

On cephalozia (a genus of hepaticae) : its subgenera and some allied genera / by Richard Spruce.

Contributors

Spruce, Richard, 1817-1893.

Publication/Creation

Malton : Printed for the author, 1882 (Malton : J. W. Slater.)

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ON

CEPHALOZIA

BY

Richard Spruce.



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ON

CEPHALOZIA

(a genus of Hepaticæ)

*Its SUBGENERA and SOME
ALLIED GENERA.*

BY

Richard Spruce.

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J. W. SLATER, PRINTER, RAILWAY STREET.

1882.

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P R E F A C E.

THE following memoir does not profess to be a complete monograph of all known species of *Cephalozia*, but only a descriptive account of all the species I have been able to examine. A few additional species are known to me only by name, and a few others may lurk undistinguished, or as yet unpublished, in our large herbaria; but the material here brought together amply suffices for my purpose. I have chosen this genus for illustration, because, in an extended view of its limits, it comprises within itself certain characters heretofore deemed of generic or even of tribal importance. Such are, 1°, the frondose, as contrasted with the leafy, stem; 2°, the succubous, transverse, and incubous foliage; 3°, the acrogenous and the cladogenous fructification; all of which modes are to be seen in the various species of *Cephalozia*, and the two last-mentioned often coëxist in a single species, or even in the same individual. On the other hand, characters hitherto overlooked, or underrated, are proved, by an extensive study of Hepaticæ, to be constant throughout large groups of species, and therefore of great diagnostic value. These are 1°, the insertion of the branches on the stem: either all postical, as in *Cephalozia*, *Kantia*, &c.; or all lateral, as in *Lejeunea*, *Radula*, *Frullaria*, &c.; or some combination of these modes in various other genera, the most unusual being where all the leafy and the flowering branches are antical (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*, *Scapania* and *Gottschea* ; &c. &c. The number of pistillidia varies through wider limits, and in many genera the ♀ flowers are polygynous ; in *Lejeunea*, however, they are constantly monogynous ; in *Frullania*, very mostly tetragynous, although one or other of the four pistillidia may remain undeveloped, thus reducing the actual number to two or three. Characters derived from the number and structure of the sexual organs do indeed figure in the descriptions of a few genera framed by Nees, Gottsche, &c., but they deserve accurate determination in all. The relative position of the ♂ and ♀ flowers affords as important characters for discriminating species in Hepaticæ as in Mosses, and is in every case necessary to be ascertained.

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

In the citation of authorities I have followed the rule of Elias Fries ; “Ofver vexternes namn” in the *Botaniska Utflygter* for (I think) 1845 : in always citing the writer who first named and described (or published named specimens of) a species as the authority for it. In April, 1846, Dr. Camille Montagne shewed me a translation he had just made of

Fries's essay. It was his intention to publish a notice of it in some periodical, but I cannot make out that he ever did so. However, he allowed me to copy from it as much as I chose, and I here reproduce, in the words of Montagne's translation, a portion of my extracts.

“L'usage d'ajouter à chaque nom son autorité a été pour la science la boîte de Pandore, d'où 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 Linnæus, 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 Linnæus 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 "*Sarcoscyphus* (*adustus* Nees);" for I was not the author of either the generic or specific names, and all I had done was to take the species out of genera to which they did not belong and put them in their proper place; but I did not think that gave me any right to arrogate the names to myself, and to quite ignore their actual founders.

It is further to be noted that in Hepaticæ the great bulk of the species stood until quite recent times in a single genus, *Jungermania*; in Musci (not quite so recently, but still within the memory of veterans of the science) in *Hypnum* and *Bryum*; and in Lichenes in the solitary genus *Lichen*. It is therefore essential to the student to know in what author he may find the original definition of (for instance) *Jungermania bidentata*, and often of slight (or of no) importance to him to know who first called it *Lophocolea bidentata*.*

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 " $\frac{1}{8}$ " read " $\frac{1}{2}$ "
- „ 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 "sublaciniæ" read "sublaciniatæ"
- „ 43, „ 11, from top, for "lacum" read "lacuum"
- „ 50, „ 4, from bottom, for "amæne" read "amœne"
- „ 56, „ 1, after "elongatæ" put period
- „ „ „ 1, of note, for "135" read "137"
- „ 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 "propie" read "propriæ"
- „ 73, „ 6 from foot, for "tantummodo" read "tantummodo"
- „ 77, „ 10, for "mores" read "more"
- „ 91, „ 18, for "coltumnis" read "columnis"
- „ 91, „ 21, before "8—1.0" insert "cal"
- „ 92, „ 6, for "Pleuroschima" read "Pleuroschisma"
- „ 96, „ 12 from foot, for "lunguiformi" 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 conduced 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:—

CELLULÆ	diametro
magnæ (<i>large</i>)	1/10 mm = '10 mm
majusculæ (<i>rather large</i>)	1/20 mm = '05 mm
mediocres (<i>medium size</i>)	1/30 mm = '033 mm
parvulæ (<i>smallish</i>)	1/40 mm = '025 mm
parvæ (<i>small</i>)	1/50 mm = '02 mm
minutulæ (<i>very small</i>)	1/60 mm = '0167 mm
minutæ (<i>minute</i>)	1/70 mm = '0143 mm
minutissimæ (<i>very minute</i>)	1/80—1/100 mm = '0125—'01 mm.

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 *Plagiochilæ*, 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 *Plagiochilæ* § *Cristatæ*, &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 involucreal 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 *Bicuspides* of Nees (*Hep. Europ.* II, 211, a. 1836) to which I gave the name *Trigonanthus*, because the perianth was normally a trigonous prism. This character, combined with the postical ramification—all the branches springing from the back, or underside, of the stem, and the polyphyllous tristichous involucre, in which underleaves were always present, although often absent from the stem—seemed to amply justify the separation of the group, as a distinct genus, from *Jungermania*. I did not then know that Dumortier had previously proposed for nearly the same group the name *Cephalozia*, first in his *Sylloge Jungermaniæarum Europæ* (1831) as a section of *Jungermania*, thus defined: "Perichætium polyphyllum undique imbricatum, phyllis dissectis:—Species stipulatæ vel exstipulatæ, foliis subcurrentibus bifariis explanatis divisis."—and afterwards, in his *Recueil d'Observations sur les Jungermaniées* (1835) as a genus, with the following essential character: "Périchète polyphyllé, à phylles laciniées, imbriquées circulairement et involucrant 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 recognise it from his meagre and more or less incorrect generic character. This has apparently arisen from his imperfect knowledge of the plants themselves, and his reliance on the figures and descriptions of other authors, which also he has sometimes misconstrued or wrongly com-

bined. Thus he unites to *Cephalozia* the *Jungermania capitata* of Hooker, on account of its rather large involucre, whereas it really belongs, by all its characters, to his own § *Lophozia of Jungermania*; but he excludes a very characteristic *Cephalozia*, *C. connivens* (Dicks), solely because of the ciliated mouth of the perianth, and relegates it to his genus *Blepharostoma*, whose character is "Perichætium polyphyllum undique imbricatum, phyllis articulato ciliatis. Plantæ exstipulatæ foliis transversis vel verticalibus." It hardly needs pointing out that *C. connivens*, having neither transverse leaves nor ciliated bracts, could not, on Dumortier's own shewing, be a *Blepharostoma*. He enumerates but 3 species of this genus; *Bl. trichophyllum*, *Bl. connivens*, and *Bl. setacea*. If the first be considered the type of *Blepharostoma*, the second is a *Cephalozia*, and the third a *Lepidozia*; that is, they belong to three distinct genera—all of Dumortier's own proposing!

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

Within the involucre, quite free from it, and usually protruding a long way beyond it, is a narrow trigono-prismatic perianth; only in certain species of the subgenus *Cephaloziella* does it acquire supplementary angles and become 4—5—or 6-angled. This three-sided perianth differs essentially from that of *Lophocolea* in the origin of its angles, or keels. In *Lophocolea* the angles are at the marginal sutures

of the connate *anthophyls*, or flower-leaves, by whose union the (primitively) triphyllous perianth becomes a monophyllous colesule. But in *Cephalozia* the angles are the folds, or keels, of the complicate flower-leaves; and as these leaves are 3, the third being postical, their union forms a 3-carinate perianth, whereof two keels are lateral, and the third keel is postical, or at the *under* side. This structure obtains in every *Cephalozia*, and in several other genera—whether the leaves be succubous, transverse, or incubous—and it always originates in the same way. The sutures at the actual margins of the anthophyls are either plane or depressed, but not elevated into a keel, except in some species of *Cephaloziella*; and even in these, although the perianths may have normally more than three angles, other perianths are nearly always to be found—sometimes on the same plant—which have the angles reduced to three, and invariably with the third angle postical. [See below, under the description of the subgenus *Cephaloziella*.]

But in *Lophocolea* the leaves and bracts—instead of being inflexed on each side of their axis, and more or less *complicate*, as in *Cephalozia*, are either plane or bent in the contrary direction—*i.e.* convex, or reduplicate (*i.e.* recurvo-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 *Lophocoleæ*, and exists also in the European *L. bidentata* var. *alata*. And as underleaves are everywhere present, the postical anthophyl—similar to, but usually narrower than the lateral leaves—forms with these latter a trigonous perianth, in which (as is easily seen must be the case) *the third angle is antical*, and the third face postical; the exact contrary of what obtains in *Cephalozia*, where the perianth is plane in front, and *the third angle is postical*.

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

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 *Plagiochilæ*. 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*, *amæna*, &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 JUNGEMANIDEÆ 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 succubous, 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 *Alobiella*, large and oblong or rectangular; cell-walls mostly thin, rarely conspicuously thickened at the angles; cuticle smooth or scaberulous.

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

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

7. *Gynæcia* capitate, usually seated on an abbreviated branch (*i.e.* cladocarpous), but sometimes terminal on longer branches or on the main

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

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

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

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

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

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

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

1. PROTO-CEPHALOZIA
2. PTEROPSIELLA
3. ZOOPSIS
4. ALOBIELLA.
5. EU-CEPHALOZIA
6. LEMBIDIUM
7. ODONTOSCHISMA
8. CEPHALOZIELLA

In pointing out wherein these differ from each other, and where they touch, or coalesce, so as to constitute but a single comprehensive genus, I shall take first the typical group, and thence pass on to the less-known, or hitherto unnoticed, groups.

To begin then with EU-CEPHALOZIA, (whereof the well-known and widely distributed *Jungermania 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 rhombic-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 ($\frac{1}{15}$ mm long), but more commonly moderate ($\frac{1}{30}$ — $\frac{1}{40}$ mm), never minute, often subquadrate, or quadrato-hexagonal, and about as long as broad, only a few of the lower cells being elongate. *Underleaves* normally wanting in most species, always present in a few, and occurring exceptionally in some others. *Female infl.* mostly cladogenous; but the flowering branch is sometimes much elongated, and even the main stem occasionally flowers at its apex. *Bracts* normal, often toothed, or subincised, not constantly connate in any species. *Perianth* always trigonous, *Capsule* usually elongate.

A small section (*Subluridæ*) 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* § *Gymnocolea* on the other.

To unite *Odontoschisma* (= *Sphagnoecetis* Nees) with *Cephalozia* may at first sight shock the notions of those conversant only with our two European species; although the impossibility of framing characters, derived from the parts of fructification alone, to distinguish between the two supposed genera, is acknowledged by all who have attempted it. For, although the stem-leaves of *Odontoschisma* are usually of firmer texture, subrotund and entire, yet the tristichous bracts of the clad-

ogenous female flowers are bilobed and usually laxly reticulate as in *Eucephalozia*; while the trigonous perianth, the form and number of the pistillidia, the calyptra, and the capsule in two layers, whereof the inner are strengthened by semiannular fibres, are all exactly on the same type. In his 'Mexikanske Levermosser,' Gottsche admits a *Sphagnoecetis* with leaves emarginate or 2—3 dentate at the apex; but, indeed, in our own *Odontoschisma Sphagni* retuse or indented leaves are often met with; and Mr. Stabler has gathered on Fowlshaw Moss, Westmorland, a form in which emarginate leaves decidedly predominate.

Again, *Eucephalozia Francisci* (Hook.) is almost a miniature copy of *Odontoschisma denudatum*, in the numerous flagella, the suborbicular leaves, the female involucre and perianth, the reddish 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. pygmæa* 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 succubous leaves of the latter. The trigonous perianth and its included organs, and the monandrous male bracts are exactly as in *Odontoschisma* and *Eucephalozia*.

If we start from *Eucephalozia* in another direction, it brings us to *ALOBIELLA* nobis: a subgenus confined, so far as hitherto known, to tropical America, where I have gathered 4 species, one of which (*Jung. Husnoti* Gottsche) has been found also in the Antilles, by M. Husnot. Here also, as in *Odontoschisma*, the leaves are normally entire, and only by rare exception cloven at the apex; but, instead of the concave and rather closely reticulate leaves of *Odontoschisma*, we find nearly flat, oblong or lanceolate leaves, with large pellucid elongate cells, $1/16-1/12$ mm long, and half as broad, which give the plants at first sight more the aspect of *Kantia Trichomanis* than of *Cephalozia*. In *C. Alobiella integrifolia* n. sp., indeed, an incubous leaf is sometimes (though very rarely) interposed among the normal succubous leaves, which makes the resemblance to *Kantia* more striking. The very long perianths are mostly laciniate at the constricted mouth, and the laciniae ciliiform. Three of the species are cladocarpous, but the fourth (*C. Al. acroscypha* n. sp.) is acrocarpous, 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 *Eucephalozia*.

A minute Amazonian *Eucephalozia* (*C. micromera* n. sp.) diverges from the type by the minute leaves, having the antical lobe much smaller than the postical, and not unfrequently quite obsolete, so that the leaves become simple and acuminate; but the globose cells—æquilatero-hexagonal by mutual pressure—forbid its being placed in *Alobiella*. It affords, however, a direct transition to the curious subgenus *Zoopsis* Hook. f. et Tayl., through *C. Z. monodactyla* n. sp.

ZOOPSIS was at first curiously misunderstood, Taylor having described the stem as a *frond*, with *crenate or sinuato-repand margins*, the supposed crenations being true, though minute and scale-like leaves. It has also escaped the notice of all recent writers on the subject that the leaves of the two original species, *Z. argentea* H. f. et Tayl. and *Z. setulosa* Leitgeb, although so minute, are really *bilobed*!! In *Z. argentea* the leaf consists (normally) of two large cells only—not placed one upon the other, but laterally contiguous on a line parallel to the axis of the stem; and the two cells are connate only in their lower half, so that the upper half of each projects as a hemispherical or paraboloidal lobe. In *Z. setulosa*, however, each basal cell is tipped by another cell—slender, hooked and claw-like—and the bilobed structure is manifest. These two species have been found in New Zealand, Tasmania, and as far north as Java. In the Amazonian *Z. monodactyla* the leaves are only one-lobed, and they are almost exact counterparts of a half leaf of *Z. setulosa*, for they consist of a single large truncato-conical basal cell, tipped by a much smaller and slenderer unguiform cell; but the missing lobe is restored in the bipartite ♀ bracts, and the ♂ bracts also are usually bidentate.—In all the species, the postical ramification, the involucre 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-quadrangle 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 bicuspidata*, where the rudimentary leaves consist of only 1, 2, or 3 superposed cells, as in the fullgrown leaves of *C. Z. monodactyla*.)

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

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

IN PROTO-CEPHALOZIA the extreme of simplicity of structure is reached. No stem, properly so called, exists; there are consequently no stem-leaves. From the base of the persistent and much-branched prothallium springs a ♀ flower, and certain branches of the prothallium end each in a ♂ spike. The bracts of the inflorescence of both sexes are exactly conformable to those of normal *Cephalozia*: the ♀ bracts bipartite, tristichous and 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 Phascoid moss (*Ephemerum æquinoctiale* 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 perichætia standing out of it here and there—very like the *Ephemerum serratum* on our garden-pots in England. The prothallium of all *Cephalozia* is narrow and threadlike—very different from the suborbicular prothallium and propagula of *Radula*, *Lejeunea*, and many other Hepaticæ: and it approaches the nearest of any among Hepaticæ to the *protonema* of true

mosses, so that the latter name would not be inapt for it. My original note on *Proto-Cephalozia* is as follows—"Protonema tufted, consisting of 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 CEPHALOZIELLA, 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. *Underleaves* 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 complicated toothed leaves, and its constantly 5-angled perianth approximate it—as in *Cephalozia*; were it not for its unmistakable affinity to such true *Cephaloziellæ* as *C. dentata* (Raddi), *C. myriantha* Lindberg, &c. [See remarks following my description of *C. Turneri*.]

It may be asked why I have given such extension to *Cephalozia* as to include in it certain groups hitherto regarded distinct genera. My idea of a genus is that it should be (wherever possible) a *large* assemblage of closely-related species. In some cases, either because several species remain still undiscovered, or because many intermediate forms have fallen out of existence—presumably from their unfitness to survive—a genus may be well marked off from its fellows, although it consist of but a few, or even of a solitary, species. For instance, every one will recognise what a wide gap exists between such genera as *Radula*, *Scalia* (= *Haplomitrium*) and *Aneura* and all their coördinates; and how difficult it is to assign the nearest ally—or indeed any very near allies—to any one of these genera. But in some tribes, of which the *Trigonanthæ* are an example, the wealth of existing and known species may be so great, and so many forms may be nearly conterminous, that the great mass of the species must necessarily be combined into genera resting each on a broad base: e. gr. *Cephalozia*, *Lepidozia*, *Bazzania*, (*s. Mastygobryum*), &c., &c. Even so, certain small groups may still (for lack of material) remain incombiable with the larger genera, although the acquisition of new species may enable us hereafter to effect a broader synthesis.

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

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

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

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 *Jung. 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-equant bracts, and in the entire absence of underleaves, even from the ♀ flowers, whereas in *J. laxifolia* they are everywhere present. These two species are therefore not very certainly congeners, although both (as it seems to me) are distinct from *Cephalozia*; and it is with some diffidence I venture to unite them under the generic name HYGROBIELLA.

