramoso, ramis sæpe apice tenui radicantibus, nullo tamen subaphyllo. Cellulae in caulis diametro sub octo; c. corticales 22-seriatæ incrassatae opaque; interiores externis æquimagna vel imo latiores leptodermes subpellucidæ. Folia parvula oblique inserta vel fere longi-
Odontochisma---Cephaloziella

tudinalia, subcontigua, patula planiuscule, obcordato-rotunda obovatae; cellulae minutulae (1/60—1/50 mm) quadrato-hexagonae leptodermes sub-opaque verruculose. Foliola 0. Androcucia postica amentiformia julacea, semper fere ramosa, axi primaria sola mascula; bracteae propriae foliis duplo fere minores orbiculate concave integrae monandrae; ramuli alií fœminei, alií neutri quorum bracteae stériles elongato-oblongae emarginata bifidulæve canaliculato-cuatantes. Flores ♀ vel ramulo brevi cauligeno constantes, vel ad spicam ♂ axillares, nempe ramulum e bracteæ masculæ axilla ortum sistentes; bracteae subbijugæ, foliis caulinis æquilongae recurvo-patulæ ovales breviter bifidae—subinde 3—4-fidæ—lobis acutis, cum bracteola lanceolata integra subconnatae.

Hab. in imis truncis fl Casiquiari inundatis.—Spirts singularis, facie foliisque fere Odont. Sphagni minoris, florescentia monoicâ—interdum quasi gynandra—defectu flagellorum cat. 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 Linderb. et G., which from Gottsche's detailed description in 'Mexic. Leverm.,' can hardly be more than a variety of О. 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.

Plantæ pusillæ minutæve, sæpe supra muscos, vel alia hepaticas, cæspite denso sublurido reptantæ. Caulis pro plantula sæpissime validus, basi in plerisque subbrhizomaticosus, flagellis autem orbatus; cellulae corticales 10—20-seriatae ab internis haud diversae. Folia inferiora dissita sub-oblique inserta (succuba); superiora magis conferta, fere vel exacte transversa, longitudine (1—15 mm) caulis latitudinem raro excedentia, persæpe cuneata ad vel ultra ½ bifida, carinata, segmentis vel subcompliçatis vel divergentibus, integerrima, vel in aliis sp. subdenticulata, raro spinulosa;
Cephaloziella 63

cellulae parvae—minutae (diam. 1/50—1/70 mm) subquadrate, guttulatae. Foliola valde variabilia, interdum in una et eadem specie nunc ubique præsentia, nunc ex p. vel omnino obsoleta; semper (ubi adsunt) parva angusta integra bifidave. Flores in plerisque dioici, in paucis monoici; ♀ persæpe in ipso caule terminales, in aliis sp. cladogeni, vel situ variabiles. Bracteæ sat magna 3-jugæ (vel plures) biloba, 3-stichæ, persæpe cum bracteola conformi alte connotae, lobis in plerisque denticulatis spinulosisve. Perianthia plerumque elongata et angusta, leptodermia, acute prismatica, 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 caulís, ramive majoris, partem sistentia, medialia apicaliave; bracteæ foliis haud minores, iisdem consectivæ, rarissime ad ramulum tenuem posticum redactæ.

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

Cephaloziella a cæteris Cephalozioæ subgeneribus distincta caule constanter esflagelliferæ; foliis vix longioribus quam caulís est latus, superioribus saltem insertione transversis; perianthiis tota longitudine pluri (3—6) carinatis, carinis in perpancis speciebus ad 3 solas reductis. Ad Eucephalozium sine dubio magis accedit, precipue ad species esflagelliferæs e.g. C. catenulatum, &c.). Quoad flores ♀ in plerisque in caule ramove longiore terminales cum C. Lammersiana Hüb. convenit; illa tamen foliis magnis valde laxe cellulosis et caule laxe corticato longe diversa est.
33. Cephalozia divaricata.

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


Cephaloziella

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. "43, 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. Grinsulana 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.
34. **Cephalozia biloba** Lindberg MSS.

_Dioica_ acrocarpa pusilla viridissima. _Caules_ semipollicares simplices vel ramos posticos perpaucos edens, crassiusculus, fragilis, opacus, radiocellosus. _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; _cellulae_ minutae quadratae subopace. _Foliola_ nulla, vel rara: parvula lanceolata. _Flores_ 6 in caule terminales, assurgentes. _Bracteæ_ tres, unijuga, foliis submajores, teneræ pellucideæ, in excipulum periantthii basin arcte ampectens, ore breviter 6—8-lobum erosulumque, alte connatae. _Perianthium_ alte emersum, clavatum vel anguste pyriforme 5-carinatum, ore truncato scarioso repandulo. _Calyptera_ 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 l)—Species ambigua, ramis posticis inter _Cephalozias_ prope _C. divaricatam_ certe collocanda, bracteis autem solum unijugis inter congeneres singularis.

35. **Cephalozia integerrima** 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_ 6 versus majora et rotundiora—caulina media cuneata vel cuneato-quadrata, ad ¼ acute biloba, subcarinata, lobis patentibus obtusissimis; _cellulae_ minutulae leptodermæ quadrato-vel rhombeo-hexagonæ, marginales quadratae. _Foliola_ nulla. _Flores_ 6 in caule ramisque terminales; _bracteæ_ subtrijuga tristichæ, foliis sat majores, latitudine variae, sœpe praeteræ, apice bilobæ vel truncato-trilobæ, lobis interdum retusis, intima in excipulum periantthio arcte appressum connatae. _Perianthium_ alte emersum, lineare vel subclavatum, semper fere incurvum, 8—4-plicatum, ore lato repando demum plurifido. _Capsula_ oblonga. _Andrawcia_ ramum totum fere tenentia; _bracteæ_ bilobæ, lobo postico majore persœpe retuso, monand्रæ.