ANTHELIA Dum., certainly analogous (if not nearly related) to *J. laxifolia* in the complicato-carinate tristichous leaves, differs essentially in the radicellose stems; in the dense polyphyllous involucre; 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

*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 bicrural 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 papillæ. The cladogenous tristichous-leaved involucre is 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 "*Jung. trichophylla*." They are in reality more closely related to *Micro-Lepidozia chætophylla* 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 perichætia are postical: normal features in all *Lepidoziæ*. The stem-leaves are tripartite, with the capillary crura connate at the base, and there are (as in every other *Lepidozia*) similar, but smaller underleaves.—*Jung. nematodes* Gottsche in Wright's 'Hep. Cubenses' stands so near to this as to be barely distinguishable as a species. [There is a prior *Lepidozia nemoides* Tayl., from St. Helena, distinct from the Cuban plant, but belonging to the same subgenus. *Jung. confervoides* G., another of

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

Some other genera, closely allied to *Cephalozia*, I have already discussed elsewhere. [Cf. Journ. Bot. 1876, 'On *Anomoclada*,' by R. S.] One of these genera, *Adelanthus* Mitt., is well distinguished by its habit of *Plagiochila*; by its decurvo-secund and (usually) sharply toothed leaves; and by its half-inferior calyptra, strewn with sterile pistillidia; although the cladogenous 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.

Anomoclada mucosa Spruce in Journal Bot. 1876. *Plantæ masculæ cum fæmineis mixtæ, tenuiores, paucirameæ. Amenta antica*—interdum duo vel plura eodem ramo insidentia—folio proximo breviora, tenuia albida incurva. Bracteæ 8-jugæ vel pauciores, foliis 4-plo breviores, tenerrimæ, suborbiculatæ, concavæ, lateribus incurvis, apice bilobæ, interdum quadrilobæ. *Antheridia solitaria magna* brevistipitata. *Bracteolæ* ovatæ, apice bidentatæ, supremæ subrotundæ bracteis vix minores.

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 Jungermanniaceæ (1835).

Jungermania § *Cephalozia* Dum. Syll. (1831).

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

Trigonanthus Spruce, Trans. Bot. Soc. Edinb. (1849).

Pteropsiella Spruce, Journ. Bot. (1876).

Zoopsis Hook. f. et Tayl. Crypt. Antarct. (1845).

Nowellia Mitt. in Salvin. Nat. Hist. Açores (1870).

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

Pleuroschisma § *Odontoschisma* Dum. Syll. (1831).

Odontoschisma Dum. Rec. (1835).

Sphagnoecetis Nees in G. L. et N. Syn. Hep. (1845).

Character essentialis.

*Plantæ e prothallio filiformi linearive interdum ramoso orti, pro more pusillæ, interdum minutæ, raro majusculæ et robustæ, foliosæ—in unica specie frondosæ—radicellosæ, subramosæ, ramis omnibus e facie caulis inferiore sive postica ortis. Folia succuba, in paucis subtransversa, in paucissimis subincuba, sat lata, plus minus concava, in plerisque biloba (nunquam ab ipsa basi fissa) persæpeque subcomplicata; margine nullibi reflexo, integerrimo, raro denticulato. Folia postica lateralibus minora, in plerisque speciebus ex. p. vel omnino nulla (ad florescentias autem semper præsentia). Flores monoici vel dioici, rarissime paroici. Andræcia vel spicata vel amentum posticum sistentia; bractæ constanter monandræ. Bractæ floris fæminei in capitulum congestæ tristichæ sæpissimeque trijuga, bi (dein 3—4-) lobæ, inter se (saltem intimæ) sæpe connatæ, a perianthio tamen liberæ. Perianthium elongatum trigonoprismaticum (in subgenere *Cephaloziella* 3—6-gonum), ore truncato constricto varie dentato. Calyptra parvula, superior, basi pistillidiis sterilibus circumdata,*

Capsula plus minus oblonga, ab ipsa basi quadrivalvis, facie tota interna elaterifera, *pariete bistrato*, *cellulis interioribus fibris semiannularibus fulcitis*. *Elateres* bispiri decidui. *Sporæ* minutæ.

Descriptio.

Plantæ depresso-cæspitosæ, vel supra muscos reptantes, pusillæ vel mediocres—rarius minutæ vel majusculæ—plerumque pallide virides et pellucidæ, interdum roseo plus minus pictæ, rarius subopacæ et fulvæ, olivaceo-virides vel luridæ.

Prothallium angustum, nematoideum fere, simplex vel persæpe subramosum.

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

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); paucarum specierum integra et rotundata, retusa, subacutave, vel alia integra alia bidentata, subcomplicata vel saltem concava, raro planiuscula, margine in nulla specie recurvo, in omnibus fere subintegerrimo, in paucissimis spinuloso-denticulato. *Rete* in typicis laxum pellucidum, raro subopacum; cellulæ diametro $\frac{1}{15}$ — $\frac{1}{40}$ mm mediæ sc. æquilateri 4—6-gonæ, in paucis omnes oblongo-quadratae; in aberrantibus (e.g. in *Cephaloziellis*) parvæ minutæve—(diametro $\frac{1}{50}$ — $\frac{1}{70}$ mm) magis quadratae sæpiusque opacæ; 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 persæpe integra; ad involucrium \varnothing 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 fœmineus in omnibus fere constanter simplicissimus, in paucis sub flore sterili innovationem solitariam—nunquam duas oppositas—proferens.

Bracteæ \varnothing in capitulum congestæ, foliis sat majores, tristichæ, constanter fere trijugæ, semper (imò in sp. frondosis et in subaphyllis) foliaceæ, sat latæ, bi- (dein 3—5-) lobæ, magis frequenter quam folia dentatæ incisæve; bracteolæ sæpissime bracteis omnibus adjectæ, iisdemque parum minores, intima saltem semper præsens persæpeque cum una alterave bractea basi—in aliis speciebus præalte—connata; rete laxum oblongum unistratum, in perpaucis inferne 2—3-stratum. *Pistillidia* ad 20 breviuscula lageniformia.

Perianthium ab involucrio liberum, plus minus alte emersum, semper elongatum, in plurimis 5-plo longius quam latum—interdum ad 7-plo usque, in paucis 2—3-plo solum longius; in omnibus fere trigonum, carina tertia postica, in Cephaloziellis autem carinis 3—6 ludens, omnibus carinis exalatis fructu maturato minus prominulis, ore plus minus constrictum—raro ab initio hians—et vel 3—6—lobato-ciliatum vel solum denticulatum—ciliatumve, in paucis subintegerrimum, plerumque pellucidum leptoderme, raro inferne carnosum. *Calyptra* parva, perianthio sæpe 4 plo brevior, tenuis—rarissime carnosula—pyriformi-globosa, basi pistillidiis sterilibus circumdata. *Capsula* in pedicello pellucido fragili alte exserta, cylindrico-oblonga, subduplo longior quam lata, rarius brevior et oblongo-globosa, ad basin usque 4-valvis, cellulis bistratis subæquimagnis, interioribus fibris semiannularibus fulcitis, conflata. *Elatères* bispiri decidui, circiter 2^{mm} longi subobtusiusculi. *Sporæ* globosæ, eodem diametro ac elaterum, læves scaberulæve.

Andræcia in plerisque amentum posticum pallidum sistens, raro in ipsius caulis, ramive majoris, apice mediove spicata; *bracteæ* foliis pro more subminores, plurijugæ, assurgenti-secundæ, confertiusculæ, constanter (etiam in sp. frondosis) foliaceæ et bilobæ, basi

antica lobulo incurvo interdum adjecto. *Antheridia* solitaria magna, stipite subæquilongo suffulta.

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

Distributio. In zona temperata, boreali præcipue, magis frequenter adveniunt *Eucephalozie*; quarum *C. bicuspidata* L. in Europa et America-boreali revera vulgatissima; sub Æquatore paucae species, istæqueæ propriæ, inveniuntur. *Proto-Cephalozias*, *Pteropsiellas* et *Alobiellas* solum ex America tropica possidemus. *Zoopsis* habet tres species, alteram Amazonicam, alteras duas in insulis Malayanis et Oceanis. *Lembidii* species extra insulas maris Pacifici et Australis nondum inventæ fuerunt. *Odontoschismatis* paucae species bene cognitæ cosmopolitanæ fere videntur, nullis terris (nisi australioribus) exules. *Cephaloziellæ* omnes fere Europææ et Boreali-Americanæ sunt; unicam speciem in sylvis fluminis Amazonum inveni.

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

A. Perianthium normale constanter 3-gonum-carinatumve.

a. *Acaules*, flore ♀ e prothallii centro orto, amentis ♂ prothallii ramos terminantibus1. 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 chlorophyllo plus minus opacis.

Folia succuba, aliquando fere longitudinalia, rotundata retusave—rarissime apice bidentella; bracteæ ♀ pro more foliis sat diversæ, longiores, tenuiores—interdum subscariosæ—ab ipsa basi cellulis solum unistratis conflatae apice bilobæ; perianthium 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 perianthii carnosi) cellulis bi-tristratis conflatae.....6. LEMBIDIUM

Folia tenuia subplana, laxè et pellucide texta, cellulis duplo longioribus quam latis, oblonga lanceolatave, 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. *Perianthium* 3—6 gonum, angulis in una et eadem specie numero persæpe variabilibus—raro ad tria sola redactis.—*Plantæ* minutulæ, constanter eflagelliferæ; foliis bilobis, idem ac in *Eucephalozia*, cellulis autem plerumque minutis8. CEPHALOZIELLA

Subgenus I.—*PROTO-CEPHALOZIA* Spruce.

Caulis nullus, nisi axiculus floris fœminei brevissimus, ex ipso prothallio ortus. *Bracteæ* ♀ tristichæ profunde bilobæ. *Perianthia* trigona, ore in lacinias 6 longas fissa. *Andræcia* in prothallii ramis (nematoideis) terminalia spicata. *Habitatio et Distributio*. Unica species hodie cognita in America tropica inventa est.

1. *CEPHALOZIA EPHEMEROIDES* Spruce.

Minuta albicans acaulis, facie *Ephemeris æquinoctialis* Spruce. *Protonema* cæspitosum, filamentis confervoideis suberectis fastigiatis subdichotome ramosis constans. *Cellulæ* filamentorum uniseriatæ—rarissime basin versus biseriatæ—vix duplo longiores quam latæ pellucidæ chlorophyllosæ. E filamentorum fasciculi basi oritur flos ♀; alia filamenta apice in amenta ♂ abeunt; florescentia igitur *monoica*. *Bracteæ* floris ♀ trijugæ tristichæ confertæ suberectæ, intimæ majusculæ bifidæ-partitæve integerrimæ, lamina basali ovata, laciniis subulatis apice fere capillaribus; *bracteola* bracteis æquilonga, magis profunde fissa; *cellulæ* magnæ tenues pellucidæ lineari-hexagonæ-parallelogrammæve. *Bracteæ* exteriores sensim minores, conformes. *Perianthia* involucrum solum dimidio superantia, pellucida, trigono-subulata incurva, ab ore profunde (ad $\frac{1}{3}$ — $\frac{1}{2}$ longitudinis) sexfida, laciniis tenuibus flexuosis capillaceo-acuminatis. Capsula parvula oblonga. *Andræcia* bracteis fœmineis plus duplo breviora tenuia recurva; *bracteæ* sub 10-jugæ minutæ incurvo-secundæ ovatæ bifidæ monandræ.—*Filamenta* .8—1.6^{mm} longa, eorundem *cellulæ* $\frac{1}{16}$ — $\frac{1}{8}$ mm longa, $\frac{1}{16}$ mm latæ. *Bracteæ* ♀ 1.75, *cellulæ* $\frac{1}{12}$ — $\frac{1}{8}$ mm longa. *Perianthia* 2.5; *capsula* .3 × .18 mm.

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

Subgenus II.—*PTEROPSIELLA* Spruce.

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

folia tristicha profunde bifida sistentes. *Perianthium* prælongum lineari-subulatum trigono-prismaticum, ore 6-laciniatum, leptoderme. *Calyptra* 4-plo brevior tenuis. *Capsula* oblongo-cylindrica omnino *Cephalozia*. *Andræcia* amentiformia, postica, raro in ipso caule terminalia; bracteæ et antheridia normalia.—*Hab. et Distr.* Stirps insignis in subgenere solitaria, in sylvis fluminis Amazonum borealibus copiose vigens.

2. CEPHALOZIA FRONDIFORMIS.

Pteropsiella frondiformis Spruce in Journ. Bot. 1876.

Frondes dioicæ 1—2 pollicares prostratæ olivaceo-virides, late lineares vel hic illic dilatatæ, planæ tenues validæ costatæ, apice attenuato sæpe decurvæ et radicales, subtus per intervalla radiculosæ, et ramos paucos posticos frondi similes, vel alios flagellares radicellis pallidis villosos, alios in florem ♂ vel ♀, bracteis foliaceis stipatum, transformatos, proferentes. Caulis (costave) semicylindricus, supra planus 2 vel 3 cell. latus; *cellulæ* corticales 6-seriatæ magnæ brevi-cylindricæ subcompressæ pellucidæ, internæ 2—3-plo angustiores sub 20-seriatæ subopacæ. *Lamina* frondis pro more utroque costæ latere 4—6 cell. lata—interdum hic illic ad 12 cell. lata—lævis eroso-crenulata; *cellulæ* majusculæ elongato-4—6 gonæ, axi majore angulum 70° cum costa formante, pellucidæ fere vacuæ leptodermes, in ætate subincrassatæ, marginales longe minores. *Flores* ♀ ramulo perbrevis, facie costæ postica oriundo, sursum curvato, constantes. *Bracteæ* 3-stichæ, 3—4 jugæ, intimæ multo majores liberæ pallidæ pellucidæ elongato-areolatæ ovatæ, ultra medium bifidæ, laciniis tenui-acuminatis denticulatis spinulosive; bracteolæ bracteis conformes, dimidio minores vel fere æquimagnæ. *Perianthia* bractearum triplo superantia, incurva, lineari-subulata triquetropismatica, ore constricto 6-fida, laciniis capillaceo-acuminatis subspinulosis. *Calyptra* perianthio 4-plo brevior ovalis tenuis. *Capsula* oblongo-cylindrica cæteraque omnino *Cephalozia*. *Andræcii* julacei olivaceo-viridis *bracteæ* 10—20-jugæ confertæ assurgenti-secundæ rectangulari-cuneatæ breviter bifidæ, segmentis sæpe in cornua breviter porrectis, concavæ, monandræ. *Bracteolæ* interdum adjectæ sunt: parvæ quadratæ bidentatæ, dentibus cellula 1—2 constantibus.

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

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

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

Subgenus III. ZOOPSIS (Hook. fil.)

ZOOPSIS, Hook. f. Crypt. bot. Antarct. Voy. p. 55 (1846); G.L. et N. Syn. Hep. 473; Mitt. in Hook. Handb. N.Z. Flora (1867); Lindberg, Journ. Linn. Soc. (May 1872.)

Plantæ minutæ prostratæ cladocarpicæ, caule angusto, frondiformi et ad speciem (nec revera) aphylo, laxè corticato, subradicelloso, paucirameo, aliis ramis cauli conformibus, aliis floriferis, aliis flagellaribus et radicanibus. *Folia* valde rudimentaria—sæpius autem biloba—basi cellula 1 v. 2 (rarissime 3) constantia, apice vel mutica vel cellulâ minutâ, tenui et elongatâ, incurvâ apiculata (in foliis bilobis biapiculata). *Foliola* subnulla. *Bractææ* ♀ foliis longe majores, iis *Eucephalozicæ* conformes, tristichæ bipartitæ, laciniis subulatis. *Perianthia* pro plantula maxima, elongata, distincte trigona vel fere teretia, apice constricto profunde laciniata. *Andræcia* *Cephalozicæ* normalia. *Hab. et Distr.* Species 3 nobis cognitæ; duæ Insulas Australes a Nova Zelandia ad Javam usque, tertia sylvam Amazonicam secus fluminum Negro et Orinoco origines habitat.

3. CEPHALOZIA ARGENTEA (Tayl.)

Jungermania argentea Tayl. Lond. Journ. Bot. 1844.

Dioica albicans nitida prostrata intricata. *Caulis* $\frac{1}{4}$ pollicaris validiusculus, basi aphylla subrhizomatosus, dein semel bisve bifurcatus, interdum simplex, ramos autem, pro more paucos, posticos, caulⁱ similes, sæpe apice attenuato radicales, vel totos flagelliformes, alios brevissimos et floriferos, proferens. *Cellulæ* caulis corticales 8—12-seriatæ magnæ pellucidæ (serierum 2 vel 3 superiorum maximæ), in sicco concavæ (collapsæ, unde caulis scrobiculatus et margaritaceo-splendens evadit); c. internæ 8—12-seriatæ angustæ subchlorophyllosæ. *Folia* brevi spatio dissita, longitudinalia, ad cellulas duas maximas sphæroideas, in caulis plano collaterales (nec suprapositas) redacta, revera tamen *biloba*, quaque cellula (cum collateralis inferne connata) lobulum sistente. *Foliola* nulla, nisi pro foliolo papillula rhizophora hic illic subter caule obvia habenda est. *Bracteæ* \varnothing tristichæ trijugæ (floris fertilis sæpe perparvæ, sterilis majores) bipartitæ, cruribus subulatis inferne 2 cellulas latis—vel altero crure ad processulum redacto; *br. posticæ* (s. *bracteolæ*) subminores, integræ bifidæve, exteriores sæpe minutævel obsoletæ. *Perianthium* pyriforme, junius apice obtuse trigonum, maturum ubique teres, unistratum laxè areolatum tenerimum, ore ad $\frac{1}{3}$ alt. usque in lacinias 6 incurvas fissum. *Capsula* oblonga, cæteraquæ omnino *Eucephalozicæ*. *Andræcia* ramulo amentiformi constantia; *bracteæ* paucijugæ assurgenti-incurvæ suborbiculatæ bidentatæ, cellulis ad 20 conflatae, monandræ.

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

4. CEPHALOZIA SETULOSA (Leitg.)

Zoopsis setulosa Leitg. Mittheil. des Naturw. Ver. für Steiermark, 1876 (sub Jung.)=“*Zoopsis argentea*” Mitt. in Hook. Handb. N.Z. 540 et 752.

A priore distincta caracteribus sequentibus. *Caulis* est magis ramosus, ramique persæpe apice flagellari radicans, flagellis autem propriis vix ullis; *cellulæ* caulis sub 20-seriatæ; sc. corticales pellucidæ 6-seriatæ—anticæ biseriatae et serierum 2 lateralium maximæ, subglobosæ (pressione mutua polyhædræ), c. autem medio-posticæ biseriatae axin obvelantes cæteris triplo minores—*cellulæ* axeos sub. 14-seriatæ

peranguste prismaticæ chlorophyllosæ. *Folia* brevissimo spatio dissita, *distincte biloba*, basi cellulis 2 maximis paraboloidiis (cellulis caulinis anticis æquimagnis) plus minus alte connatis, quaque cellula apiculo incurvo filiformi (e cellula unica 6-plo longiore quam lata, vel rarius e duabus uniseriatis) aucta, constantia. Cætera nonhabui.—*Caulis*, cum foliis, $\cdot 35$ mm *latus*; *cellulæ folii basales* $\cdot 08 \times \cdot 06$, *c. apicales unguiformes* $\cdot 08$ — $\cdot 06$ mm *longæ*.

Hab. Nova Zelandia, etc. cum priore. In insulis Aucklandicis primum legit A. CUNNINGHAM.

5. CEPHALOZIA MONODACTYLA Spruce.

Monoica minutissima subramosa flagellifera cladocarpa. *Caules* 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 chlorophyllosis, conflati. *Folia* spatio cellularum caulis duarum dissita, cellulis 2 constantia, sc. altera inferiore magna truncato-conica, altera superiore 4-plo breviora tenui unguiformi. *Foliola* O. *Bractææ* σ 1—2-jugæ, tristichæ, perianthio triplo breviores, liberæ vel postice subconnatæ, profunde bipartitæ, laciniis subulatis elongato-cellulosis. *Perianthia* maxima, folliis 16-plo longiora, trigono-subulata, ore profunde 6-fida, laciniis ciliiformibus. *Calyptra* parva tenuis. *Capsula* oblonga. *Rami* σ cæteris ramis æquimagni; *br.* plurijugæ confertæ secundæ subulatæ cellulis 5 vel 6 constantes, integræ bifidæve, monandræ; *bracteolæ* O.—*Caulis* $\frac{1}{10}$ mm *latus*; *cell.* $\frac{1}{20}$ mm *longæ*; *folia* $\cdot 06$; *br.* $\cdot 3$ — $\cdot 4$; *per* $1.0 \times \cdot 2$ mm.

Hab. in sylvis fl. Negro superioris, juxta cataractas præcipue, in terra nuda sæpeque ad cumulos vermibus magnis suffossos.

Subgenus IV. ALOBIELLA Spruce.

Plantæ mediocres albicantes facie (nisi pro foliis succubis) magis *Kantiæ* (*Calypogeia*) 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; *cellulæ* majusculæ vel fere magnæ, subrectangulares, duplo longiores quam latæ. *Foliola* aliis speciebus præsentia,

parvula angusta, integra et bifida. *Flores* ♂ cladogeni; in unica specie acrogeni. *Bracteæ* tristichæ foliis majores profunde bifidæ, laciniis angustis, subintegerrimæ; in unica *C. acroscypha* apice solum breviter 2—4-fidæ. *Perianthia* elongata tota longitudine trigono-prismatica, ore breviuscule 3-vel 6-fida—rarissime 7—9-fida, segmentis plerumque ciliatis, in paucis solum setulosa, semper leptodermia. *Andræcia* in diversa—raro in eadem stirpe ac gynœcia, vel robusta et spicæformia, vel ad amenta parva postica redacta.—*Hab. et Distrib.* Terrestris et lignicola in sylvis æquatorialibus calidis. Paucae species adhuc cognitæ meipso in terris Amazonicis et Subandinis collectæ fuerunt, annis 1849—56; altera earum quaque in Antillis advenit, a cl. HUSNOT nuperius inventa.

§ I. *Foliola nulla.*

6. CEPHALOZIA INTEGRIFOLIA Spruce.

Dioica cladocarpa majuscula albicans nitens prostrata flagellifera. *Folia* fere longitudinalia subcontigua oblonga rotundata subtruncatave—rarissime apice bidentula, cellulis magnis oblongis. *Bracteæ* bipartitæ, laciniis subulato-attenuatis. *Perianthia* alte emersa lineari—subulata trigona, ore breviter trifida, segmentis apice 2—3-ciliatis.

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

7. CEPHALOZIA MACELLA Spruce.

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

Hab. Santarem flum. Amazonum et *San Carlos* fl. *Negro*, in truncis putrescentibus.

§ 2. *Foliola præsentia.*

8. CEPHALOZIA ACROSCYPHA Spruce.

Dioica pusilla tenerrima prostrata, facie postica flagellifera, apice caulis ipso perianthifera. *Folia* subimbricata subplana ovato-oblonga-lanceolatave obtusata—raro retusa vel apice 2—3-crenata, *cellulis* majusculis elongatis. *Foliola* parva, superne increscentia, subulata integra bifidave. *Bracteæ* subliberæ apice emarginato-2—4-fidæ. *Perianthia* obtuse trigona, ore edentulo breviter 3—6 fida.

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

9. CEPHALOZIA HUSNOTI (Gottsche).

Dioica cladocarpa, a basi procumbente flagelliferâ erecta, fastigiatim ramosa, ramis in sicco sæpe apice hamatis. *Folia* viridia contigua patula plana lanceolata subacuta—rarissime apice bidentula, *cellulis* majusculis elongatis. *Foliola* duplo breviora linearia ultra $\frac{1}{2}$ bifida, segmentis erectis. *Bracteæ* liberæ connatæve complicato-carinatæ ad $\frac{1}{2}$ bifidæ angulatæ vel subdenticulatæ. *Perianthia* triquetropismatica ore subsetulosa (juvenilia sola visa).

Jungermania Husnoti Gr. in Husnot. Hep. Antillarum Exsicc. (1874).
Jung. lancifolia Spruce Mst. (1855).

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

Subgenus V. *EUCEPHALOZIA*.

Plantæ mediocres, raro pusillæ vel robustæ, virescentes, rarius fulvæ luridæve, interdum roseo pictæ, lato cæspite crescentes, vel inter muscos palustres reptantes. *Caulis* plerumque mollis et fragilis, rarius rigidulus, cortice in plerisque e cellulis majusculis pellucidis conflato indutus, in planum simplex, rarissime furcatus, postice plus minus ramosus, in paucis speciebus flagellifer. *Folia* oblique inserta, rarius subtransversa, caule semper latiora, sæpe sat magna (inter 0.3 et 1.35 mm longa) plus minus oblonga,

concava vel laxe complicata, raro subplana, bifida rarissime 3—4-fida, sinu raro profundo, in aliis subacuto, aliis lunato; segmentis apice variis, raro autem vel rotundatis vel cuspidatis; margine integerrimo. *Foliola* (paucis sp. normaliter præsentia) parva integra bifidave. *Cellulæ foliorum* magnitudine sat constantes, diametro in diversis speciebus inter $\frac{1}{20}$ et $\frac{1}{40}$ mm variantes, raro fere magnæ ($\frac{1}{15}$ mm) rarissime parvæ ($\frac{1}{45}$ — $\frac{1}{48}$ mm) æquilateri-hexagonæ, vel sæpius quadrato-hexagonæ quadratæve, in plerisque sp. subpellucidæ, pariete in perpaucis ad angulos incrassato, cuticula sublævissima; *cellulæ bractearum* et perianthiorum plerumque submaiores rectangulari-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. *Bracteæ* trijugæ, raro pauciores, intimæ sat magnæ bi-rarius 3—4-fidæ, integerrimæ vel persæpe dentatæ, spinulosæ, incisæve, liberæ vel cum *bracteola* subconformi, æquilonga vel brevior, basi connatæ. *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, laciniatave; 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 *Cephalozia* typicæ nullis terris, nisi arcticis et alpinis frigidissimis, exules, in Europa et America-boreali præcipue abundant, loca umbrosa subhumida, paucae palustria, matrice varia, diligentes. In

sylva Amazonica et in Andibus sylvestribus rarius et sporadice occurrunt, idem ac in insulis tropicis tam occidentalibus quam orientalibus.

§ 1. *Pellucidæ*. *Planta tota pro more pallida vel amœne viridis (in C. catenulata sola sordide flavescens badiave) et plus minus pellucida. Cellulæ caulis corticales diaphanæ, internis multo majores.*

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. *Bractæ* bipartitæ, cruribus lanceolato-subulatis, altero interdum obsoleto. *Perianthia* magna ovato-subulata obtuse trigona, ore in lacinias 6 subulato-attenuatas 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.

Dioica cladocarpa eflagellifera. *Caulis* plano-convexus, cellulis corticalibus 6-seriatis, internis sub 5-seriatis, subramosus. *Folia* contigua longitudinalia plana ovato-quadrata breviter bifida, sine acuto lunatove, apicibus rectis acutis, *cellulis* mediocribus. *Foliola* foliis 3-plo breviora oblato-quadrata emarginato-truncata, sæpe subobsoleta. *Bractæ* cuneatæ ultra $\frac{1}{2}$ bifidæ, laciniis lato-subulatis subintegerrimis. *Perianthia* magna subulata hamata superne obtuse 3-carinata, ore 6-fida, laciniis capillaceo-acuminatis.

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 $\frac{1}{2}$ subacute bifida, segmentis subulatis acuminatis sæpius falcato-diver-

gentibus (cornua simulantibus); *cellulae* sat magnæ quadrato-hexagonæ. Foliola 4-plo minora rectangularia ad $\frac{1}{2}$ bifida, segmentis brevisetaceis.

Hab. supra *Chiloscyphum notophyllum* Tayl., ab HOOKERO fil. in ins. Aucklandicis lectum, reptans.

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

13. CEPHALOZIA CATENULATA (Hüben.)

Jungermania catenulata Hüben! Hepaticol. German. 169.

Dioica, plerumque cladocarpa eflagellifera, statura habituque *C. multifloræ*, rigidior tamen, colore fulvo plerumque insignis, *caule* prostrato subpinnatim ramoso radiculoso; *cellulae* in caulis diametro sub 6, corticales 14-seriatæ internis paulo majores atque pellucidiores. *Folia* parva subimbricata concavula—siccando magis incurva catenam simulantia—ovali-rotunda ad $\frac{1}{2}$ bifida, sinu plus minus obtuso, segmentis patulis vel subconniventibus acutis; *cellulae* parvulae subquadratae rhombeæve leptodermes chlorophyllosæ et subopacæ. Foliola (nisi in var. β) nulla. *Rami* σ breves, raro subelongati. *Bractea* intimæ foliis duplo longiores, oblongæ ad $\frac{1}{2}$ bifidæ, segmentis subulato-acuminatis, marginē hic illic denticulatae spinulosæve, raro subintegerrimæ; *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* tenuis. *Capsula* rufobadia ovali-cylindrica. *Andræcia* in ramo apicalia julacea; bractea paucijugæ foliis æquimagnæ, bracteolis adjectis.—*Folia* $\cdot 3 \times \cdot 2$, $\cdot 25 \times \cdot 17$: *c* $\frac{1}{45} - \frac{1}{40}$; *br*^{la} *intima* $\cdot 6 \times \cdot 35$; *per.* $1 \cdot 3 \times \cdot 35^{\text{mm}}$.

Jungermania catenulata Nees Hep. Eur. II, 248, et Syn. Hep.

Jung. reclusa Tayl.! Lond. Journ. Bot. 1846, p. 278.—Spruce Hep. Pyren. No. 41 (1847) et Trans. Bot. Sc. Edinb. (1849.)

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

Var. β . *stipulifera* S. foliolis minutis subulatis lanceolatisve hic illic, vel ubique, obviis; bracteis σ magis spinulosis; perianthiis magis argute carinatis.

Var. γ . *pallida* S. pallide viridis vix flavicans, valde ramosa ramis subfastigiatis; foliis subdecurrentibus ad $\frac{1}{3}$ — $\frac{1}{2}$ fissis, segmentis interdum obtusis, cellulis paulo majoribus; bracteis integerrimis; perianthiis

typicis (cellulis unistratis conflatis, 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: *Cromaglow*n, 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. Transoubât*, 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 *Jung. 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 Eifel, between Bonn and Treves; afterward in similar sites in the Vosges. It loves the society of *J. setacea* and *anomala* [in England oftener of *J. setacea* and *Trichomanis*, to which *J. divaricata* is sometimes added]. Stems subopaque, rather rigid and brittle. Leaves assurgent-concave, when dry more incurved, so as exactly to resemble the links of a chain, cloven to the middle, with acute segments, *less transparent than in other species of this series* and composed of *smaller thick-sided cells* [it is the opaque chlorophyll, aggregated in the circumference of the cells, that makes them appear thick-walled]. Colour *dull yellow-green, passing into olive-brown*. Invol. leaves cloven to $\frac{1}{2}$ 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 perichæatial 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 "*J. catenulata* Hüben," given five times, and comprising under that name *four distinct species* (!) viz.:

No. 301. *Jutland* (JENSEN)=*J. Francisci* Hook.

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

No. 544. *Lacus Hornsjon, Sueciæ* (ANGSTROM)=*J. bicuspidata* L.—simply the normal form of that species.

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

That this species is also what Taylor, many years after Hübener, described as new, under the name *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 Cromaglow. 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.:

"*J. reclusa* Tayl. MSS.—*Cromaglow*" (T. T. and R. S. 13 July, 1842)
—type-specimens of the true plant=*J. catenulata* Hübener.

"*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* Hübner.: 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 Gottsche from Kerry, and others sent to him by myself from Tunbridge Wells and the Pyrenees, were by that *savant* unhesitatingly referred to *J. bicuspidata* var. *ericetorum* Nees (vide 'Syn. Hep.'). Being myself well satisfied of its distinctness from *J. bicuspidata*, and knowing nothing at that time of *J. catenulata* beyond the brief description in 'Syn. Hep.', I could do no otherwise than give it in my 'Hepaticæ Pyrenaicæ' (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 dioicous 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 hb. Stabler.

Since drawing up the foregoing account, I have had the privilege of examining an original specimen of *Jung. catenulata*, from Hübener himself, in the herbarium of the late Professor Schimper. It is exactly what I have above considered a "forma pusilla rigida" of *C. catenulata*, gathered by Taylor on the Finnehy river in Ireland; and its main characters are as follows.—Plants lurid brown, dwarfed—apparently starved—although a few stems and perianths are of normal size. Leaves acutely patent, sub-assurgent subimbricated, 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; andræcia terminal; bracts few, as large as, or larger than, adjacent leaves, monandrous.

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

14. CEPHALOZIA VIRGINIANA Spruce.

Dioica et *monoica*, cladocarpa eflagellaris, prostrata radiculosa 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; *cellulæ* parvæ subquadrato-hexagonæ opaculæ, paucæ juxta caulem submajores magisque pellucidæ ocellum quasi sistentes, omnes leptodermes. *Foliola* nulla nisi ab florescentias. *Flores* plerumque dioici, interdum tamen autoici. *Andræcia* longispica, ramum totum pro more tenentia; *bractæ* ad 10-jugæ confertæ assurgentes, foliis concolores et subæquilongæ, latiores tamen, orbiculatæ concavissimæ breviter acute 2—3-lobæ monandræ. *Bractæ* ♀ tristichæ sub 3-jugæ, intimæ foliis duplo longiores, sæpe connatæ, rotundo-quadratæ ad $\frac{1}{2}$ bilobæ, lobis tenuiacuminatis, spina denteve una alterave utrinque armatæ. Perianthia magna lineari-clavata (i.e. supra medium paulo latiora) altiuscule obtuse 3-carinata, ore constricto inequaliter setulosa, leptodermia nisi prope basin ubi 2 cell. crassa. Capsula alte exserta magna ovali-cylindrica, plus duplo longior quam lata rufo-badia bistrata.—F $\cdot 25 \times \cdot 2$; c $\frac{1}{45}$; br $\cdot 5$ — 6 ; per. $2\cdot 6 \times \cdot 5$; caps $\cdot 6 \times \cdot 25$, $\cdot 75 \times \cdot 35$ mm.

Hab. 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 *monoicous*, although the sexes very mostly occupy separate plants (while *C. catenulata* is invariably *dioicous*); the large elongate male spikes are a great contrast to the small ones of *C. catenulata*; the leaves are paler, remarkably flattened, even in the dry state, and their straight lobes are very sharp-pointed; the perianth is proportionately larger, clavate—being widest above the middle, which it is not in *C. catenulata*—and the contracted mouth is more shortly and unequally setulose or ciliolate.

15. CEPHALOZIA MULTIFLORA Spruce, n. sp.

Dioica cladocarpa eflagellifera, humilis, amœne vel pallide viridis, dense depresso-cæspitosa—in Sphagnetis laxè reptans—prostrata subramosa, interdum subpinnata, ramis radiculosis apice assurgente a rhizis, flagellis 0. *Caulis* subcompressus—supra fere planus, subtus convexus, cellulis 6 vel 7 in diametro; c. corticales 12—14-seriatæ majusculæ pellucidæ, internæ multo angustiores subopacæ. *Folia* parva

subimbricata—in pl. sterili sæpe distantia—subassurgentia, rhombeo-rotunda, antice decurrentia, ab apice ad $\frac{1}{3}$ alt. bifida, sinu obtuso rarius lunato, segmentis conniventibus acutis vel subacuminatis; *cellulæ* mediocres leptodermes pellucidæ, chlorophyllo parco, quadrato-hexagonæ, subconformes, inferiores submaiores. *Flores* dioici: ♀ in ramo perbrevis terminales. *Bracteæ* subtrijugæ tristichæ, intimæ foliis 3—4-plo majores tenues, oblongo-rotundæ ad $\frac{1}{3}$ bifidæ—raro trifidæ vel bis bifidæ—segmentis acutatis integerrimis; *bracteola* subconformis sæpe 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 cellulis 3-stratis, medio 2-stratis, conflata. *Calyptra* duplo brevior ovali-globosa *carnosa*, tota fere longitudine cellulis 3-stratis constans. *Capsula* oblongo-cylindrica haud alte pedicellata. *Sporæ* pulchre *cinna-momeæ*. *Andræcia* rami apicem—rarius medium—tenentia: *bracteæ* plurijugæ subsecundæ foliis æquimagnæ, ad $\frac{1}{2}$ usque acute bifidæ, canaliculato-concavæ, antheridiis solitariis.—F 3×4 ; $c^{1/28-1/25}$: invol 1.1; per $2.1 \times .7$; caps $.45 \times 2$ mm.