_Hab._ in lacús Ladoga insula, cum _C. myriantha_ Lindberg mixta, ubi detexit cl. s. o. Lindberg.
Huic affinis est *C. exiliflora* Tayl., differt autem floresc. dioica; statura paulo majore et validiore; caule a basi rhizomatosa suberecto; foliis acutilobis; foliolis semper præsentibus; perianthiiis brevibus obovato-oblongis.

36. *Cephalozia* Jackii Limpr. MSS.

*Paroica* pusilla, magn. *C. divaricata*, aero-et cladocarpa pallide viridis, apicibus florentibus sæpe purpurascens. *Caules* breves fragiles, ramique (pauci) prostrati radicellosi, apice assurgentibus, alii ramis elongatis minutifoliiis, nullo flagellari radicante. *Folia* inferiora—ramorum sterilium praecipue—distantia minuta cuneata, superiora, flores♂ versus, imbricata cuneato-quadrata vel subrotundata, omnia subcarinata, fere vel usque ad ½ acute biloba, lobis ovato-triangularibus acutis; *cellulae* pargvulæ subpellucidae subelongatae 4—6-gonæ, ad angulos vix incrassatae. *Foliola* duplo breviora, inferiora linearia lanceolatae, superiora ovato-lanceolatae raro apice fissae. *Involucra* ovato-juliformia; *bracteæ* 3—5-jugæ, foliis sat majores, oblongo-orbiculatæ concavæ minus profunde bilobæ, plus minus denticulatae, antlieridium singulum foveantes, intimae (mediante bracteæ 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 × ·1, ·15 × ·12; c ½ : br ·3 × ·25, ·4 × ·3; per ·7 × ·25 mm.

*Hab.* Germany: near Custrin, in fine fruit, Sept. 1833 (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 (Limpriicht).

*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 andréacia 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 andréacia occupying their upper half, and sometimes topped by a few normal anantherous leaves, but never by a female flower.

37. *Cephalozia* exiliflora.


*Dioica* acroracarpa eflagellifera dense cáespitosa pallide viridis, apice rufo-badia; *caule* subramoso vel simplice, basi prostrato et rhizo-
matoso, dein suberecto crassiusculo folioso et radicelloso. Caeteris
caracteribus, quoad foliola praecipue, C. *divaricata* Starkii sat similis,
differt autem *folii* latioribus quam longis, cellulis paulo majoribus; *florescentia*, tam mascula quam feminea, semper in ipso caule terminali; bracteis (alte connatis) integerrimis; præsertim *perianthio brevi obovato-oblongo subinflato* 3—5-carinato purpureo-badio, apice scarioso subedentato. Caules ♀ sœpe tota longitudine antheridiiferi; *bracteae* equitantes
denticulatœ vel subspinulosœ.

*Hab. Swan River, Australia*, on charred wood (t. *drummond*).

38. **Cephalozia Macounii.**


*Diœcia* cladocarpa eflagellifera; caule tenui pellucido flexuoso radicelloso crebris ramoso. *Folia* viridia, contigua vel subimbricata, late
patentia cuneata parum complicato-carinata, ad vel paulo ultra ½ bifida, sinu lato obtusato lunatove, lobis patulis subdivergentibus late subulatis (basi 2—4 cell. latis) pro more acutis; *cellulis* parvis subquadrate subpellucidis. *Foliola* 0. *Bracteæ* ♡ 2—3-juge tristichæ appressæ liberæ vel subconnatae, vix ad ½ usque 2—3-lobæ irregulariter spinulosæ. *Peri-
anthia* parvula albida leptoderminia, obovato-vel-ovato-fusiformia, obtuse
trigona, ore subconstricto setuloso ciliolatove.—*Andreea* caulis ramive
apicum mediumve tenentia.—F · 15 × 1; per · 75 × · 25 mm.

*Hab. Canada*, on rotting trunks (*macoun*).

[C. *Sullivantii* Aust. l. c. (=*Jung. divaricata* Sulliv. *Musc. Allegh.* 239; on rotten
wood in *Ohio, New Jersey, Canada*, &c.) quoad habitem et minutiam C. *micromera*
nostræ persimilis, e cellulis autem praeminuitis et perianthiis ore hauud 6-laciniatis
longe aliena, *Cephalozia vera* videretur, C. *Macounii* affinis sed longe minor et
stipulifera; mihi tamen solum e specimenibus mancis male cognita.]

39. **Cephalozia leucantha** Spruce.

*Diœica*, semper fere cladocarpa, albescens, magn. C. *divaricatae*. Caules prostrati, ♀ cum ♀ sœpe arcte implexi, tenues elongati flexuosi
subramosi radicellosi, flagellis nullis. *Folia* parva valde distantia, patula
vel assurgentia, oblonga vel quadrato-rotunda, adusque vel ultra ½
bifida, sinu acuto obtusove, lobis sæpe inœqualibus lato-subulatis (basi
3—4 cell. latis) acutis subæuminatisve, *parallelis vel conniventibus*; *cellulae*
minutulœ subquadrateæ, inferiores parum elongataæ. *Foliola* 0. *Bracteae*
Cephalozia

floris \(\varphi\) intimæ foliis 3—4-plo majores, plus minus connatae, orbiculatæ subdenticulatæ 2—3-lobæ, lobis brevibus acuminatis. Perianthia pro plantula maxima, foliis 10-plo longiora ovato-lanceolato-fusiformia vel sublinearia, albida leptodermia, superne 3-(raro 4-) gona, ore minute sæpeque obsolete setuloso. Calyptra tenuis. Capsula magna, dimidium perianthii adaequans, oblongo-cylindrica badia. Andræcia brevia, vix unquam ramulum totum tenentia, terminalia mediave, julacea; bracteæ foliis majores arcte imbricatæ orbiculatæ concavissimæ carinatæ, ad \(\frac{1}{3}\) bi-trilobæ monandri; bracteolæ minutæ lineari-subulatae.—F \(\cdot 2\times 0.13\); \(\varphi^{1/2}\); br \(\varphi\) 75; per 2\(\cdot 0\times 0.5\); br \(\varphi\) 2.25mm.

"Jungermania catenulata" G. et R. Hep. Eur. no. 483 (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 (Limpich, Aug. 1871, \(\varphi\) et fr.) Scotland: Potarch near Banchory, in very fine fruit, on rottning wood, along with C. C. catenulata and curvifolia (t. sim).

C. Macounii Aust., huic proxima, facile distincta est foliis minoribus subimbricatis cuneatis carinatis, sinu apicis latiore sæpe lunato; bracteis spinulosis; perianthio triplofere breviore subobovato; Andræciis—e bracteis masculis acutilobis sursum prominulis—cristulatis nec julecis.

C. catenulata Huében. longius distat statura majore, colore fulvo; foliis subimbricatis latioribus concavulis—in sicco incurvis et catenulam simulantibus—cellulis latioribus; praecipueque 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 foliis majoribus rhombeo-rotundis decurrentibus, ad \(\frac{1}{2}\) solum fissis, sinu pro m. lunulari, cellulis majoribus; perianthio (quad folia multo breviore) et calyptra carnosulis, \&c. \&c.

40. Cephalozia pygmea Spruce.

Monoica cladocarpa minuta \(\varphi\) fuscidula prostrata eflagellifera. Folia minuta distantia subtransversa subsquarroso plana cuneata profunde acute bifida, cruribus subulatis basi 2c. latis; cellulis minutis subparallelogrammis. Flores \(\varphi\) e caule, vel sæpe e ramo \(\varphi\), orti. Br. connatae, ad \(\frac{3}{4}\) bilobæ, subdenticulatæ, lobis acuminatis. Per alte emersa lineatrigona, ore setuloso.
Hab. ad terram umbrosam in Andibus Peruvianis, alt. 1200 m. (r. s. Nov. 1855).

Var. spinuliflora, foliis sublatioribus, interdum dente umo alterove armatis; bracteis spinuloso-serratis.—In Lejeunea porelloide S. parasitans ad fl. Uaupés. (r. s. Dec. 1852).

C. rubella Nees., europaea, huic floresc. nonoica (fide Lindbergii) conveniens, distat foliis subrotundis ad ½ solum fissis, superioribus subdenticaulis, et perianthio oblongo, ore constricto subintegerrimo.—C. rhizantha Mont., corticola in ins. Cuba, differt foliis solum ad ½ 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 ELACHISTA (Jack).


Monoica clado-et acrocarpa pusilla pallida tenerrima prostrata; caule e basi rhizomatosa subaphylla paucirameo. Folia distantia—solum versus ramorum fertilium apicum subimbricata—ovalia, profunde acutë biloba, lobis lato-subulatis acuminatis incurvis, dente uno alterove armata; cellulae parvae subquadratepellucide subleptodercm. Foliola minuta, sepius bifida, segmentis brevisetaceis; interdum nulla. Amenta ♂ in caule terminalia, vel ramum totum fere tenentia; bracteæ angustæ sepius denticulatae, lobis acuminatis sursum secundis. Rami ♀ breves

"C. rubella Nees", in hb. Schimperiano asservata, cadem est ac C. catenulata Hüb. en.


43. Cephalozia Massalongi Spruce.


A C. elachista distat florescentia dioica, statura elatiore, caule præ-longo; foliis fere bipartitis, cruribus distanter valide spinulosæ; foliolis ubique præsentibus subulatis lanceolatisve integris bifidisve subspinulosis. Caetera non aderant.

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

44. Cephalozia dentata (Raddi).


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

Hab. in sylvis humidis Italicae (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-cæspitosa fragilis pallide rufa apice virescens. Caules a basi prostrata subradicellosa assurgentes subramosi, ramique polphylli teretes. Cellulae caulis pluristratæ tenuissimæ, interiores opace, corticales easteris paulo latiores subpellucidæ. Folia pectinato-disticha conferta et equitantia, adusque vel ultra ½ complicato-biloba, toto margine argute inequaliter, sæpeque subduplo, dentato-serrata, lobis ovatis vel ovato-
Cephaloziella

lanceolati acutis apiculatisve, lobo antico erecto caulique subparallelo, postico (parum latiore) angulo sub 60° patente; cellulae minute quadrato-hexagonae planæ pulchre guttulatae, pariete ad angulos valde incassato, endochromio parco. Foliola nulla. Flores in ramo sæpius elongato terminales, innovatione nulla suffulti. Bracteæ propiae uni-tri-jugae intimæ foliis duplo fere maiores, basi antica connatae, spinoso-dentatae bilobæ, lobis subacuminatis acutis; bracteola cum altera bractea alte connata ovata subacuminata integra bilobave spinoso-dentata. (Folia bracteis proxime sequentia cæteris foliis submajora, basi libera tamen, foliolo nullo adjecto.) Perianthia alte emersa tenuia, cellulis unistratis ( nisi ut in ipsa basi ad angulos interdum bistratis) conflata, linearia (basi perpaulo angustata) pentagono-prismatica, carinis altiusulis, apice rotundata, ore fere clauso obscure ciliolata. Calyptra tenuis. Capsula ovalis. Andrœcia in eadem, vel sæpius in diversa, stirpe, medium ramum pro more tenentia; bracteæ assurgentes plurijugæ foliis subconformes—imo interdum majores—monandæ. —$F \cdot 25 \times \cdot 2$; $e^{1/20-1/60}$; br. $4$; per $1.0 \times 25$ 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); Cromagloven (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 orti, quando caulis furcatus evadit), frequentius lobo postico solo velati; adveniunt rarius rami postici, eaulis tergo—extra foliorum bases—execute. 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; exteriori minus alte—vel uno solo latere—connatae.