Jungermania connivens vars. *laxa* et *Sphagnorum* Nees? Eur. Leberm.; G. L. et N. Syn. Hep.—*J. connivens* forma *symbolica*, Gottsche in G. et R. Hep. Eur. fasc. 62—64.

Jungermania bicuspidata β *gracillima* Nees. Hep. Eur. et Syn. Hep. (minime *J. multiflora* Huds. Fl. Angl. quæ *Lepidoziam setaceam* refert; neque Dillenii t. 69, f. 4, p. 481, “*Lichenastrum multiflorum*, fol. angustissimis,” quæ species composita videatur; nec *Ceph. multiflora* Lindberg, Manip. Musc. Sec. (1874) et Hep. in Hibern. lect., quæ vera *C. connivens* Dicks. est.)

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 *Jung. 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 "*J. 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 dioicous inflorescence; the small leaves, obtusely cloven to only $\frac{1}{3}$ of their length, and rather more closely reticulate; the bracts far less deeply cloven, and rarely into more than two segments; but above all by the *fleshy perianth and calyptra*, the perianth being 3 cells thick below and 2 cells thick about the middle, and the calyptra 3 cells thick almost up to the very apex; while both these organs in *C. bicuspidata* and *connivens* consist throughout of but a single layer of cells. Moreover, the perianth is merely denticulate at the mouth, while that of *C. connivens* has the almost unique character, among European *Cephalozia*, of terminating in long cilia; the perianth of *C. catenulata* being merely ciliolate, or setose at the apex. *C. multiflora*, when fertile, as in our Castle Howard woods, and especially as Mr. Slater has gathered it in the "gills" near Whitby, well deserves its name; and the wide-spreading 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 *J. connivens*"; and Lindberg, who examined the same, calls it *Cephalozia connivens* var. *laxa*. The figure, however, is plainly that of a common form of *C. bicuspidata* (as indeed Hooker said long ago), and the description seems to have been made from a tuft in which *C. connivens*, *C. bicuspidata*, and *Lepidozia setacea* grew intermixed and were not dis-

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

criminated. Hudson's *J. 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 Linnæus's character (which he also cites) "*J. fronde repente ramosa, foliolis 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.

16. CEPHALOZIA CRASSIFLORA Spruce.

Monoica, depresso-cæspitosa viridis, caule semipollicari repente valido, sectionis diametro 6—8 cellulas lato, compressulo (supra fere plano), cortice pellucido; ramis paucis, nisi ad apicem assurgentem tota longitudine crebre radiculosis, aliis stoloniformibus raro flagellaribus. *Folia* valida dissita—raro subimbricata—assurgentia oblique orbiculata concava antice subdecurrentia, apice ad $\frac{1}{4}$ — $\frac{1}{3}$ bifida, sinu acuto, obtuso lunatove, lobulis acutis, vel postico (submajore) obtuso, sæpe conniventibus; *cellulæ* majusculæ quadrato-hexagonæ pellucidæ sat crassæ leptodermes. *Foliola* nulla, nisi floralia, vel perraro apicem ramorum sterilius versus unum alterumve parvum subulatum. *Flores* ♀ in ramo pro more perbreve terminales; *bracteæ* 3-jugæ appressæ, intimæ foliis plus duplo majores, carnosulæ, *basi et paulo altius cellulis bistratis conflata*, breviuscule bis bifidæ; *bracteola* basi utrinque breviter connata, apice emarginato-bi-trifida; *bracteolæ* exteriores parvæ obsoletæve. *Perianthia* involucri triplo superantia anguste obovato-cylindracea, solum apicem versus valde obtuse trigona, ore constricto inæqualiter denticulata, *carnosa*, basi cellulis 3-stratis, medio 2-stratis, conflata. *Calyptra* brevis tenuis. *Capsula* oblongo-subcylindrica. *Andræcia* spicæformia, rami medium—raro totum—tenentia: *br.* foliis subminores, basi antica dente incurvo auctæ monandræ.—F. $55 \times \cdot 6$; *c* $\frac{1}{25}$ — $\frac{1}{20}$; *br* 1.1—1.3; *per* 3.5×9 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 rupes humidæ ipse legi, mense Sept. 1845.

C. multiflora Spruce huic proxima dioica et longe tenuior est, foliis duplo minoribus rhombeo-rotundis antice supra caulem in alam longe decurrentibus, segmentis

apicis angustioribus subulatis subacuminatisve; bracteis persæpe alte connatis, 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 (solum tamen 2 cellulas crasso), nostræ similis, dioica est, foliis magnis ultra dimidium bilobis, bracteis omnibus tenuibus.—Forsan eadem est *C. crassiflora* ac *Jung. pleniceps* Aust. in Proc. Acad. Philad. Dec. 1869 (in *White Mountains* a cl. OAKES lecta), cui tamen tributa sunt “folia incrassata, segmentis omnibus acutis,” quum in nostra folia involucralia sola basi revera incrassata sunt, caulina autem cellulis unistratis conflata, et lobulus foliorum posticus persæpe obtusus invenitur.

17. CEPHALOZIA BICUSPIDATA.

Jungermania bicuspidata Linn. Sp. Pl.

Monoica, clado-et acrocarpa flagellifera, prostrata vel assurgenti-cæspitosa, virescens, interdum roseo picta, rarius albicans luridave. *Caules* $\frac{1}{2}$ —1-pollicares vage ramosi, ramique radiculosi vel apice assurgente arhizi, alii flagellares radicanter. *Cellulæ* caulis subteretis sub 6 in diametro, corticales sub 10-seriatæ magnæ pellucidæ, interiores multo angustiores subopacæ. *Folia* inferiora parva distantia, superiora majora subimbricata, basi diagonali—vel, ubi confertiora, fere transversa—inserta, ovato-orbiculata, ab apice ad medium fere vel usque biloba, concava interdum complicata, lobis conniventibus patentibusve ovato-lanceolatis vel subtriangularibus, postico acuto, antico parum angustiore subacuminato interdum breviapiculato; *cellulæ* majusculæ quadrato-5—6-gonæ pellucidæ, sat crassæ, pariete autem tenui. *Foliola* pro more nulla nisi ad florescentiam fœminæam. *Rami* \varnothing brevissimi, rarius plus minus elongati. *Bractææ* sub 3-jugæ, intimæ foliis mediis triplo fere longiores, subliberæ, ad $\frac{1}{2}$ bilobæ, lobis lanceolatis acuminatis, integerrimæ vel basin versus 1—2-spinæ, rarius sublaciniatæ; *bracteola* conformis; *bracteolæ* exteriores minores lanceolatæ spinulosæ raro bifidæ, interdum obsoletæ. *Innovatio* sub flore sterili rarissimo casu—sub fl. fertili nunquam—provenit.) *Perianthia* foliis 4-plo longiora lineari-prismatica vel subfusiformia, ore constricto v. raro hiantè denticulata setulosave, primum ab ipsa basi tricarinata, in ætate inferne sub-teretia superne trigona, laxè areolata, virescentia albidave, interdum basi pulchre purpurea, apice canescentia, tota longitudine (nisi ipsissima basi) cellulis unistratis conflata. *Calyptra* parvula tenuis. *Capsula* foliis caulinis sublongior cylindræco-oblonga. *Sporæ* purpureæ. *Andræcia* spicæformia, in rami medio apiceve posita, vel ramum totum

sistentia—rarissime in ramo fertili florem ♀ proxime sequentia (i.e. florescentia paroica); *bracteæ* foliis parum diversæ confertiores assurgentes, sæpe dente antico basi auctæ monandræ; *bracteolæ* subnullæ.— $F\ 0.55 \times 0.55$, 0.5×0.4 ; $c\ 1^{1/25}-1^{1/20}$; $br\ 1.3$; $per\ 1.8-2.2 \times 0.5\ mm$.

Jung. bicuspidata L., Nees Hep. Eur.; G.L. et N. Syn. Hep. 138; Hook. Brit. Jung. t. 11 et Suppl. t. 4.

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

Inter formas speciei vulgatissimæ innumeras nobis cognitæ, magis memorabiles sunt sequentes: 1. *grandiflora*, luxurians, bracteis ♀ maximis squarrosulo-recurvis, sæpe insigniter laciniatis; *hab. Stockton Forest prope Eboracum*.—2. *setulosa*, pusilla, foliis parvis, lobis subapiculatis; perianthiis ore truncato setulosis (setis 2—3 cellulas longis); bractearum laciniis 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 *Cephalozis*, e.g. *C. pygmæa* et *C. obcordata* interdum videmus.

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

*I have evidence tending to the conclusion that when any *Jungermanniidea* 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 albescens* (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.

18. CEPHALOZIA LAMMERSIANA Hübner!

Jung. Lammersiana Hübner. Hep. Germ. 165.—*Jung. bicuspidata* γ *uliginosa* Nees, Eur. Leberm. II, 253, et (ex parte) $\gamma\gamma$ *obliquata* Nees, l.c. 254.—*Jung. bicuspidata* E. Bot. t. 2239.

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

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

This can hardly be considered more than the dioicous and perfect form of *C. bicuspidata*, some even of the smaller forms of which are sometimes in part unisexual. Whether species, subspecies, or variety, it is mostly easy to distinguish from *C. bicuspidata* by its much larger size, tufted growth, the absence of flagella, the dioicous 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 involucre, 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 doubtless that of typical *C. bicuspidata*.

18a. *Cephalozia tubulata* (Tayl. et Hook. f.! Lond. Journ. Bot. 1844, p. 463) ex insulis Falkland, cum *C. Lammersiana* congruit habitu, florescentia dioica, etc.; differt autem foliis angustioribus—ovalibus ($.75 \times .55$ mm), nec ovato-orbiculatis—lobis sublongioribus; foliolis ramorum apicem versus semper fere præsentibus: bracteis perianthiisque magis elongatis, his a basi ultra medium cellulis bistratis conflatis.—Caulis interdum in planum furcati, furcis subæquilongis, vel altera brevior—raro tam unâ quam alterâ brevi et ad florem ♀ redactâ.

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 involucreal 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.

Jung. extensa Tayl.! in Lond. Journ. Bot. 1846.

Dioica cladocarpa eflagellifera, prostrata vel cæspitoso-assurgens, radiculosa, e pallido rufescens, pauciramea. *Cellulæ* caulis 6 v. 7 in diametro, corticales 12—13-seriatæ. *Folia* subtransversa—parum succuba—distiche patula, complicato-concava, inferiora contigua, superiora confertiora et equitantia, oblonga, ultra $\frac{1}{2}$ biloba, lobis triangulari-lanceolatis acuminatis, acumine sæpius in apiculum 2—4 cellulas longum attenuato; *cellulæ* mediocres leptodermes. *Bracteæ* 3-vel 4-jugæ, appressæ, intimæ foliis paulo majores, basi breviter connatæ, orbiculatæ, vix ad $\frac{1}{2}$ bilobæ, lobis subacuminatis repandis; *bracteola* utrinque unidentata; *bracteola* secunda conformis nisi edentata, tertia paulo minor obcordato-cuneata, quarta parva ligulata. *Perianthia* bracteis triplo longiora lineari-fusiformia vel sub lanceolata, ab ipsa basi altiuscule trigona, ore lato minute setulose. *Br.* ♂ terminales spicatæ, foliis subconformes, magis concavæ, monandræ.—F $.65 \times .45$; c $1/25$; br $.8$; per $2.3 \times .55$ mm.

Hab. Observatory Inlet, N.W. coast of America: ♂ and ♀ plants (SCOULER). The male plant I have also from the same region, gathered by Douglas, under the name *J. assurgens* Tayl. MSS.

Taylor calls the leaf-segments merely acute, yet his own specimens show them distinctly apiculate, and this, along with the deeper sinus, the absence of flagella and the dioicous inflorescence, affords the most obvious differences from *C. bicuspidata*; while the cladogenous perichætia separate it from *C. Lammersiana*.

20. CEPHALOZIA LACINULATA (Jack.)

Jung. lacinulata Jack! in G. et R. Hep. Eur. 624 (a. 1877.)

Dioica, pro more cladocarpa eflagellifera pusilla pallida. *Caules* vix $\frac{1}{4}$ pollicares subramosi radicullosi prostrati. *Folia* parva plus minus dissita—superiora interdum subimbricata, insertione diagonali vel fere longitudinali, subplana cuneato-oblonga-obovatave adusque vel paulo ultra $\frac{1}{2}$ biloba, lobis late subulatis acutis erectis patentibusve, sinu obtuso raro subacuto; *cellulæ* fere majusculæ subquadratae leptodermes pellucidæ. *Foliola* ad papillulas 2 collaterales redacta vel plane nulla. *Ramuli* ♂ brevissimi, raro subelongati. *Bracteæ* 3-jugæ; intimæ liberæ foliis duplo longiores ad $\frac{1}{2}$ bi-(raro tri-) fidæ, segmentis subacuminatis integerrimis, rarius grosse 1—2-dentatis; *bracteola* ovata 3—4-fida, segmentis lateralibus minoribus. *Bracteolæ* 2 exteriores multo minores sæpius integræ. *Perianthia* bracteis 4-plo longiora lineari-fusiformia, supra medium paulo latiora, inferne teretia, apicem versus obtuse trigona, ore constricto 12-laciniata, laciniis bractearum segmentis æquilongis sed angustioribus, cellulis magnis oblongo-quadratis pellucidis unistratis conflata. *Calyptra* duplo minor tenuissima. *Capsula* ovalis (juvenilis solum visa). *Pl.* ♂ paucirameæ, tota longitudine, vel hic illic, antheridiiferæ; *bracteæ* foliis sæpe majores, latiores, magis acute bilobæ, monandræ; *bracteolæ* ubique adsunt: sat magnæ, lanceolatae acuminatae integræ vel inæqualiter bifidulæ.—*F* $\cdot 35 \times \cdot 2$; *c* $\frac{1}{24}$; *br* $\cdot 6$ — $\cdot 7$; *per* $2\cdot 0$ — $2\cdot 5 \times \cdot 8$ mm. *Cellulæ* cujusque 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 subearinatis, segmentis longioribus apice per-tenuibus; perianthio ore longiciliato nec laciniato.—*C. connivens* Dicks. multo major est, foliis cellulisque duplo fere majoribus, foliorum sinu plerumque lunato; floribus monoicis; bracteis femineis palmatifidis; perianthiis ore ciliatis.—*C. Macounii* Aust. (ex America boreali) et *C. micromera* Spruce (e terris Amazonicis) quoad magnitudinem *C. lacinulatae* valde similes, characteribus longius recedunt.

21. CEPHALOZIA CROSSII Spruce.

Monoica, formis *C. bicuspidatæ* minoribus primo visu sat similis, differt flagellorum defectu; foliis angustioribus ultra $\frac{1}{2}$ bifidis, segmentis lanceolatis tenuiacuminatis; præcipue autem perianthio ore ciliis ad 7—8 cellulas longis insigniter fimbriato.

Hab. in rivuli arena juxta *Popayan*, Andium Bogotensium (ROB. CROSS, a. 1877).

22. CEPHALOZIA FORFICATA Spruce.

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

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

23. CEPHALOZIA SANDVICENSIS (Mont.)

Jung. Sandvicensis Mont. Bot. Crypt. de la Bonite.

A *C. forficata* distat majore rigiditate; foliis ad $\frac{1}{2}$ fere obtuse bilobis, lobis tenuiacuminatis sæpissime porrectis—strictis, nec conniventibus; perianthio brevior ovato-fusiformi tota fere longitudine valde obtuse trigono, ore 12-ciliato.—Folia planissima. Capsula ovali-globosa.

Jung. crassifolia Lindenb. et G. Syn. Hep.; Gottsche Mexik. Leverm.

Hab. Ins. Sandvicensibus. *Mexico* (LIEBMANN). Ins. Antillanis fere omnibus. *Cuba* (WRIGHT!)

24. CEPHALOZIA CONNIVENS.

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

Monoica cladocarpa eflagellifera pallida pellucida fragilis, radicellis crebris longis albidis arcte repens. *Caules* subramosi subcompressi; cellulæ corticales sub 8-seriatæ internis sat majores fere vacuæ. *Folia* inferiora superioraque sensim minora, media majora subimbricata fere horizontalia, ad insertionem sublongitudinalem antice longe decurrentia, oblique suborbiculata, apice ad $\frac{1}{3}$ vel fere ad $\frac{1}{2}$ usque bifida, sinu obtuso lunatove, segmentis triangulari-acuminatis conniventibus; *cellulæ* sat magnæ quadrato-hexagonæ fere vacuæ. *Foliola* nulla. *Bractea* floris

♂ 3-jugæ, intimæ foliis vix duplo longiores ovales profunde 3—5-fidæ (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 pyriformi-fusiformia teretia, apicem versus obtuse trigona, cellulis elongatis unistratis conflata, ore subconstricto longiciliata demum triloba; cilia cujusque lobi sub 4, cellulis 5 linearibus sæpius uniseriatis constantia, ciliolis paucis spinulisque interjectis. *Calyptra* brevis tenuis. Capsula oblongo-globosa. *Andræcia* conspicua, ramum totum vel sæpe ejus apicem solum basinve tenentia; *br.* 8—10-jugæ foliis paulo minores concavæ ad $\frac{1}{2}$ bifidæ, sæpe dente lobulove antico auctæ, monandræ; *bracteolæ* pro more nullæ.—*F* $\cdot 5 \times \cdot 5$; *c* $1/15$; *br* $\varnothing \cdot 8$; *per* $2\cdot 5-4\cdot 0 \times \cdot 1\cdot 0$, *cilia* $\cdot 4-5$; *caps* $\cdot 5 \times \cdot 5$ mm.

Jung. connivens Dicks. IV, t. 11.—Hook. Br. Jung. t. 15.—Smith, E. B. t. 2436.—Syn. Hep. 141.

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. l. 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.

Jungermania curvifolia Dicks. Crypt. Fase. II, 15, t. 5.