Obs. A curious and beautiful little plant, standing on the confines of several genera. Except for its similarity to Cephaloziella 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 Cephaloziella. Its toothed, pectinato-distichous leaves bring it very near to Fungernmania Helleriana, on the one hand, and Anthelia phyllacantha on the other. By Dumortier, indeed, it was placed in Anthelia: a genus sufficiently distinguished from C. Turneri and every other Cephaloziella by the unfertilised pistillidia being carried up by the fertilised one, i.e. by the calyptra; and by the perianth being replicate at the mouth.
APPENDIX
de generibus nonnullis Cephaloziae 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 caespitosa. Caulis pollicaris suberectus subteres, cellulis angustis (6 in diametro transverso), corticalibus sub 14-seriatis internis perpaulo latioribus, constans, basi sæpe valde ramosus; alii rami breves flagellares, aphylli vel microphylli, radicantes, alii assurgentes fastigiato-corymbosi inferne pauci-distantiifolii superne (fertiles præcipue) subconfertifolii. Radicellœ persequo omnino nullæ, raro paucissimæ (1—3 nae) ad flagella caulemve adstant.

Folia transversa erecta, inferiora minuta ovato-subulata pleraque integra; superiora increscensia subimbricata ovalia et ovali-lanceolata complicato-canaliculata et equitantia, apice ad ½—⅔ bifida, segmentis obtusis acutisæ sæpe inæquimagnis, alia solum emarginata; cellulae majusculæ pellucidae leptodermes, rectangulari-hexagonæ subduplo longiores quam latae. Foliola foliis parum minora subconformia nisi sæpe integra vel solum emarginata. Flores dioici: 0 in caule ramove brevi longioreve, sæpe iteratim innovando, terminales. Bractœ 2—3-jugæ, perianthii basin amplectentes vel subremotæ, foliis caulinis similes, saepe autem multo maiores, breviter bifidæ, inæqualibœ, repandæ, ad axin a basi ad medium fere usque cellulis bistratis conflatœ (ex eo quasi costatae); genitalia paucæ. Perianthia magna, lanceolato-fusiformia— in fructu sæpe elongata fereque linearia—alte trigona, ore angusto fere clauso vix subjacentula, a basi ad apicem fere usque cellulis bi-(ad carinas sæpe tri-) stratis conflatœ. Calyptra duplo brevior angustiorque, clavata, ¼ inferiore 2 c. crassa, demum apice inæqualiter bivalvis, pistillidiis sterilibus basi circumdata. Pedicellus perianthio plus duplo longior, e. 16-seriatis, sc. cellulis periphericis 12-seriatis, axialibus (majoribus) 4-seriatis, conflatœ. Capsula anguste oblonga, ruro badia bistrata; cellulae strorum subæquimagnœ irregulariter tesselatae, oblongo-4-6-gonœ, parietibus lateralibus columnis trabeculisve paucis fulcis, fibris semiamnularibus strati interioris nullis vel perraris et subobsoletis. Elaters breves obtusi bispiri. Spores eodem diametro ac elaterum, globosœ sublæves. Andrcœa terminalia brevia—raro ramum
totum tenentia; bracteae foliis conformes, vel majores et latiores, monandrae.—Folia \(35 \times 15\); \(f^*\) \(35 \times 12\); br \(1:65 \times 55\), (cellulae bractearum \(1:16 – 1:12\) mm longae); per \(2:0 \times 0:5\) mm.


Stirps singularis, a Cephalozii certa diversa habitu peculiari; ramis foliosis lateralibus, defectu radicellarum fere absolute; floribus femineis constanter terminalibus. Cellulis elongatis cum Alobiellis congruit; foliolis majusculis semper præsentibus ad Eucephalozias subluridas accedit; foliis complicatis ad Cephaloziellam; ab omnibus tamen carateribus 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. b. 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 coëspitosa. Caules \(1–4\)–pollicares intesti rigidiusculi obtuse quadranguli, basi nuda rhizomatosi divergenti-

*Mr. Stabler has lately (May 11, 1882) succeeded in finding _H. laxifolia_ in fruit in Mardale.
Hygrobiella

ramosi—interdum subbrachiati; aliis ramis lateralis, basi aphyllis superne foliosis, aliis (inferioribus) posticus nudis flagellaribus et radicellis nullis vel perraris. Cellulae caulis diametri 6 vel 7, corticales 20-seriatae subquadratae, internis perpaulo majores, primum magis pellucide, in aetate opacæ. Folia caulis ramorumque inferiora dissita minuta erecta appressa (exinde ægre visibilia) ovato-quadrata, complicata—arte explanata subcuneata—ad ½ bifida, lobis acutis; superiora abrupte multo majora, confertiora et equitantia, in bracteas ♂ transeuntia; cellulae minutæ subquadratae leptodermes subpellucidae. Foliola omnino nulla. Flores ♂ terminales, in ramo sepe iteratim innovando-proliferus, innovationibus lateralisibus, raro posticus, interdum binis oppositis elongato. Bracteæ pro plantula magna, 2—3-jugæ, distichæ, arcte conduplicatae et æquantiae, carina recta ad angulum 45° e caule extante, intimæ maximæ, foliis caulinis 4 plo majores, quadrato-oblongæ, basi subcordatae, apice vix ad ¼ usque bifidæ, lobis obtusatis, raro subacutis; exteriores sensim minores in folia transeuntes.