Monoica et *dioica* clado-(raro acro-) carpa eflagellifera, dense depresso-cæspitosa, virescens, vel sæpius albida roseo picta, interdum tota pulchre purpurea. *Caules* tenues pellucidi subteretes, radicellis albidis validis repentes, rarissime furcati, ramos autem paucos assurgentes arcuatos e facie postica edentes. *Cellulæ caulis* 4 in sectionis diametro, corticales 8-seriatæ cubicæ vacuæ, internæ paulo angustiores sub 5-seriatæ parum chlorophyllosæ; omnes cellulæ pariete incrassato. *Folia*

laxiuscule imbricata assurgenti-subsecunda, succuba, basi perbrevis fere transversa inserta, valde oblique obovata concava, margine antico fere recto, postico basi late semicordata, auriculâ inflexâ (ad *Radulæ* et *Lejeuneæ* lobuli instar) margineque folio appressâ, ad carinam ventricosâ; ab apice ultra $\frac{1}{2}$ biloba; sinu pro more late lunulari; lobis incurvo-hamatis capillari-cuspidatis, cuspidate cellulas 8—10 oblongo-quadratas uniseriatis sistente; *cellulæ* parvulæ quadratæ guttulatæ, parieti ad angulos incrassato, auriculæ (nisi marginales) subminores.—*Folium axillare* (ad caulis furcam, ubi adest) acuminatum integrum, altero crure abortiente.—*Folia* ad caulis ramive elongati apicem interdum fere symmetrica, auricula inflexa obsoleta.—*Foliola* nulla. *Ramuli* ♂ pro more brevissimi, bracteas trijugas tristichas cum perianthio solum gerentes; nonnumquam paulo longiores, folia parva paucijuga infra bracteas monstrantes. *Bracteæ* intimæ erectæ oblongæ complicato-bilobæ, lobis subovatis apiculatis, subliberæ, toto margine nisi basin versus minutule inæqualiter spinuloso-denticulatæ; bracteola conformis. *Bracteæ* exteriores abrupte minores; omnes bracteæ exauriculatæ, bracteolatæ. *Perianthia* magna sæpius medio roseo-purpurea, apice albida, linearia, alte triquetra-prismatica, ore lato truncato hiantes—rarius constricto—setulosa, setulis 1—4 cellulas minutas quadratas longis; substantia tenui, cellulis unistratis conflata. *Calyptra* tenuis. *Capsula* oblongo-globosa, haud duplo longior quam lata. *Andræcia* terminalia polyphylla; *bracteæ* foliis subsimiles magis symmetricæ, cuspidibus strictioribus, auricula postica nulla, antice tamen sæpe basi dente antheridium solitarium obvelante auctæ:—*Folia* $\cdot 65 \times \cdot 4$ (*plica* haud explanata); *cellulæ* $\frac{1}{40}$ mm.

Jungermania curvifolia Hook. Brit. Jung. t. 15 et Suppl. t. 1 (ex parte).

—*Jung. Baueri* Mart. Fl. Crypt. Erlang.

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,—6,000 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 involueral leaves, of both male and female flowers, and even sometimes in the ordinary leaves towards the apex of drawn-out stems and branches.—*C. Lammersii* has often been mistaken for it, and some even of Hooker's figures have probably been taken from an intermixed plant of that species, although the two are widely different, as may be seen from comparing the descriptions here given. Both Gottsche and Carrington have noted the occasional bifurcation of the stem in *C. curvifolia*, with a difform (unierural) 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.

§ 2. *Subluridæ*. *Planta saturate sæpeque sordide viridis, vel luride rufa, insigniter flagellifera. Cellulæ caulis corticales internis vix majores, interdum imo opaciores.*—Sectio hæc pro subgenere proprio (CLADOPUS nobis) fere habenda, habitu ad *Odontochisma* proxime accedens. Paucae species adhuc cognitæ omnes dioicæ sunt.

26. CEPHALOZIA FRANCISCI.

Jung. Francisci Hook. Brit. Jung. t. 49. Syn. Hep. 133.

Dioica, cladocarpa, flagellifera, pusilla viridis dense cæspitosa, e caudice repente albido ramoso subaphyllo radiculoso caules subramosos edens. *Cellulæ caulis* teretis corticales sub 15 seriatae, cæteris internis perpaulo majores, omnes opacæ. *Folia* parva rigida dissita vel subimbricata ovali-orbiculata assurgenti-concava, apice breviter (ad $\frac{1}{6}$ — $\frac{1}{5}$ —raro ad $\frac{1}{4}$ usque) bidentata, sinu acuto, dentibus obtusis subacutisve conniventibus; *cellulæ* parvulæ subæquilateræ leptodermes opacæ.

Foliola duplo breviora ovato-lanceolata obtusa integra, rarius bidentula. *Bracteæ* 3-jugæ, intimæ foliis triplo fere majores ovato-oblongæ, basi erectæ, apice ad $\frac{1}{3}$ bifidæ, segmentis lanceolatis obtusis recurvo-tortellis; *bracteola* libera conformis basi hinc vel utrinque subbispinosa. *Périanthia* 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 ovali-cylindrica. *Andræcia* caulis ramive apicem mediumve tenentia; *br.* foliis paulo latiores brevioresque concavissimæ.—E toto habitu, flagellis, foliis concavis, cellulis parvis, &c., ad *Ceph. Odontochisma denudatam* distincte accedit. Adveniunt frequenter in planta, præcipue sterili, rami erecti superne sensim parvifolii, apice *propagula rosea* ferentes, ramis gemmiparis *C. denudatæ* perfecte similes. F $\cdot 4 \times 35$, $\cdot 35 \times \cdot 35$, $\cdot 25 \times \cdot 15$; *c* $\frac{1}{40}$: *f* $\cdot 15 \times \cdot 8$, $\cdot 2 \times \cdot 1$; *br* $\cdot 9 \times \cdot 55$; *per* $2 \cdot 0 \times \cdot 55$; *caps* $\cdot 65 \times \cdot 35$ 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 "*Jung. 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.)

Jungermania fluitans Nees in Syll. Ratisb. (1823) p. 129.

Dioica majuscula amæne viridis hic illic luride rufa, raro subrosea scariosave. *Caules* elongati 2—3-pollicares laxè reptantes subramosi flagelliferi ætate sæpe albidi; *cellulæ caulis* 8 in diametro, corticales 14—16-seriatæ chlorophyllo valde repleto *opacæ*, internæ vix subminores

magis pellucidæ, interdum fere vacuæ. *Flagella* crebra breviuscula albido-radicellosa, aphylla vel ex parte foliosa. *Folia* majuscula assurgenti-subsecunda distantia, raro subimbricata, oblique inserta, suboblique ovali-ovatove-oblonga, interdum basi subcuneata, parum concava, ab apice ad $\frac{1}{3}$, raro ad $\frac{1}{2}$ fere usque biloba—subinde (inferiora præcipue) triloba—sinu acuto angusto, lobis subinæqualibus, postico majore, lanceolatis, apice subcucullato obtusatis, raro subacutis, margine repandis; *cellulæ* majusculæ hexagonæ leptodermes vix convexulæ lævissimæ, chlorophyllo copioso subopacæ, inferiores paulo majores subelongatæ, marginales subquadratae. *Foliola* distantia, cauli appressa eodemque celata, foliis triplo fere breviora, 6-plo longiora quam lata, linearia, interdum lineari-lanceolata-subulatave bifidula, laciniis sæpe inæquilongis, altera 3 cellulas, altera 5—6c. longa, raro in unam coalitis, margine utrinque 1—2. dentata. *Flores* dioici: ♀ ramulo postico brevi, sub 3^{mm} longo, basi radicelloso constantes. *Bracteæ* laxæ 3-jugæ 3-stichæ, intimæ foliis vix minores erectæ ovato-oblongæ canaliculatæ, ad medium fere bilobæ, lobis acutis subacuminatisve; laterales hinc, media (i.e. *bracteola*) utrinque, basin versus 1—2-dentatæ, cellulis elongatis subpellucidis conflatae. *Bracteæ* extimæ triplo minores inæqualiter bidentatæ, vel falcatae et integræ; mediæ 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 pellucido basi ovali-bulboso alte exserta purpurea (sporis repletis nigra) oblonga vel oblongo-cylindrica 4-valvis; *valvulae* lineari-lanceolatae, alternæ latiores, cellulis bistratis lineari-rectangulis, internis ad parietem lateralem nodosis (fibra semiannulari obsoleta vel absorpta) conflatae. *Elateres* mediocres subobtusi bispiri, tubulo hyalino cito dissoluto. *Sporæ* elateribus paulo latiorēs subglobosæ minute tuberculosæ.—*Amenta* ♂ ramulis posticis, foemineis æquilongis, constantia, assurgentia, basi radicellis et foliis minutis vacuis vestita; *bracteæ* propriæ pauci-(3—4-) jugæ, confertæ subcapitatae, f. caulinis triplo minores, orbiculatae, concavæ breviter acutilobæ, lobulo tertio antico brevi incurvo auctæ; *antheridia* solitaria majuscula globosa pedicellata; *bracteolæ* lineares vel ovali-lanceolatae integræ bifidæve sæpius integerrimæ, pro bractearum ratione sat magnæ. Raro adveniunt andræcia in ipso caule; *bracteæ* paucae, foliis consecutivæ et vix minores,

antice lobulatæ, antheridium maximum foveantes.—F 1.35×1.05 , $1.0 \times .6$; $c_{1/25} = 1/20$; $f^{la} .5 \times .08$; $br. int 1.2 \times .5$; $br^{la} .9 \times .5$; $per 3.3 \times .8-.9$; $cal 1.6$; $caps .8 \times .3-.4$, $valvulæ .15-.35$ mm latæ.

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

Jung. inflata d *fluitans* Nees Eur. Leberm.; *J. inflata* γ^{**} *laxa ambigua* (amphigastriata!) G. L. et N. Syn. Hep. 106.

Jung. Francisci Eng. Bot. t. 2569.

Jung. Sehlmeiyeri Hübn. Hepat. Germ. ex p.

Cephalozia obtusiloba Lindb. Bot. Not. 1872.

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 Hüben. Hep. Germ.)

FRANCE: In Vogeso (HUEBENER in hb. Schimp.)

SCANDINAVIA: Eastern Finland, and in the Isle of Åland (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* (G. STABLER, 25 Sept. 1875 ♂ and ♀ 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, 13 Sept. 1875). *Delamere Forest*, Cheshire (W. WILSON, sub nom. *J. inflata* var. *laxa*). Ireland: floating in a bog near *Kylemore*, Co. *Galway*, along with *C. multiflora* and *Lammersii* (D. MOORE).

NORTH AMERICA: In *Ohio* and elsewhere (F. C. AUSTIN).

Var. *cæspitans*. *Planta* tota, vel ex parte, luride purpurascens, caulibus brevioribus confertioribus subassurgentibus. *Folia* raro ultra $\frac{1}{3}$ 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 subdentula, basi ipsissima 2 cellulas crassa.—*Hab. Delamere Forest and New Forest* (Vide supra).

This fine plant has been strangely overlooked and misunderstood. There can be no doubt that it was first discovered by Mr. Lyell, in the New Forest, in 1813; and that in November of the same year a very fair figure, made from his specimens, was published in 'English Botany' (t. 2569), but under the false name "*Jung. Francisci*." Whoever compares that figure with Hooker's excellent one of his *J. Francisci* must see at a glance that the two plants are perfectly distinct; for the E. Bot. plant is thrice the size, and the large flattish leaves are oblong—varying little in width from base to apex—while the lobes are very obtuse and the cells rather large; but the figure of the true *J. Francisci* shows minute, almost orbicular, and very concave leaves, with very short subacute segments, and opaque cells only half the size of those of the other. The stipules, clearly shown in Sowerby's figure, are linear and shortly bifid, while those of *J. Francisci vera* are ovato-lanceolate. The only important feature omitted from the E. Bot. figure is the flagella, which were possibly wanting from the very short 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 *J. bifida* by Turner, and re-named *J. Francisci* by Smith—one may safely assume without consulting Hooker, the authority for the original *J. Francisci*.

The Eng. Bot. figure represents a more compact and tufted form than what is usually found; but richly-fruited specimens, gathered by the late Mr. Wilson on Delamere Forest, and preserved in his herbarium under the name *J. inflata* var. *laxa*, exactly agree with it.

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

Ten years after Lyell's specimens were gathered, and figured (but misnamed) in Eng. Bot., the same plant was found by Funck in the Riesengebirge, and the specimens distributed in his excellent 'Exsiccata,' under the name *Jungermania fluitans*, given to them by Nees (l. c.). Yet in 1836, in the 2nd vol. of his *Europa's Lebermoose*, Nees reduced it to *J. 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 foliiferous or floriferous, all postical; the longer, narrower and more laxly-reticulate leaves; the constant presence of underleaves; the cladocarpous inflorescence; the tristichous female bracts, toothed at the base, and the innermost embracing the perianth; finally the lineari-fusiform, trigonous, thin perianth. But in *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 $\frac{1}{2}$ of its height.

I had never gathered, or even seen, *Cephalozia fluitans*, until my friend, Mr. Stabler, on Nov. 5, 1875, picked it out of Sphagna gathered on Fowlshaw Moss, near Levens, the previous September. By long searching he found on it flowers of both sexes, but neither fruit nor perianths; so that although he felt sure he had got hold of something new, and had a clear perception of its affinities, he was naturally dubious of its exact place. Writing to me, with specimens, two days later, he said "At one time I thought it might be a *Harpanthus*, but the absence of flagella in that genus is opposed to such a notion. Then the cut leaves seem to remove it from *Odontoschisma*. It has some features in common with *Adelanthus*, but still more with *Cephalozia*. . . . The male inflorescence varies considerably. Sometimes the amentum is short, at other times elongate; nay even the apex of the stem may be antheriferous. Each leaf (or bract) which encloses an anther has three lobes, the front lobe reduced to a small tooth." My readers may be interested also with Mr. Stabler's sketch of the site of this remarkable plant. "Fowlshaw Moss covers two or three thousand acres, or perhaps more. It lies on the north side of Morecambe Bay, due north from Milnthorpe, and at its nearest point about two miles away from Levens. It consists of

spongy peat bog, some feet deep, and its surface is very little above high water mark. The Moss and adjacent cultivated land are protected from the sea by banks. There are many grouse on it, and the large seagull builds its nest on some parts of it. *Hypnum Schreberi*, *Leucobryum glaucum*, *Fungermania 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 *Fungermania 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 *Fungermania fluitans* (which he afterwards merged in *Fungermania 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 Carr. et Spruce, n. sp.

Dioica, majuscula depresso-cæspitosa e viridi rufescens badiave, interdum aurantiaca, fragilis. *Caules* $\frac{1}{2}$ —1-pollicares intricati validi flexuosi, tota longitudine albido-radicellosi, simplices vel persæpe semel bisve dichotomi—apice novello semper fere bifurcati—interdum (nec semper) ramos posticos stoloniformes breves radiculatos ex parte foliosos (raro omnino aphyllous) proferentes. *Cellulæ caulis* 7 vel 8 in diametro, corticales 20—22-seriatæ subquadratae subopacæ, internæ subangustiores magis pellucidæ. *Folia* basi diagonali inserta, inferiora distantia patula oblonga v. cuneato-oblonga, ad $\frac{1}{2}$ subacute biloba, lobis obtusatis rotundatisve, sæpe decolora; superiora approximata et plus minus imbricata—florem ♀ et caulis furcas versus præcipue—intensius colorata, latiora, cuneata assurgenti-concava sæpe ad $\frac{1}{2}$ usque biloba, persæpeque 3-vel etiam 4-loba, angulata vel obsolete denticulata, lobis solum obtusis, interdum subacutis, sub-æqualibus, vel altero externo—nunc antico, nunc postico—minore; *cellulæ* sat parvæ 4—6 gonæ subleptodermes, ad angulos vix sub-

incrassatæ, 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 obsoleta, raro plane deficientia, colorata, linearia subulatave, integra, rarius bifida, segmentis erectis angustis. Nonnumquam inter foliola normalia advenit alterum monstrosum, foliis subæquilongum, falcato-ligulatum vel informe.—*Flores* dioici: ♂ in caule terminales; *pistillidia* 10—16. *Bracteæ* 2—3-jugæ, laxè imbricatæ, concavæ, latiores quam longæ, 3—4-lobæ, lobis subacutis, obtusis vel rotundatis; *bracteolæ* bracteis sat minores oblique ovato-lanceolatæ integræ vel profunde bilobæ. *Perianthia* alte emersa *viridia* pyriformia compressula valde obscure trigona, ore breviter 6-loba, lobis inciso-2—4-dentatis, dentibus omnibus sub 18, brevisubulatis inæquimagnis; *cellulæ* quadratæ opacæ pachydermes unistratæ, nisi ipsa basi et perpaulo altius ubi bistratæ.—*F. inferiora* $\cdot 6 \times \cdot 4$; *superiora* (biloba) $\cdot 8 \times \cdot 65$, (3—4-loba, et *bracteæ* ♂) $\cdot 6 \times \cdot 8$, $\cdot 75 \times \cdot 8$; *c. mediæ* $\frac{1}{48}$ — $\frac{1}{40}$; *per* $3\cdot 0 \times 1\cdot 4$ mm.

Hab. on wet rocks in mountains. *Ingleborough, Yorkshire* (CARRINGTON in G. and R. Hep. Eur. 172, sub nom. *Jung. inflata*). *Glyders, North Wales* (E. M. HOLMES, 1876). ?*Swiss Alps, Canton of Uri* (HEPP in G. and R. Hep. Eur. 137, sub nom. "*Sarcoscyphus sphacelatus*" = *Cephalozia turgida* CARR. MSS.).

I owe to Dr. Carrington the suggestion that the Swiss plant last cited is the same as *C. heterostipa*. It is noted by him in 'British Hepaticæ' p. 13, in these words: "No. 135 [a misprint for 137] in my copy of G. and Rab. is not *Nardia sphacelata* but some undescribed species, allied to *Cephalozia catenulata* Dum. (*C. turgida* MSS.)." I have examined the specimen here alluded to, and find it remote enough from *C. catenulata*, but probably a small dark coloured form of *C. heterostipa*. As it is the male plant, of which I have not yet seen British specimens, I append a brief description of it. When the fertile plant is found we may be able to decide the question of its identity with *C. heterostipa*.*

Minor, e rufo nigricans, cæspitoso-subramosa, caule ramisque tota fere longitudine antheridiiferis. *Folia* caulina propria perrara, subplana patentia—fere squarrosa—cuneata, ad $\frac{1}{2}$ longit. usque 2—3-loba, lobis obtusis raro subacutis, *cellulis* $\frac{1}{44}$ — $\frac{1}{40}$ mm longis. *Andræcia* spicata; *bracteæ* plurijugæ $\cdot 35$ mm longæ, concavæ breviter bifidæ, 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*.

minutæ subulatæ, raro longe lineares, rarissime bifidulæ, interdum cum bractea adjacente basi connatæ.