Perianthia semiemersa, oblonga, a facie subcompressa, valde obtuse trigona (angulo tertio postico) antice profunde uniuscula—demum probabiliter subplana, apice lato rotundata, ore parvulo denticulato vel setulosa, setulis 1—4 cellulas longis. Cætera haud visa.—Folia *12 x 0.08 et minora; cell. 1/65; bract. int. lobus posticus 43 x 0.25 l. anticus 4 x 2; per 65 x 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
Hygrobiella

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, hic illie rubescens, siccando sordide flavida, caespitosa. Caules sesquipollicares suberecti validi, cellulis pellucidis sub 6-stratis (diametro 12 cellulas constante), corticalibus 24-seriatis elongatis, internis vix diversis, conflati, basi nuda rhizomatosi, flagella postica arhiza edentes, superne sparsifolii, pro mores simplices, rarissimo casu ramum unum alterumve lateralum edentes. *Folia* distantia erecto-patula parva ovato-rotunda subcomplicato-concava, basi subcordata, margine supra medium in angulum, raro indentem, protracta, apice ad $\frac{1}{4}$—$\frac{3}{4}$ acute biloba, lobis acutis subacuminatisve, superiora brevius fissa, lobis sub-obtusis; cellulae minute quadrato-hexagonae leptodermes, convexulae, chlorophyllo parco. *Foliola* nulla. *Flores* utriusque sexus ignoti.—*Folia* $\cdot 35 \times \cdot 35$; cellulae $^{1/70}$ mm.

*Hab.* Ben Nevis, on moist shelving rocks (J. Whitehead! July, 1875).

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 subæquifoliato, 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; *valvula* $\cdot 4 \times \cdot 175$ mm tenues bistratæ, cellulis strati interioris fibris semiannularibus paucis depictis. *Pedicellus* diametro $\cdot 1$, apice $\cdot 12$ mm. *Elateres* $\cdot 1 \times \cdot 01$ mm rufo-badii bispiri. *Sporæ* diam. $\cdot 0175$ mm pallide badiæ.
conca\-vissimis (vix complicatis; perianthiiis carnosis\-simmis, in-
ferne 8 cellulas crassis; innovatione sub\-florali nulla.—Hab.
et Distr. Unica species nobis cognita ad saxa humectata
in montibus Europæ et Groenlandiæ rarius occurit.

**Pleuroclada al\-bescens** (Hook).

*Jungermania al\-bescens* Hook. Brit. Jung. t. 72 et suppl. t. 4

*Dioica* depresso-\-caespitosa stratificata al\-bescens virescens\-ve, sic-
cando ca\-rul\-escens. *Caules* pollicares raro longiores proc\-umbentes in-
tricati, laxe subpinnati, interdum ex parte dichotomi, parce radicellosi,
eflagelliferi, validi, ovali-teretes, cellularum stratis 5 concentricis sub-
æqualium conflati, opaci; *rami* stricti subfastigiati. *Folia* subdissita
patula, insertione fere transversa, parum succuba orbiculata, conca-
vissima, fere hemispherica, adusque vel paulo ultra \( \frac{1}{2} \) biloba, lobis ovato
triangularibus conniventibus acutis, sinu anguto subobtuse; *cellulae*
mediocres quadrato-\-hexagonæ crassæ, subleptodermes tamen, fere
planæ, endochromio parco subpellucidæ. *Folium axillare*—e cujus gremio
ramus oritur—ex parte cauli, ex parte ramo adnatum, cæteris foliis
diversum, late ovatum, basi subcordatum, apice acutum nec bifidum.
*Foliola* subcontigua appressa subplana, foliis vix breviora, late ovata vel
ovato-lanceolata acuta vel subacuminata, raro obtusa, utrinque supra
basin valide unidentata, altero vel utroque dente interdum obsolet.

*Flores* dioici: \( \phi \) in ramo brevi longioreve—pro pedicelli receptione ad
involucri basin usque excavato—terminals, innovatione propria nullu
suffulti, assurgentes, basi sæpe valde radicellosi. *Bractæ* 3-jugæ ap-
presso-\-convolutæ, extime foliis submajores, intimaæ triplo fere majores,
basi libere vel breviter connatæ, oblongo-quadrate, ad \( \frac{1}{2} \) bifidæ, raro
trifidæ, segmentis subacuminatis acutis; *bracteola* subminores apice in-
tegrae bifiduleve, basi utrinque grosse 1—3-dentatæ. *Perianthia* alte
emersa, foliis caulinis 7 plo longiora, clavata vel linearis\-fusiformia, alte
trigona, ore constricto sæpe scarioso demum lacera erosaque, substantia
firma, basin versus 5—8 cellulas crassa, medio 2—4 cell., ad \( \frac{8}{9} \) alt. 2
cell., solum juxta apicem 1 cellularum solam crassa; *cellulae* magnæ elonga-
tæ pellucideæ. *Calypta* pyriformis tenuis, basi sola 2 cell. crassa
ibidemque pistillidiis sterilibus sub 8 breviusculis lageniformibus obsita,
superne unistrata. *Capsula* perianthio 4—5 plo brevior alte exserta
cylindraceo-oblonga; valvulae linearis-lanceolatae ovales, ideam ac elateres sporaeque purpureo-badice; cellulis bistriatis, interioribus fibra annularis—saepe ex. p. dissoluta et ad trabeculas redacta—impletis conflatae. Pedicellus sat crassus, cellulis magnis, demum 4—5 plo longioribus quam latis, prismatice-cylindricis, corticalis 8—9-seriatis primum chlorophyllo repletis posterius evacuatis, internis aequimagnis 4—5-seriatis ab initio subvacuis. conflatus. Elateres capsula 4 plo breviores filiformes utrinque obtusi, fibra spirali duplici angusta impleti. Spore latitudine elaterum globosae leves. 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 longis concavissimis, ad ¼ alt. solum bilobis; foliolis latis, ovatis, hinc vel saepius utrinque unidentatis, superioribus saepe bifidulis. Jung albescens Hook. (typus).


Hab. var. scotica, in montibus Scoticis (Clova! Greville); in alpibus Helveticis (Grimsel! Schimper: specimina ditissime fertilia); in alpibus Tyrolensibus! (Jack in G. et R. &c. 35 et 468.)


Obs. In G. et Rab. Hep. Eur. exsicc., under no. 386, (Jung. islandica) Dr. Gottsche has the following remark. "Richard Spruce has proposed, in his 'Musci and Hepaticae of the Pyrenees', 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 *F. albescens*, 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 *Cephalosoria* 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 cæspitose, e viridi olivaceo glaucescentes. *Caules* validi, cellulis pluristratis conformibus opacis conflati, inæqualiter pinnati, ramique tristique foliati (exinde ad speciem trigono-prismatici); *omnes rami laterales*—nullo folio difformi stipati—basi interdum denudati vel minutifolii; flagellis nullis; radicellis in statu juvenili sat copiosis, in adulto interdum raboribus. *Folia* tristica transversa, sat lata, complicato-carinata, ubi magis conferta equitantia, ad vel ultra $\frac{1}{2}$ biloba, lobis subæcuminis, integerrima vel sæpius (superiora præcipue) denticulata vel spinulosa—interdum ipsa facie spinoso-muricata; *cellulæ* parvæ pellucidæ quadrato-hexagonalæ—axiales subelongatae—pariete plus minus increasato. *F. postica* (s. *foliola*) laterálibus conformia et vix paulo minora; in aliis speciebus autem sat minora persæpeque apice integræ. *Flores* dioici, raro paroici, terminales: $\circ$ 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 subcompressa, antice profunde unisulca, utroque sulcæ margine superne
Antlielia 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. 
*Calypttra* 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, bistrata; cellulae rectangulares, pariete exteriorum trabeculis, interiorum fibris semiannularibus, fulcitae. *Andraecia* in stirpe simplicioe terminalia, spicata; *bracteae monandreae.—Hab. et Distrib.* Ad rupes madiadas in subalpinis et alpinis, ad nives aeternas usque ascendens, per Europam mediam et borealem; unica species in insula Madeira cresit.

*Jungermania* L. Fl. Lapp. (1737).


A. Folia omnia facie inermia, postica lateralibus subaequimagna.

1. *Anthelia julacea* (Lightf.)


Var. β, *clavuligera* Nees, humilis, caule iteratim innovando-florifero, ad fl. 9 basin sat radicellosa, ramis insigniter clavatis (e folii densissimis, inferioribus minutis, superne increcentibus et in bracteas transeuntibus). Folia subintegerrima.
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 radicello sa. Folia foliolaque iis A. julacea parum diversa, in exemplis Sueciis sæpe ad 1/4 solum fissæ, segmentis triangularibus; in Styriaicis et Scotiais autem ad vel ultra 2/3 fissæ, segmentis angustioribus subacuminatis; cellulae (1/35—1/30 mm) iis A. julacea majores et pellucidoiores. Bractæ floris bisexualis (in ipso caule terminalis) plurijugæ, laxiuscula capitatae, foliis sensim majores, conformes nisi basi latiore ventricosa antheridiferæ, apice pannucinulose. (Flores ramos terminantes persæpe tenniiores et unisexuales, i.e. fæminei.) Perianthia ovato-oblonga; cætera iis A. julacea conformia.

J. nivalis Sw. in Schleich. exsicc. 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 Tjättjäsk (Lindberg! 1856). In monte Grimsel Helvetiæ, cum Marsupella sphacelata (Schimper! 1847). On moist rocks below the summit of Ben 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 J. julacea of Lightfoot, as well as J. Juratzkana, under their name “J. nivalis”; so that, whether species or variety, to Limpricht belongs the honour of first distinguishing J. 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, caulis 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 lateralibus sat minora.

3. **Anthelia phylacantha** (Massal.)

*Cephaloziia* ? *phylacantha* Massalongo Epat. Ital. exsicc. no. 58.

Dioica, pusilla viridis in sicco glaucus, dense cespitosa, radicellis longis albidis intecta, pinnatim subramosae, ramis omnibus e foliorum lateralius axilla ortis. *Folia* subrotunda, subcomplicata, ad $\frac{1}{4}$ biloba, lobis ovato-lanceolatis acuminatis, margine subrecurvo spinulosa, facie externa et cellulis in papillam spinulamve alte prominulis *echinata*; cellulae parvae subaequilatere. *Foliola* paulo minora, tenuiora, facie laeva, margine spinulosa, apice (integro bifidove) ciliata. Flores $\varphi$ (juveniles) terminales; bracteae conflentes capitatae, foliis longiores subconformes, nullibi incassatae. **Perianthia** . . . .

Hab. Mountains of North Italy: Alagna, Valsesia (Massalongo !)—Habit almost of *Cephaloziia* 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 phylacantha*, 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.)


*Plantula* mihi nondum visa certe *A. phylacantha* affinissima. "*Folia* margine et dorso cellulosoe-echinata, ut in *Lejeunea calcaria*, necnon "amphigastria ovato-acuminata ciliato-dentata" conveniunt. Differt *A. asperifolia* foliis subquadratis (nee subrotundis), lobis solum acutis (nee acuminatis); foliolis minutis; *bracteae* $\varphi$ subtrifidis; forsan etiam florescentia monoica, quum cl. Taylor flores utriusque sexus descriptis, anne autem in eadem, anne in diversa stirpe occurrunt, non dixit. "*Andrecia* magna ventricosa spicam obtusam formantia. **Perianthia** oblonga subcompressa subplicata, basi purpurae apice decolora, ore sub-integro". (Tayl. l. c.)

Hab. Insula Madeira, unde e Dicksono habuit Taylor.