This curious species brings us into actual contact with *Fungermania*, 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 involucre, 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 *F. 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 "*Fungermania inflata*." *Gymnocolea* has actually a few points in common with the *Cephalozia*, and especially with the § *Sublurida*, whereof the most important are the solitary antheridia and the bilobed leaves, with usually very obtuse lobes. *Fung. 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 *F. 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).

Plantulæ Odontoschismati, et præcipue *O. denudato*, sub-similes, virides, pallidæ rufulæve, cæspitosæ. *Caules* validi succulenti, cellulis 8 in diametro, corticalibus 20—24-seriatis, internis subconformibus, conflati, a basi rhizomatosa plerumque flagellifera suberecti, parum ramosi, cladocarpî, 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; *cellulæ* medii folii mediocres leptodermes, inferiores

maiores parum elongatæ pellucidæ, folii marginem versus minores æquilateræ et subopacæ. *Foliola* ubique obvia, dimidium folium æquantia, vel minora, integra, vel bidentata. *Flores* monoici vel dioici. *Bracteæ* ♀ foliis paulo majores, magis elongatæ, apice lato foliis subconformes, infra medium incrassatæ. *Perianthia* maxima ovato-fusiformia trigona plus minus carnosæ. *Calyptra* tenuis. *Capsula*. . . *Andræcia* omnino *Cephalozia*.—*Hab. et Distr.* Species paucæ ad huc cognitæ insulis Malayanis et Oceanicis vigent.

29. CEPHALOZIA BOSCHIANA.

Jung. Boschiana Sande-Lacoste in Nederl. Kr. Arch. III, 521; ejusd. in Hep. Javan. 28, t. 6.

Monoica cladocarpa pusilla, e rufo albula, magnit. *Ceph. bicuspidatæ* minoris. *Caulis* cellulis 8 in diametro, 24 in circumferentia, omnibus oblongo-cylindricis, caulis faciem superiorem versus submajoribus (corticalibus propriis tamen nullis) conflatus, basi rhizomatosus et flagellifer, dein subramosus, ramis assurgentibus basi subaphyllis. *Folia* succuba subimbricata—ramea sæpe dissita—ovata, cymbiformia, apice subobtusum, acuto, raro bidentulo vel subdenticulato, interdum apiculo incurvo aucta; *cellulæ* sat crassæ, leptodermes tamen, pellucidæ, paucæ folii marginem versus parvulæ et æquilateri—6-gonæ, plures subcentrales et basales majores oblongo—4—6-gonæ. *Foliola* parva ovata rotundata. *Bracteæ* 2—3-jugæ erectæ, intimæ foliis dimidio majores late ovatæ, apice rotundato paucidenticulatæ, infra medium carnosæ et cellulis 2—3-stratis constantes. *Perianthia* ramis foliosis subæquilonga, ovato-fusiformia trigona turgidula, carinis obtuse prominulis, carnosæ, basin versus cellulis 4—6-stratis, paulo infra medium 3-stratis, solum prope apicem 1-stratis, conflata, ore constricto subdenticulata. *Calyptra* subbrevior, tenuis teneraque. *Andræcia* ramulo incurvo, basi aphylo, apice julaceo-imbricato, constantia; *bracteæ* haud numerosæ, foliis minores, assurgenti-secundæ, apice sæpius bidentulæ.

Hab. "Javam, ad terram cum *Jung. bicuspidata* L. et *Symphyogyna podophylla* M. et N.: hb. Junghuhn." (S. Lacoste loc. cit.). Specimina ex eodem loco benevolentia am. Lindberg debeo.

Cephalozia heteromorpha (Lehm. Hep. Cap. sub *Jung.* a. 1829; Syn. Hep. 131) foliis subrotundis concavis laxè textis, aliis subemarginatis, aliis integris, *C. Boschii* certe proxima, differt caule eflagellari et foliolis vel subulatis integris vel ovatis bidentatis.—[*Jung. rhizantha* Mont. in Crypt. Cub. *C. heteromorpha* vicina dicitur, foliis autem ad $\frac{1}{2}$ usque bilobis, lobis (idem ac bractearum) obtusis, exemplum *C. fluitantis* extenuatum simulare mihi videretur.]

Lembidium archetypum est *L. nutans* (Tayl.) Mitt.=*Jung. nutans* Tayl. Lond. Journ. Bot. 1844=*Mastigobryum nutans* Hook. f. et Tayl. Fl. Antarct. 160, t. 65; Lindenb. et G. Spec. Hepat. 20, t. 22, mihi nonnisi sterile visum. Species autem sine dubio *Ceph. Boschii* congener est, caule crasso diametro 8 cellulas lato, cell. corticis 24-seriatis, internis conformibus; * foliis latis concavis, etc.; differt *florescentia dioica*; caule basi magis ramoso et flagella validissima demittente; foliis confertissimis fragillimis transversis, subincubis, (antice sese paulo latius quam postice imbricantibus) apice bifidulis; foliolis majoribus, apice bidentellis vel paucidenticulatis. *Cellulæ* in folii medio basique magnæ oblongo-4—6-gonæ pellucidæ, superiores et submarginales triplo minores hexagonæ æquilaterales opacæ (chlorophyllo in cellulæ angulis concervato) facillime disruptæ.—Altera species est *Lembidium ventrosum* Mitt. Journ. Linn. Soc. 1876, ex insula *Kerguelen*, prioribus diversa foliis orbiculatis apice rotundatis retusulisve concavissimis, *cellulis* minoribus; foliolis triangularibus subemarginatis; ramulo fœm. Insigniter incrassato, &c.—Omnes hæc, *Ceph. rhizantha* excepta, sine dubio arcte affines sunt, hinc cum *Eucephaloziiis subluridis*, illinc cum *Odontochismatibus* osculantes; characteribus suis (primo visu genericis) omnibus in aliis *Cephalozia* subgeneribus vel constanter vel casu obviis; sc. bracteis perianthiisque carnosius in *C. crassiflora*, perianthiis solis in *C. Francisci*; ramis nutantibus et foliis pro more integris in *C. (Alobiella) lancifolia*; foliis transversis in pluribus, &c. &c.; ideoque genus proprium vix sistentes.

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

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

Jungermania Dicks. etc.

Plantæ sat robustæ, virides luridæve, interdum roseæ, raro albidæ, in plagas latas unistratas arcte intricatas diffusæ, vel supra muscos reptantes iisdemque persæpe in cæspitem densum implexæ. *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 *Notiser ur Sällsk. pro F. et Flora Fennica* (1874); et Spruce, in *Journal of Botany* (1876).

descendentes ope flagellorum radicales; ramis foliosis paucis, cauli conformibus. *Cellulæ* in caulis diametro sub 8, corticales 20—22-seriatæ internis subæquimagnæ et concolores, interdum *magis opacæ*. *Folia* basi diagonali vel fere longitudinali inserta, late ovata vel suborbiculata rotundata retusave, rarius obcordata vel emarginato-bidentata, pro more concava, integerrima; *cellulæ* mediocres—minutulæ æquilateræ, pariete in aliis speciebus tenui in aliis ad angulos incrassato, cuticula plerumque scaberula. *Foliola* minuta et vel ubique obvia, vel pro parte obsoleta, interdum nulla. *Flores* in plerisque dioici, in paucis monoici; ♀ cladogeni. *Bractææ* tristichæ plerumque bifidæ—rarius 3—4-fidæ. *Perianthia* magna leptodermia trigonofusiformia, sæpissime angusta, ore ciliata denticulatave interdum clausa et rima laterali dehiscentia. *Calyptra* leptodermis. *Capsula* cylindrico-oblonga cæteraque omnino *Cephalozia*. *Andræcia* amentis parvis albidis posticis constantia, rarissime robustiora et terminalia.—*Hab. et Distrib.* Species (paucæ bene cognitæ) arborum imos truncos, cariosos vel excisos præcipue, et sphagneta diligunt, totis terris tropicis et temperatis borealibus vigentes, Australasicis ut videtur exules.

30. CEPHALOLOZIA SPHAGNI.

Jungermania Sphagni. Dicks. Crypt. Brit. (1785).

Dioica, caule elongato subæquifoliato, ope flagellorum arcuato-radicante, ramis gemmiparis nullis. *Folia* subhorizontaliter patula vel assurgenti-secunda ovato-rotunda-oblongave, rotundata retusulave, subconcava, plus minus distincte marginata; *cellulæ* mediocres subopacæ, pariete ad angulos incrassato, cuticula verruculosa. *Foliola* nulla vel perrara, minuta ovata integra bifidave. *Bractææ* ♀ foliis submajores sæpissimeque pellucidiores recurvulæ cuneato-oblongæ ad $\frac{1}{2}$ fere bifidæ integerrimæ. *Perianthia* foliis 3—6-plo longiora subulato-fusiformia trigona albida roseave unistrata, ore vel in lacinias sub 6, ciliatis, fissa,

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

Jung. Sphagni Hook. Br. Jung. t. 33 (pro parte).

Sphagnoecetis communis Nees in G. L. et N. Syn. Hep.

Pleuroschisma § *Odontoschisma Sphagni* Dum. Syll. Jung. Eur.

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

31. CEPHALOZIA DENUDATA.

Jungermania scalaris β *denudata* Mart. Fl. Crypt. Erlang.

Priori proxima subminor plerumque cæspitosa. *Caules* basi subaphylla rhizomatosi, flagella radicellis villosissima demittentes, dein subramosi, ramique alii arcuati arhizi—raro apice decurvo radicales—alii erecti superne sensim minutifolii, apice gemmipari. *Folia* media cæteris majora, utroque caulis (ramive) fine sensim minora, patentia, (nunquam secunda), late ovata subpellucida concavula. *Foliola* ubique obvia, ad ramos gemmiparos incrementa foliisque supremis æquimagna, late ovalia integerrima vel subdenticulata. *Bractea* σ apice magis recurvæ, sæpe denticulatæ. *Perianthia* apice conniventi-clauso subciliata, demum irregulariter rupta.

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 radicanibus, nullo tamen subaphyllo. *Cellulae* in caulis diametro sub octo; c. corticales 22-seriatæ incrassatæ opacæ; interiores externis æquimagnæ vel imo latiores leptodermes subpellucidæ. *Folia* parvula oblique inserta vel fere longi-

tudinalia, subcontigua, patula planiuscula, obcordato-rotunda obovatave; *cellulæ* minutulæ ($\frac{1}{60}$ — $\frac{1}{50}$ mm) quadrato-hexagonæ leptodermes subopacæ verruculosæ. *Foliola* 0. *Andracia* postica amentiformia julacea, semper fere ramosa, axi primaria sola mascula; *bracteæ* propriæ foliis duplo fere minores orbiculatæ concavæ integræ monandræ; ramuli alii foeminei, alii neutri quorum *bracteæ* steriles elongato-oblongæ emarginatæ bifidulæve canaliculato-equitantes. *Flores* ♀ vel ramulo brevi cauligeno constantes, vel ad spicam ♂ axillares, nempe ramulum e *bracteæ* masculæ axilla ortum sistentes; *bracteæ* subbijugæ, foliis caulinis æquilongæ recurvo-patulæ ovaes breviter bifidæ—subinde 3—4-fidæ—lobis acutis, cum *bracteola* lanceolata integra subconnatæ.

Hab. in imis truncis fl *Casiquiari* inundatis.—Stirps singularis, facie foliisque fere *Odont. Sphagni* minoris, florescentia monoica—interdum quasi gynandra—defectu flagellorum cæt. 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 *Sphagnoecetis stolonifera* Lindenb. et G., which from Gottsche's detailed description in 'Mexic. Leverm.', can hardly be more than a variety of *O. denudatum*; or else they really belong to some other genus. Of this latter category is (apparently) *Sphagnoecetis 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 alias hepaticas, cæspite denso sublurido reptantes. *Caulis* pro plantula sæpissime validus, basi in plerisque subrhizomatosus, flagellis autem orbatus; *cellulæ* corticales 10—20-seriatæ ab internis haud diversæ. *Folia* inferiora dissita suboblique inserta (succuba); superiora magis conferta, fere vel exacte transversa, longitudine ($\cdot 1$ — $\cdot 15$ mm) caulis latitudinem raro excedentia, persæpe cuneata ad vel ultra $\frac{1}{2}$ bifida, carinata, segmentis vel subcomplicatis vel divergentibus, integerrima, vel in aliis sp. subdenticulata, raro spinulosa;

cellulae parvæ—minutæ (diam. $\frac{1}{50}$ — $\frac{1}{70}$ mm) subquadratae, 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. *Bractea* sat magnæ 3-jugæ (vel plures) bilobæ, 3-stichæ, persæpe cum bracteola conformi alte connatae, lobis in plerisque denticulatis spinulosisque. *Perianthia* plerumque elongata et angusta, leptodermia, acute prismatica, carinis raro ad 3 reductis, plerumque 3, 4, 5, etiamve 6 in eadem specie, ore denticulato ciliolato raro submutico. *Calyptra* tenuis. *Capsula* oblongo-globosa. *Andræcia* ipsius caulis, ramive majoris, partem sistens, medialis apicalis; bractea foliis haud minores, iisdem consecutivæ, 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 temperatam 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 occurrunt; omnes fere Europææ vel Boreali-Americanæ; unicam Amazonicam et Subandinam primum in *Lejeunea* parasitantem, postea in terra inveni.

Cephaloziella a cæteris *Cephalozia* subgeneribus distincta caule constanter eflagellifero; foliis vix longioribus quam caulis est latus, superioribus saltem insertione transversis; perianthiis tota longitudine pluri (3—6-) carinatis, carinis in perpaucis speciebus ad 3 solas reductis. Ad *Eucephaloziam* sine dubio magis accedit, præcipue ad species eflagelliferas e.g. *C. catenulatam*, &c.). Quoad flores ♀ in plerisque in caule ramove longiore terminales cum *C. Lammersiana* Hüb. convenit; illa tamen foliis magnis valde laxè cellulosus et caule laxè corticato longe diversa est.

33. CEPHALOZIA DIVARICATA.

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

Dioica pusilla, colore valde vario, virescente, olivaceo, interdum roseo picto, raro albicante v. fere nigro, dense cæspitosa v. supra muscos laxè reptans, prostrata v. suberecta; *caule* valido 6—8 cellulas in diametro, *cellulis corticis* 14—20-seriatis ab internis haud diversis, paucirameo, radice celloso eflagellifero. *Folia* parva, caulis diametro vix longiora, caulium sterilium dissita, fertilium sæpe subimbricata superioraque increnentia, subsuccuba v. fere transversa, cuneato-vel rotundo-quadrata, adusque (raro paulo ultra) dimidium bifida; lobis complicatis v. divergentibus, ovato-triangularibus acutis vel subacuminatis—raro ex parte (f. inferiorum præcipue) obtusis, integerrimis, rarius denticulo uno alterove armatis; *cellulis* minutis subquadratis leptodermibus pellucidis vel subopacis. *Foliola* aut nulla, nisi ad florescentiam, aut (in vars.) hic illic vel ubique præsentia, lanceolata ligulatave, inferiora minuta pro m. integra, superiora crescentia apiceque sæpe 2-(raro 3-) fida. *Flores* dioici: ♀ in ipso caule et in ramis longioribus (raro in abbreviatis) terminales. *Bractee* 3-jugæ 3-stichæ, foliis majores, intimæ saltem in excipulum plus minus altum connatæ, bilobæ, lobis acutis denticulatis v. subspinulosis; *bracteolæ* bracteis cujusque seriei adjectæ, iisdem vix minores. *Perianthia* alte emersa linearia vel anguste fusiformia, cellulis unistratis conflata, sæpe bicoloria, sc. basin versus purpurea, apice albida et scariosa, prismatica, angulis rarissime solum 3, sæpius (e carinis alterâ v. utrâque facie adjectis) 4, 5 vel 6, ore subconstricto denticulato v. subintegerrimo. *Calyptra* sat minor tenuis. *Capsula* oblongo-globosa demum altiuscule exserta. *Andræcia* in stirpis propriæ caule ramove varie posita; *bractee* plurijugæ, foliis consecutivæ et æquimagnæ, incurvo-concavæ, lobis acutioribus, *antheridiis* solitariis.

a. normalis (= *J. divaricata* Neesii et Syn. Hep. 135 = "*J. byssacea* Roth." Hook. Brit. Jung. t. 12 et auctorum plurimorum): foliolis orbata, foliorum lobis triangularibus.

β. Starkii (= *J. Starkii* Funck: Nees. Hep. Eur. II; Syn. Hep. 134 = *J. Grimsulana* Jack. in G. et R. Hep. Eur.) foliolis præsentibus; foliorum lobis magis ovatis vel ovato-lanceolatis subacuminatis, acutis, vel obtusis.

β. stellulifera* (= *J. stellulifera* Tayl. MSS.; Syn. Hep. 134): foliis recurvopatulis, involueralibus magis confertis stellato-squarrosis.

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

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

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

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

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

34. CEPHALOZIA BILOBA Lindberg MSS.

Dioica acrocarpa pusilla viridissima. *Caules* semipollicares simplices vel ramos posticos perpaucos edens, crassiusculus, fragilis, opacus, radice-
 cellosus. *Folia* parva distantia late patentia cuneata, obovata vel sub-
 quadrata, subcarinata, ad vel paulo ultra $\frac{1}{2}$ acute biloba, lobis ovato-
 lanceolatis, apice pro more acutis incurvulis; *cellulæ* minutæ quadratæ
 subopacæ. *Foliola* nulla, vel rara: parvula lanceolata. *Flores* ♀ in caule
 terminales, assurgentes. *Bractæ* tres, *unjugæ*, foliis submaiores,
 teneræ pellucidæ, in excipulum perianthii basin arcte amplexens, ore
 breviter 6—8-lobum erosulumque, alte connatæ. *Perianthium* alte
 emersum, clavatum vel anguste pyriforme 5-carinatum, ore truncato
 scarioso repandulo. *Calyptra* pyriformis. *Capsula* oblongo-globosa.
 —F $\cdot 2 \times \cdot 2$; c $\frac{1}{80}$ — $\frac{1}{70}$; per 1.0—1.2 mm.