Obs. Mitten's genus *Chandonanthus*—founded (in ignorance 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
Anthelia---Arachniopsis

to reserve for \textit{J. squarrosa}, and possibly \textit{J. setiformis} (? 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{Gymnomitrium} N.)—we find some species with free, others with adherent receptacles. In \textit{Nardia} (\textit{Alicularia}) \textit{scalaris}, \textit{N. hæmatosticta}, \textit{N. (Eucalyx) succulenta} (L. et 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 Bredleri} Limpr. the few sterile pistillidia are found 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{Jungermaniae} as \textit{J. sphærocarpa}, \textit{J. lurida}, and others.

\textbf{ARACHNIOPSIS} nov. gen.

\textit{Plantæ} pusillæ confervoideæ griseo-vel cæruleo-virescentes, ad telaranæ instar late intextæ. \textit{Caules} filiformes laxe corticati, postice ramosi et radicellosi. \textit{Folia} capillacea stricta, cellulis cylindricis, 2—6 plo longioribus quam latis, uniseriatis constantia et vel unicrura vel in aliis speciebus bicrura; cruribus ab ipsissima basi discretis, altero (antico) paulo inferius inserto. \textit{Foliola} 0 vel subnulla. \textit{Flores} \textit{0} cladogeni; \textit{bractæ} 3-stichæ, 3—5-jugæ, intimæ liberæ vel subconnatae, pro more quadripartitæ, laciniis capillaceaæ et limbo basali angusto ortis. \textit{Pistillidia} sub 12. \textit{Perianthia} prælonga, linearia, superne (saltem) trigona, ore longe 12-laciniato-ciliata. \textit{Calyptra} tennis libera. \textit{Capsula} oblonga, cæteraque iis \textit{Cephalozææ} conformia. \textit{Andræcia} terminalia; \textit{bractæ} 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 pariotes tanquam araneae telarum instar dilatatur.

Var. *filifolia* S. Foliorum crura longissima (1.5—1.8 mm) e cellulis 10—14, duplo (rarotriplo) longioribus quam latis, conflata. *Perianthia* praelonga (2.3 × 0.4 mm) tereti-fusiformia, ore angusto triplicata. *Bracteae* intimae perianthio perpaulo breviiores.—Ad Panuré fluviī Uaupés hane 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).

*Plantæ* humiles caespitosæ vel super muscos vagantes. *Caules* tenues opaci, cellulis in diametro sub 5, extimis brevioribus; radicellosi subdichotome ramosi, ramis paucis 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; *cellulae* mediocres oblongo-quadratæ leptodermes sat chlorophyllosæ sublaevissimæ.—*Folium caulis* bifurcatione præ-positum cæteris difforme, sæpius erure unico prælongo constans, vel tripartitum, erure antico longiore. *Foliola* foliis ½ breviora, 3-crura. *Flores* paroici et dioici, terminales. *Andracii bractæ* sub 8-jugæ, foliis æquimagnæ, incurvæ 6-partitæ, eruribus mediis 2 vel 3 bifurcis, monandræ. *Bractæ* 9 tristichæ subtrijugæ, intimæ foliis ½ longiores, verticillatae, minime connatae, profunde 4-fidæ (pagina basali 4—6 cell. alta); lobis vel bis dichotomis vel plurifidis, laciniis filiformibus. *Bractæ* exteriores minus fissæ; in
Blepharostoma


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* 1a 35; *c* 15—1 25; *br. int.* 8; *per* 1.8 × 6; *cal* 9 55; *caps* 8 × 5 mm.

*Jungermania* L. Fl. Suec. (1745).


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


*Obs.* The leaves are inserted almost transversely on the stem, but have (if anything) a slight tendency to be incubous. 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 underleaves 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 numerosly 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. Trigonantheæ, 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.

- *Zoëpis* H. f. et T.
- *Pteropsiella* S.
- *Protocephalozia* S.
- *Alobiella* S.
- *Eucephalozia* S.
- *Cephalozilla* S.
- *Lembidium* Mitt.
*Odontochisma* Dum.

*Adelanthus* Mitt.
*Anomocladia* S.
*Hygrobiiella* 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 difficiliori sunt, 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.

... " ..., " connivens to Alobiella, Pteropsiella, Protocephalozia.

... " ..., " catenuhita to Cephaloziella, Hygrobiella, Jungermania § Sphenolobus, Marsupella.

... " ..., " Francisci and fluitans to Odontoschisma, 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 "cladocarpous" and "acrocarpous;" 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. acryciophila 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 decurrens 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 subgenus, 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 laxè bispiri. *Sporæ* diametro elaterum tuberculosæ.

Species unica, *Mytylopsis albifrons* S., habitat in montibus Andiam Peruvianorum orientalium *Campana, Guayrapurina, &c.* alt. 1000 metr. supra mare, locis cavis umbrosis, ubi ad folia emortua saxaque latos æspites efformat.—Albescens, albido-viridis, rarius roseo picta, opaca rigidiuscula fragilis. Caules fertiles (cum foliis 20—27-jugis) lineari-lanceolati, steriles (cum foliis sub 40-jugis) lineares, raro apice attenuati et radicantes; rami nulli paucive et paucifolii, alii flagellares radicelliferi. Folia subcontigua, vel ubi densiora equitantia, arte explicata cordato-oblonga, totò margine eroso-repanda, apice subacuto incisa; lamellæ lineari-rhomboidæ, anterior dimidio superiore posterioræ ala ad carinam solum 1—3 cellulas lata superans; cellulae premunite subrotundæ leviter 6-sinuatae, trigonis magnis ad angulos incrassatæ, carinam versus oblonga-hexagonæ, omnes convexulæ et minuta verruculoæ. *Perianthia* foliis 2—3plo longiora, obtusangula, reti eodem ac bracteearum laxo rectangulari rhomboideoe subscarioso. *Capsulus* cellulae tessellate, ad parietes laterales columnis trabeculisve paeonis fulcitæ. *Bracteæ* 3º paucijugæ minute concave apice bidentes. —Caules 5—15 mm longi, cum foliis 1:2 mm lati; folii laminae •65 × •3; e 1/50; br. •75 × •5, br. la •9 × •5; per 2•0 × •6; 1•35 × •5, •8—1•0; caps •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 rario adveniant ramus posticus, ad caulis primarii instar ramullosus est.—In *Mytilopsi* autem omnes rami (cephaloziae quem ad modum) postici sunt, et foliola nullibi ( nisi ad flores) obvia. Ramus κ interdum elongatus, infra involucrum 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 Chiloscyphaceae comprises—besides Chiloscyphus and Coleochila Dum. (=Mylia Gray)—Pleuroschisma Dum. (=Bazzania Gray), Odontoschisma, Lepidozia; while Cephalozia is relegated to his tribe Jungermannaceae, along with Jungermania, Lophocolea, &c.!

Lindberg, the latest systematiser of Hepaticae, has proposed a tribe Lepidoziaee, whose first half, comprising Lepidozia, Bazzania, Odontoschisma, and Cephalozia, is a natural group of genera; but the second half: Lophocolea, Pedinophyllum, Chiloscyphus, 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. p. 2—5).

Nees's Trichomanoidae (Hep. Eur. I, III et 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 Jungermanniaceae (=Marsupiocarpaceae = Geocalycaceae = Saccogyneae), 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 whorls are more or more or less adnate to each other into

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† This curious genus, the Pienrozia of Dumortier, has not yet found its true place in the system. With Radula and Madotthea, 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* (Alicularia) as *N. haematosticta* (N.), *N. Lescurii* Aust. and *N. Breidleri* (Limp.), whose gibbous, rooting involucres 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 disinterring 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, &c.†

* See also Gottche’s admirable memoir “On the fructification of the Jungermannia Geocalyceae;” 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.

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<th>Species Mexicanae</th>
<th>Species Andinae</th>
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Although it is exceedingly probable that Kantia (≡Calypogeia § B Raddi, Nees) is a marsupial form of Trigonantheæ, 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 ramifications 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 pouchéd) 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 Alohiella; but the leaves are constantly incubous, while in Alohiella 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 Trigonantheæ 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-
parison, we call those genera that have the involucre free, *Hypocolae*; 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, *Marsupicolae*, or *Marsupiocolae*, we get the following conspectus of the

**Affinities of Marsupial Hepaticae.**

**JUNGERMANIACEÆ**

**Hypocolae** ***Epicoleae*** ***Marsupicolae***

**Acrocarpice**:  

*Jungermania* L. .......... *{Nardia Gray, Notoscyphus Mitt.} Acrobolbus Nees.*  

*Jung. § Sphenolobus Ldbg...Marsupella Dum.....*  

*Lochlea* N. ............. ***Symphyomitra S.*  

*Leioscyphus Mitt. Southbya S.......... *{Calypogeia Raddi (= Lindigina Gotts.}  

*Playiochila Dum. ..........*  

*Scapania Dum.......... (=Gottshea N......)* **Balantiopsis Mitt.}  

? *Ptilidium N.......... Lepidolea Dum. ........*  

*Herberta Gray...*) **{Lepicolea Dum. ...}**  

= *Sextuera N. *{Chaetolea S. ....}  

*Leiomitra Lindberg.....* **Tricholea Dum. ........***

**Cladocarpice**:  

*Chiloscyphus Dum. ...... Harpanthus N..........* **{Geocalyx N.*  

? *Adelanthus Mitt. ......*  

**Marsupidium Mitt.***  

*Bazzania Gray..........*  

*Cephalozia § Alobiella S.}...Anomoclada S ...... *{Kantia Gray  

**Saccogyna Dum.}  

*?= Geocalyx 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 *Harrpanthus* 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 Lophocola.
38.* Cephalozia aeraria Pearson MSS.

*Dioica* cladocarpa minuta, fulva vel pallide badia, dense depressocaespitosa. *Caules* $\frac{4}{1}$-pollicares flexuosi, radicellis crebris integris, sat validi, parce ramosi, ramique subhyalinum foliosi. Cellulae caulis 8 in diametro, corticales sub 15-seriatae internis paulo majores. *Folia* dissipata, squarrose fere patentia, minuta, subcuneata, obscure carinata, profunde (ad $\frac{4}{1}$) biloba, subintegerrima, sinu acuto obtuso angulum rectum includente; lobis ovatis lanceolatisve, basi 2—4 cellulæ latis, subacuminatis cellulâque unicâ conicâ (duplo longiore quam latâ) persæpe incurvâ apiculatis; cellulae minuta oblongaeellucidae insigniter guttulate, pari et æ angulos praecipue increpate incrasato, cuticula asperula. *Foliola* variabilia, inferiora sepe minuta obsoleta, superiora foliis subduplo brevioribus, interdum cum folio proximo in folium trilobum connata, suprae raro biloba foliisque vix minora. Ramulus $\frac{9}{1}$ brevissimus; bracteæ 3-jugæ, foliis duplex longioribus, in floræ sterili liberæ, paulo ultra $\frac{4}{1}$ biloba, parce spinuloso-denticulatæ, lobis ovatis acuminatis. Genitalia paucia. Caetera baud visa.—*Folia* 125—15 longa, 125 lata (inter lobularum apices mensa); c $\frac{1}{70}-\frac{1}{60}$; 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 apiculo linguiformi carentibus, cellulis subquadratæ; foliolis nullis.—*C. divaricata* certe diversa floræ acrogeno; foliis distincte carinatis, raro ultra $\frac{4}{1}$ fissis, lobis exunguiulatæ, cellulis quadratis reticulatæ (nec guttulatæ).

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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