Hab. Fennia prope Helsingfors, supra *Dicrana palustria* repens.
 (LINDBERG!)—Species ambigua, ramis posticis inter *Cephalozias* prope
C. divaricatam certe collocanda, *bracteis* autem solum *unjugis* inter con-
 generes singularis.

35. CEPHALOZIA INTEGERRIMA Lindberg,

Meddeland. Soc. pro F. et F. Fennica, I. ejusd. Hepat. in Hibernia
 lect. (1876).

Monoica (autoica) acrocarpa pusilla, virens, inferne pallida, tenerrima.
Caules perbreves parum et breviter ramosi, ramique radicellis creberrimis
 albidis repentes. *Folia* imbricata parva—ramorum sæpe minuta, flores
 ♀ versus majora et rotundiora—caulina media cuneata vel cuneato-
 quadrata, ad $\frac{1}{2}$ acute biloba, subcarinata, lobis patentibus obtusissimis;
cellulæ minutulæ leptodermes quadrato-vel rhombeo-hexagonæ, margin-
 ales quadratæ. *Foliola* nulla. *Flores* ♀ in caule ramisque terminales;
bractæ subtrijugæ tristichæ, foliis sat maiores, latitudine variæ, sæpe
 prælatæ, apice bilobæ vel truncato-trilobæ, lobis interdum retusis, inti-
 mæ in excipulum perianthio arcte appressum connatæ. *Perianthium* alte
 emersum, lineare vel subclavatum, semper fere incurvum, 3—4-plicatum,
 ore lato repando demum plurifido. *Capsula* oblonga. *Andræcia* ramum
 totum fere tenentia; *bractæ* bilobæ, lobo postico majore persæpe retuso,
 monandræ.

Hab. in lacûs 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; perianthiis brevibus obovato-oblongis.

36. CEPHALOZIA JACKII Limpr. MSS.

Paroica pusilla, magn. *C. divaricata*, acro-et cladocarpa pallide viridis, apicibus florentibus sæpe purpurascens. *Caules* breves fragiles, ramique (pauci) prostrati radiculosi, apice assurgentes, aliis ramis elongatis minutifoliis, nullo flagellari radicante. *Folia* inferiora—ramorum steriliū præcipue—distantia minuta cuneata, superiora, flores ♂ versus, imbricata cuneato-quadrata vel subrotunda, omnia subcarinata, fere vel usque ad $\frac{1}{2}$ acute biloba, lobis ovato-triangularibus acutis; *cellulæ* parvulæ subpellucidæ subelongatæ 4—6-gonæ, ad angulos vix incrassatæ. *Foliola* duplo breviora, inferiora linearia lanceolatave, superiora ovato-lanceolata raro apice fissa. *Involucra* ovato-juliformia; *bracteæ* 3—5-jugæ, foliis sat majores, oblongo-orbiculatæ concavæ minus profunde bilobæ, plus minus denticulatæ, antheridium singulum foventes, intimæ (mediante bractea postica, lateralibus paulo minore) in excipulum alte connatæ. *Perianthia* bracteis duplo longiora oblonga vel ovato-oblonga obtuse 4—5-gona-rarissime solum 3-gona) ore scarioso truncato repando demum varie fissa. *Capsula* oblonga.—*F. inferiora* $\cdot 1 \times \cdot 1$, $\cdot 15 \times \cdot 12$; *c* $\frac{1}{50}$; *br* $\cdot 3 \times \cdot 25$, $\cdot 4 \times 3$; *per* $\cdot 7 \times 25$ 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 (LIMPRICHT).

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

37. CEPHALOZIA EXILIFLORA.

Jung. exiliflora Tayl.! in Lond. Journ. Bot. a. 1846.

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

matoso, dein suberecto crassiusculo folioso et radiculoso. Cæteris characteribus, quoad foliola præcipue, *C. divaricatæ Starkii* sat similis, differt autem foliis 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 ♂ sæpe tota longitudine antheridiiferi; bractee equitantes denticulatæ vel subspinulosæ.

Hab. Swan River, Australia, on charred wood (T. DRUMMOND).

38. CEPHALOZIA MACOUNII.

Jung. Macounii Aust.! in Proc. Acad. Philad. 1869.

Dioica cladocarpa eflagellifera; caule tenui pellucido flexuoso radiculoso crebrius ramoso. Folia viridia, contigua vel subimbricata, late patentia cuneata parum complicato-carinata, ad vel paulo ultra $\frac{1}{2}$ bifida, sinu lato obtusato lunatove, lobis patulis subdivergentibus late subulatis (basi 2—4 cell. latis) pro more acutis; cellulis parvis subquadratis subpellucidis. Foliola 0. Bractee ♀ 2—3-jugæ tristichæ appressæ liberæ vel subconnatæ, vix ad $\frac{1}{2}$ usque 2—3-lobæ irregulariter spinulosæ. Perianthia parvula albida leptodermia, obovato-vel-ovato-fusiformia, obtuse trigona, ore subconstricto setuloso ciliolatove.—Andræcia caulis ramive apicem mediumve tenentia.—F $\cdot 15 \times \cdot 1$; per $\cdot 75 \times \cdot 25$ 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 habitum et minutiem *C. micromera* nostræ persimilis, e cellulis autem præminutis et perianthiis ore haud 6-laciniatis longe aliena, *Cephaloziella* vera videretur, *C. Macounii* affinis sed longe minor et stipulifera; mihi tamen solum e speciminibus mancis male cognita.]

39. CEPHALOZIA LEUCANTHA Spruce.

Dioica, semper fere cladocarpa, albescens, magn. *C. divaricatæ*. Caules prostrati, ♂ cum ♀ sæpe arcte implexi, tenues elongati flexuosi subramosi radiculosi, flagellis nullis. Folia parva valde distantia, patula vel assurgentia, oblonga vel quadrato-rotunda, adusque vel ultra $\frac{1}{2}$ bifida, sinu acuto obtusove, lobis sæpe inæqualibus lato-subulatis (basi 3—4 cell. latis) acutis subacuminatisve, parallelis vel conniventibus; cellulæ minutulæ subquadratæ, inferiores parum elongatæ. Foliola 0. Bractee

floris ♀ intimæ foliis 3—4-plo majores, plus minus connatæ, orbiculatæ subdenticulatæ 2—3-lobæ, lobis brevibus acuminulatis. *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 perianthium sæpe adæquans, 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 monandræ; *bracteolæ* minutæ lineari-subulatæ.—*F* $\cdot 2 \times \cdot 13$; *c* $\frac{1}{60}$; *br* ♀ $\cdot 75$; *per* $2\cdot 0 \times 0\cdot 5$; *br* ♂ $\cdot 25^{\text{mm}}$.

“*Jungermania catenulata*” G. et R. Hep. Eur. no. 433 (nec Hübén.)

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* (LIMPRICHT, Aug. 1871, ♂ ♀ et fr.) Scotland: *Potarch* near *Banchory*, in very fine fruit, on rotting wood, along with *C. C. catenulata* and *curvifolia* (T. SIM).

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

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

C. leucantha, pro foliorum insertione plus minus diagonali—vix unquam exacte transversa—et perianthio cladogeno constanter fere trigono, melius forsan inter *Eucephaloziis* militaverit, eandem rationem cum *C. multiflora* monstrans ac *C. lacinulata* Jack cum *C. connivente* Dicks.—*C. multiflora* autem certe valde distincta foliis majoribus rhombo-rotundis decurrentibus, ad $\frac{1}{3}$ solum fissis, sinu pro m. lunulari, cellulis majoribus; perianthio (quoad folia multo brevior) et calyptra carnosulis, &c. &c.

40. CEPHALOZIA PYGMÆA Spruce.

Monoica cladocarpa minuta fuscidula prostrata eflagellifera. *Folia* minuta distantia subtransversa subsquarrosa plana cuneata profunde acute bifida, cruribus subulatis basi 2c. latis; *cellulis* minutis subparallelogrammis. *Flores* ♀ e caule, vel sæpe e ramo ♂, orti. *Br.* connatæ, ad $\frac{1}{2}$ bilobæ, subdenticulatæ, lobis acuminatis. *Per* alte emersa lineari-trigona, ore setuloso.

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

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

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

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

Paroica acrocarpa, magn. *C. elachistæ* sive *C. divaricatæ* formarum minorum, virescens, cæspitoso-reptans; caule valde radiculoso parum ramoso, flagellis nullis. *Folia* imbricata assurgenti-subsecunda, inferiora cuneato-orbiculata ad $\frac{1}{2}$ acute-biloba, concavula parum carinata, repanda vel parce denticulata, lobis lanceolatis acutis subacuminatisve; *cellulæ* minutulæ pulchre guttulatæ. *Foliola* nulla. *Bracteæ* 4—5-jugæ, foliis sensim majores oblato-orbiculatæ, haud ad $\frac{1}{2}$ usque bifidæ, lobis latis, spinuloso-subdenticulatæ, basi turgidæ monandræ; intimæ in exipulum, mediante *bracteola* subtrilobulata, alte connatæ: bracteolæ exteriores multo minores liberæ lanceolatæ, ad bracteas infimas sæpe obsoletæ. *Perianthia* haud alte emersa anguste fusiformi-oblonga, late et obtuse 3-carinata, ore truncato subintegerrima.

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

42. CEPHALOZIA ELACHISTA (Jack).

Jung. elachista Jack in G. et Rab. Hep Eur. no 574 (a. 1873).

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

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

vel elongati, sæpe innovando-proliferi. *Bracteæ* foliis multo majores, subliberæ, profunde bilobæ, denticulatæ vel subspinulosæ, lobis tenui-acuminatis. *Perianthia* elongata, acute trigono-prismatica, ore denticulata. *Capsula* oblonga.

Hab. loca cava torfacea prope *Salem* in ditione Badensi, ubi cl. JACK detexit, a. 1870—2. Hibernia, in rupe irrorata juxta lacum *Lough Bray* (S. O. LINDBERG, 1873); *Brandon Mt. &c.* (D. MOORE). Finlandia (LINDBERG).

(Prionolobus)
43. CEPHALOZIA MASSALONGI Spruce.

"*C. elachista*, forma robusta propagulifera," MASSALONGO, Epat. Venet. no. 152 (nec Jackii in G. et R. Hep. Eur.

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

Hab. Italia: *Riva, Valsesia* (MASSALONGO, l.c.)

(Prionolobus)
44. CEPHALOZIA DENTATA (Raddi).

Jung. dentata Raddi in Mem. della Soc. Ital. di Modena, XIX. Syn. Hep. 143.

Dioica? a prioribus duabus differe videtur caule brevi; foliis superioribus confertis—juxta fl. ♀ comatis—late patulis, vix paulo ultra $\frac{1}{2}$ bilobis, toto ambitu grosse spinuloso-dentatis, lobis multo latioribus; foliolis sursum incrementibus integris dentatis; bracteis insigniter spinoso-dentatis.

Hab. in sylvis humidis Italiae (RADDI). Gallia austro-occidentalis, in arenosis juxta *St. Sever* (R. S.) 1846).

(Prionolobus)
45. CEPHALOZIA TURNERI.

Jungermania Turneri Hook. Brit. Jung. t. 29. Syn. Hep. 143.

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. *Cellulæ caulis* pluristratæ tenuissimæ, interiores opacæ, corticales cæteris paulo latiores subpellucidæ. *Folia* pectinato-disticha conferta et equitantia, adusque vel ultra $\frac{1}{2}$ complicato-biloba, toto margine argute inæqualiter, sæpeque subduplo, dentato-serrata, lobis ovatis vel ovato-

lanceolatis acutis apiculatisve, lobo antico erecto caulique subparallelo, postico (parum latiore) angulo sub 60° patente; *cellulæ* minutæ quadrato-hexagonæ planæ pulchre guttulatæ, pariete ad angulos valde incrassato, endochromio parco. *Foliola* nulla. *Flores* ♀ in ramo sæpius elongato terminales, innovatione nulla suffulti. *Bracteæ* propiæ uni-tri-jugæ intimæ foliis duplo fere majores, basi antica connatæ, spinoso-dentatæ bilobæ, lobis subacuminatis acutis; bracteolâ 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 altiusculis, apice rotundata, ore fere clauso obscure ciliolata. *Calyptra* tenuis. *Capsula* ovalis. *Andræcia* in eadem, vel sæpius in diversa, stirpe, medium ramum pro more tenentia; *bracteæ* assurgentes plurijugæ foliis subconformes—imo interdum majores—monandræ.— $F \cdot 25 \times \cdot 2$; $c \frac{1}{70} - \frac{1}{60}$; $br \cdot 4$; $per \ 1.0 \times \cdot 25 \text{ mm.}$

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); *Cromaglow* (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, e caulis tergo—extra foliorum bases—exeuntes. *Caulis* ipso apice fructifer; rami fertiles interdum abbreviati, sæpius elongati.

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

Obs. A curious and beautiful little plant, standing on the confines of several genera. Except for its similarity to *Cephalozia dentata*—in habit, and in its toothed complicate leaves—and for the occasional occurrence of a postical branch, there is little to identify it with *Cephalozia*. Its toothed, pectinato-distichous leaves bring it very near to *Jungermania 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 *Cephalozia* by the unfertilised pistillidia being carried up by the fertilised one, i.e. by the calyptra; and by the perianth being complicate at the mouth.

APPENDIX

de generibus nonnullis Cephaloziæ affinibus.

HYGROBIELLA nov. gen.

Plantæ pusillæ cæspitosæ. *Caules* crassiusculi, fragiles tamen, sectione transversa 6—12 cellulas lati, cellulis corticalibus 14—24-seriatis, internis vix diversis; subpellucidi vel in ætate opaci, basi rhizomatosi et flagellis *subarhizis* matrici adfixi, radicellis alicubi subnullis, superne pauciramei sæpeque iteratim innovando-floriferi. *Rami* flagelliformes postici, foliosi laterales et axillares; *innovatio* subfloralis postica perraro obvia est. *Folia* inferiora minuta distantia, superiora increscentia persæpeque confertiora et equitantia, omnia transversa complicato-biloba—vel inferiora integra—lobis æqualibus vel antico subminore; *cellulæ* leptodermes subminutæ quadrato-hexagonæ—in unica sp. majusculæ et elongatæ. *Foliola* vel omnino nulla vel in aliis speciebus præsentia, foliis parum minora, iisdem sat similia nisi ut frequentius indivisa. *Flores* dioici: ♀ in caule ramove terminales, sæpe steriles et innovatione suffulti. *Bractæ* paucijugæ tristichæ—vel, in speciebus foliolis orbatis distichæ—in aliis speciebus dimidio inferiore incrassatæ. *Perianthia* magna, tenuia vel subcarnosa, fusi-formia vel oblonga, alte obtuse trigona, *microstoma* (neque tantumodo, ad *Cephaloziæ* instar apice plicato-constricta), ore subintegerrimo setuloso, facie antica—saltem instatu sterili—sæpe profunde unisulca. *Calyptra* supera angusta. *Capsula* oblonga bistrata, cellulis interioribus fibris semiannularibus distinctis subobsoletisve. *Elateres* bispiri. *Sporæ* minutulæ. *Bractæ* ♂ terminales paucijugæ, foliis

subconformes, *monandræ*.—*Hab. et distr.* Species paucae nobis cognitae Europae incolae sunt, locis montosis super saxa madida vigentes.

1. *HYGROBIELLA LAXIFOLIA* (Hook.)

Jungermania laxifolia Hook. Br. Jung. t. 59.

Dioica pusilla pallide viridis caespitosa. *Caulis* pollicaris suberectus subteres, cellulis angustis (6 in diametro transverso), corticalibus sub 14-seriatis internis perpaulo latioribus, constans, basi saepe valde ramosus; alii rami breves flagellares, aphylli vel microphylli, radicanes, alii assurgentes fastigiato-corymbosi inferne pauci-distantifolii superne (fertiles praecipue) subconfertifolii. *Radicellae* persaepe omnino nullae, raro paucissimae (1—3 nae) ad flagella caulemve adstant.

Folia transversa erecta, inferiora minuta ovato-subulata pleraque integra; superiora increscientia subimbricata ovalia et ovali-lanceolata complicato-canaliculata et equitantia, apice ad $\frac{1}{4}$ — $\frac{1}{3}$ bifida, segmentis obtusis acutisve saepe inaequimagnis, alia solum emarginata; *cellulae* majusculae pellucidae leptodermes, rectangulari-hexagonae subduplo longiores quam latae. *Foliola* foliis parum minora subconformia nisi saepe integra vel solum emarginata. *Flores* dioici: σ in caule ramove brevi longioreve, saepe iteratim innovando, terminales. *Bractee* 2—3-jugae, perianthii basin amplexantes vel subremotae, foliis caulinis similes, saepe autem multo majores, breviter bifidae, inaequilobae, repandae, ad axin a basi ad medium fere usque cellulis bistratis conflatae (ex eo quasi costatae); genitalia pauca. *Perianthia* magna, lanceolato-fusiformia—in fructu saepe elongata fereque linearia—alte trigona, ore angusto fere clauso vix subdenticulata, a basi ad apicem fere usque cellulis bi-(ad carinas saepe tri-) stratis conflata. *Calyptra* duplo brevior angustiorque, clavata, $\frac{1}{2}$ inferiore 2 c. crassa, demum apice inaequaliter bivalvis, pistillidiis sterilibus basi circumdata. *Pedicellus* perianthio plus duplo longior, c. 16-seriatis, sc. cellulis periphericis 12-seriatis, axialibus (majoribus) 4-seriatis, conflatus. *Capsula* anguste oblonga, rufo badia bistrata; *cellulae* stratorum subaequimagnae irregulariter tessellatae, oblongo-4-6-gonae, parietibus lateralibus columnis trabeculisve paucis fulcitis, fibris semiannularibus strati interioris nullis vel perraris et subobsoletis. *Elateres* breves obtusi bispiri. *Sporae* eodem diametro ac elaterum, globosae sublaves. *Andræcia* terminalia brevissima—raro rorum

totum tenentia; *bractea* foliis conformes, vel majores et latiores, monandreae.—*Folia* $\cdot 35 \times \cdot 15$; *c* $\frac{1}{20}$; *f*^{la} $\cdot 35 \times \cdot 12$; *br* $1\cdot 65 \times \cdot 55$, (*cellulae bractearum* $\frac{1}{16}$ — $\frac{1}{12}$ mm longæ); *per* $2\cdot 0 \times 0\cdot 5$ mm.

Jung. laxifolia Hook., G. L. et N. Syn. Hep. 147, necnon auctorum fere omnium.

Gymnocolea laxifolia Dum. Rev. Jung.

Cephalozia laxifolia Lindberg Musc. Scand. 1879.

Stirps singularis, a Cephaloziiis certe diversa habitu peculiari; ramis foliosis *lateralibus*, defectu radicellarum fere absoluto; floribus fœmineis constanter terminalibus. Cellulis elongatis cum *Alobiellis* congruit; foliolis majusculis semper præsentibus ad *Eucephalozias subluridas* accedit; foliis complicatis ad *Cephalozieellam*; ab omnibus tamen caracteribus expositis recedit.

Hab. in moist places, especially on rocks by streams, not ascending high in the hills; apparently confined to the north of Europe. British Isles, not rare, but local; *Teesdale* and *Eskdale* (R. S. and M. 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.)

Diplophyllum myriocarpum Carr. in C. et Pearson, Hepat. Brit. exsicc. no. 96 (1879).

Dioica pusilla rufula dense cæspitosa. *Caules* $\frac{1}{4}$ — $\frac{1}{2}$ -pollicares in-texti rigidiusculi obtuse quadranguli, basi nuda rhizomatosi divergenti-

*Mr. Stabler has lately (May 11, 1882) succeeded in finding *H. laxifolia* in fruit in Mardale.

ramosi—interdum subbrachiati; aliis ramis lateralibus, basi aphyllis superne foliosis, aliis (inferioribus) posticis nudis flagellaribus et radicanibus; radicellis nullis vel perraris. *Cellulæ caulis* diametri 6 vel 7, corticales 20-seriatæ subquadratae, internis perpaulo majores, primum magis pellucidæ, in ætate opacæ. *Folia* caulis ramorumque inferiora dissita minuta erecta appressa (exinde ægre visibilia) ovato-quadrata, complicata—arte explanata subcuneata—ad $\frac{1}{2}$ bifida, lobis acutis; superiora abrupte multo majora, confertiora et equitantia, in bracteas \varnothing transeuntia; *cellulæ* minutæ subquadratae leptodermes subpellucidæ. *Foliola* omnino nulla. *Flores* \varnothing terminales, in ramo sæpe iteratim innovando-prolifero, innovationibus lateralibus, raro posticis, interdum binis oppositis elongato. *Bracteæ* pro plantula magnæ, 2—3-jugæ, distichæ, arcte conduplicatae et æquitantes, carina recta ad angulum 45° e caule extante, intimæ maximæ, foliis caulinis 4 plo majores, quadrato-oblongæ, basi subcordatae, apice vix ad $\frac{1}{4}$ 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 unisulca—demon probabiliter subplana, apice lato rotundata, ore parvulo denticulata vel setulosa, setulis 1—4 cellulas longis. Cætera haud visa.—*Folia* $\cdot 12 \times \cdot 08$ et minora; *cell.* $\frac{1}{65}$; *bract. int. lobus posticus* $\cdot 43 \times \cdot 25 \frac{1}{3}$ *l. anticus* $\cdot 4 \times 2$; *per* $\cdot 65 \times 35$ mm.

Jungermania myriocarpa Carr. in Trans. Bot. Soc. Edinb. 1880, p. 466, t. 18, f. 4.

Hab. Creeping among spongy peat, along with *H. laxifolia*, in crevices of moist rocks, in a stream from Ben Venue, Scotland (CARRINGTON! July, 1876). *Langdale, Westmorland*: pl. \varnothing c. per.; and *Clogwyn dwr Arddu, N. Wales*: pl. σ (W. H. PEARSON! June—Aug. 1881).

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

maturity by the swelling of the enclosed fruit; and the same would possibly ensue with *H. myriocarpa*, of which we have as yet only the young and barren perianth.*

3. HYGROBIELLA NEVICENSIS (Carr.)

Jungermania Nevicensis Carr. in C. et Pears. Hep. Brit. exsicc. no. 85 (1879); ejusd. in Trans. Bot. Soc. Edinb. 1880, p. 464, t. 17, f. 2.

Pallida, hic illic rubescens, siccando sordide flavida, cæspitosa. 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 *lateralem* edentes. *Folia* distantia erecto-patula parva ovato-rotunda subcomplicato-concava, basi subcordata, margine supra medium in angulum, raro indentem, protracta, apice ad $\frac{1}{4}$ — $\frac{1}{3}$ acute biloba, lobis acutis subacuminatisve, superiora brevius fissa, lobis subobtusis; cellulæ minutæ quadrato-hexagonæ leptodermes, convexulæ, chlorophyllo parco. *Foliola* nulla. *Flores* utriusque sexus ignoti.—*Folia* $\cdot 35 \times \cdot 35$; *cellulæ* $\frac{1}{70}$ mm.

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

A *Cephalozia divaricata* caule flagellifero *arhizo* et foliis brevilibis distat, et inter *Hygrobiellas* sine dubio collocanda. Cum *Cephalozia biloba*, Lindberg, habitu et magnitudine fere convenit; differt autem hæc caule radiculoso 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; *valvulæ* $\cdot 4 \times \cdot 175$ 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.

concavissimis (vix complicatis; perianthiis carnosissimis, inferne 8 cellulas crassis; innovatione subflorali nulla.—Hab. et Distr. Unica species nobis cognita ad saxa humectata in montibus Europæ et Grœnlandiæ rarius occurrit.

PLEUROCLADA ALBESCENS (Hook).

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

Dioica depresso-cæspitosa stratificata albescens virescensve, siccando cærulescens. *Caules* pollicares raro longiores procumbentes intricati, laxè subpinnati, interdum ex parte dichotomi, parce radiculosi, eflagelliferi, validi, ovali-teretes, cellularum stratis 5 concentricis subæqualium conflati, opaci; *rami* stricti subfastigiati. *Folia* subdissita patula, insertione fere transversa, parum succuba orbiculata, concavissima, fere hemispherica, adusque vel paulo ultra $\frac{1}{3}$ biloba, lobis ovato triangularibus conniventibus acutis, sinu angusto acuto subobtusove; *cellulæ* 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 obsoleto.

Flores dioici: ♀ in ramo brevi longioreve—pro pedicelli receptione ad involucri basin usque excavato—terminales, innovatione propria nulla suffulti, assurgentes, basi sæpe valde radiculosi. *Bractæ* 3-jugæ appresso-convolutivæ, extimæ foliis submajores, intimæ triplo fere majores, basi liberæ vel breviter connatæ, oblongo-quadratae, ad $\frac{1}{3}$ bifidæ, raro trifidæ, segmentis subacuminatis acutis; *bracteolæ* subminores apice integre bifidulæve, basi utrinque grosse 1—3-dentatæ. *Perianthia* alte emersa, foliis caulinis 7 plo longiora, clavata vel lineari-fusiformia, alte trigona, ore constricto sæpe scarioso demum lacera erosaque, substantia firma, basin versus 5—8 cellulas crassa, medio 2—4 cell., ad $\frac{3}{8}$ alt. 2 cell., solum juxta apicem 1 cellulam solam crassa; *cellulæ* magnæ elongatæ pellucidæ. *Calyptra* 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 lineari-lanceolatae ovalesve, idem ac elateres sporaeque purpureo-badiae; cellulis bistratis, interioribus fibra annulari—saepe ex. p. dissoluta et ad trabeculas redacta—impletis conflatae. *Pedicellus* sat crassus, cellulis magnis, demum 4—5 plo longioribus quam latis, prismatico-cylindricis, corticis 8—9-seriatis primum chlorophyllo repletis posterius evacuatis, internis æquimagnis 4—5-seriatis ab initio subvacuis. conflatus. *Elateres* capsula 4 plo breviores filiformes utrinque obtusi, fibra spirali duplici angusta impleti. *Sporae* latitudine elaterum globosae laeves. *Andræcia*—*Folia* $\cdot 5 \times \cdot 5 \cdot 65 \times \cdot 65$, $\cdot 55 \times \cdot 65$; $c \frac{1}{30}$; $f^{la} \cdot 6 \times 3$, $\cdot 5 \times \cdot 38$, $\cdot 55 \times \cdot 4$ — $\cdot 45$; *bract. ext.* $\cdot 75 \times \cdot 7$, *int.* $1.3 \times \cdot 9$; *per* $4.0 \times \cdot 7$ — $\cdot 85$; *pedic* 10.0 — 15.0 ; *caps* $\cdot 8 \times \cdot 5$; *elat.* $\cdot 2$ — $\cdot 25$ mm.

Var. *scotica*, foliis paulo latioribus quam longis concavissimis, ad $\frac{1}{3}$ alt. solum bilobis; foliolis latis, ovatis, hinc vel saepius utrinque unidentatis, superioribus saepe bifidulis. *Jung albens* Hook. (typus).

Var *islandica*, foliis exacte fere orbiculatis, minus concavis, haud raro ad $\frac{1}{2}$ usque fissis; foliolis ovato-lanceolatis integerrimis.—*Jung. islandica* Nees Hep. Eur. II, 29; Syn. Hep. 132.

Hab. var. scotica, in montibus Scotiis (*Clova!* GREVILLE); in alpidibus Helveticis (*Grimsel!* SCHIMPER: specimina ditissime fertilia); in alpidibus Tyrolensibus! (Jack in G. et R. &c. 35 et 468.)

Var. *islandica*, in Grœnlandia! (VAHL); in rivuli ripa Lapponiæ Umensis! Angstr. in G et Rab. Hep. Eur. 386.)—Exempla Schimperiana, quoad folia valde concava perpaulo ultra $\frac{1}{3}$ fissa, inter has duas formas intermedia sunt. Perianthia paulo minus crassa quam in stirpe Grœnlandica.

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 Hepaticæ of the Pyrenees', in the 3rd volume of Trans. Bot. Soc. Edinb. (1849) his herbarium name *Trigonanthus* for the *Jungermaniæ bicuspidæ*; but all the plants enumerated under it he still distinguishes by the old name, *Jungermania*. Our specimens were sent by Angström as *Trigonanthus islandicus*, in accordance with the proposed nomenclature of R. Spruce". This is an instance of a conclusion drawn from insufficient premises; for, even in my first attempt to separate *Trigonanthus* from *Jungermania*, I was careful to exclude *J. albescens* (i.e. *islandica*) from the list of typical species. I noted, even then, an approach of *J. albescens* to *Lepidozia reptans*, in the bluish-white tinge of the dried specimens, the pinnate branching, with a difform leaf subtending each branch, and the concave leaves with connivent lobes.

Comparison of fruiting specimens reveals another character common to both, namely the fleshy perianth; but the uniformly acrogenous female flowers of *J. 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 *Cephalozia* which much resembles it in either habit or character, or that could possibly be mistaken for it. Of all the Jungermanideæ 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 cæspitosæ, e viridi olivaceove glaucescentes. *Caules* validi, cellulis pluristratis conformibus opacis conflati, inæqualiter pinnati, ramique tristiche 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 rarioribus. *Folia* tristicha transversa, sat lata, complicato-carinata, ubi magis conferta equitantia, ad vel ultra $\frac{1}{2}$ biloba, lobis subacuminatis, integerrima vel sæpius (superiora præcipue) denticulata vel spinulosa—interdum ipsa facie spinoso-muricata; *cellulæ* parvæ pellucidæ quadrato-hexagonæ—axiales subelongatæ—pariete plus minus incrassato. *F. postica* (s. *foliola*) lateralibus conformia et vix paulo minora; in aliis speciebus autem sat minora persæpeque apice integra. *Flores* dioici, raro paroici, terminales: ♀ innovatione sæpe suffulti. *Bracteæ* plurijugæ, pro more in capitulum congestæ, foliis sensim majores; cæterum vix diversæ, nisi interdum trilobæ, margine magis valide dentatæ, raro connatæ. *Perianthia* libera emersa oblonga, basi sola 2 cell. crassa, superne tenuia, a facie subcompressa, antice profunde unisulca, utroque sulcæ margine superne

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

Jungermania L. Fl. Lapp. (1737).

Jungermania § 8, *Anthelia* Dum. Syll. Jung. Eur. (1831.)

A. *Folia omnia facie inermia, postica lateralibus subæquimagna.*

1. *ANTHELIA JULACEA* (Lightf.)

Jung. julacea Lightf. Flor. Scot. 785; Hook. Brit. Jung. t. 2.

Dioica sat robusta, colore (in sicco præcipue) glaucescente, sæpe mucore vel confervis infesta, pauciradicellosa. *Folia* arcte æquitantia—raro dissita—oblonga, ad $\frac{3}{4}$ usque biloba, lobis ovato-lanceolatis acutis subacuminatisve, integerrimis vel eroso-denticulatis, utroque latere recurvis; *cellulæ* diametro $\frac{1}{50}$ mm, axiales subelongatæ, basales bistratæ. *Folia* postica lateralibus subæqualia. *Bractæ* foliis sensim majores, magis denticulatæ, basi et altius cellulis 3—2-stratis conflatae. *Perianthia* oblonga.

Var. β , *clavuligera* Nees, humilis, caule iteratim innovando-florifero, ad fl. ♀ basin sat radicelloso, ramis insigniter clavatis (e foliis densissimis, inferioribus minutis, superne increscentibus et in bractæas 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.)

Jung. Juratzkana Limpr., *Flora von Schlesien*, a. 1877.

Paroica, *A. julacea* minor, pallida, apice virens vel glaucescens, subramosa, tota fere longitudine radiculosa. *Folia foliolaque* iis *A. julaceæ* parum diversa, in exemplis Suecicis sæpe ad $\frac{1}{2}$ solum fissa, segmentis triangularibus; in Styriacis et Scoticis autem ad vel ultra $\frac{2}{3}$ fissa, segmentis angustioribus subacuminatis; *cellulæ* ($\frac{1}{35}$ — $\frac{1}{30}$ mm) iis *A. julaceæ* majores et pellucidiores. *Bracteæ* floris bisexualis (in ipso caule terminalis) plurijugæ, laxiuscule capitatae, foliis sensim majores, conformes nisi basi latiore ventricosa antheridiiferae, apice paucispinulosæ. (Flores ramos terminantes persæpe tenuiores et unisexuales, i.e. fœminei.) *Perianthia* ovato-oblonga; cætera iis *A. julaceæ* 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 *Tjådtjalsk* (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 dioicous and paroicous inflorescences certainly cœexist. [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 *ŷ. julacea* of Lightfoot, as well as *ŷ. Juratzkana*, under their name "*ŷ. nivalis*"; so that, whether species or variety, to Limpricht belongs the honour of first distinguishing *ŷ. Juratzkana* by its inflorescence.

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

B. *Folia lateralialia echinata, postica lævia lateralibus sat minora.*

3. *Cephalozia* (Prionolobus)
~~ANTHELIA~~ PHYLLACANTHA (Massal.)

Cephalozia? phyllacantha Massalongo Epat. Ital. exsicc. no. 53.

Dioica, pusilla viridis in sicco glauca, dense cæspitosa, radicellis longis albidis intexta, pinnatim subramosa, ramis omnibus e foliorum lateralium axilla ortis. *Folia* subrotunda, subcomplicata, ad $\frac{1}{2}$ biloba, lobis ovato-lanceolatis acuminatis, margine subrecurvo spinulosa, facie externa e cellulis in papillam spinulamve alte prominulis *echinata*; *cellulæ* parvæ subæquilateræ. *Foliola* paulo minora, tenuiora, facie *lævia*, margine spinulosa, apice (integro bifidove) ciliata. *Flores* ♀ (juveniles) terminales; *bracteæ* confertæ capitatae, foliis longiores subconformes, nullibi incrassatae. *Perianthia*

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

Cephalozia (Prionolobus)
4. ~~ANTHELIA~~ ASPERIFOLIA. (Tayl.)

Jung. asperifolia Tayl. Lond. Journ. Bot. (1846); G. L. et N. Syn. Hep. p. 683.

Plantula mihi nondum visa certe *A. phyllacanthæ* affinissima. "*Folia* margine et dorso celluloso-echinata, ut in *Lejeunea calcarea*", necnon "*amphigastria ovato-acuminata ciliato-dentata*" conveniunt. Differt *A. asperifolia* foliis subquadratis (nec subrotundis), lobis solum acutis (nec acuminatis); foliolis minutis; *bracteis* ♀ subtrifidis; forsan etiam *florescentia* monoica, quum cl. Taylor flores utriusque sexus descripsit, anne autem in eadem, anne in diversa stirpe occurrunt, non dixit. "*Andræcia magna ventricosa spicam obtusam formantia. Perianthia oblonga subcompressa subplicata, basi purpurea 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 *℣. julacea*, *℣. setiformis* Ehrh., *℣. squarrosa* Hook. and *℣. hirtella* Web.—Lindberg ('Hepaticæ in Hibernia lectæ', p. 517) proposes

to reserve for *℣. squarrosa*, and possibly *℣. setiformis* (?) and *℣. hirtella*), because he finds the sterile pistillidia in *℣. squarrosa* limited to the base of the calyptra, and not scattered over its whole surface as in *℣. julacea* (which he would regard the type of *Anthelia*). As I have not seen fertile specimens of any of Lindberg's *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 *Marsupella* (or *Sarcoscyphus*)—including its subgenus *Acolea* (or *Gymnomitrium* N.)—we find some species with free, others with adherent receptacles. In *Nardia* (*Alicularia*) *scalaris*, *N. hæmatosticta*, *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 *Alicularia Breidlerii* 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 *Alicularia*.

Lindberg finds the female bracts of *Anthelia julacea* adnate to the lower part of the perianth, as in *Nardia*; but I can detect no adhesion above the base of the perianth: certainly none greater than is often observable in such *℣. germaniæ* as *℣. sphærocarpa*, *℣. lurida*, and others.

ARACHNIOPSIS nov. gen.

Plantæ pusillæ confervoideæ griseo-vel cœruleo-virescentes, ad telaraneæ instar late intextæ. *Caules* filiformes laxè corticati, postice ramosi et radicellosi. *Folia* capillacea stricta, cellulis cylindricis, 2—6 plo longioribus quam latis, uniseriatis constantia et vel unierura vel in aliis speciebus bierura; cruribus ab ipsissima basi discretis, altero (antico) paulo inferius inserto. *Foliola* 0 vel subnulla. *Flores* ♂ cladogeni; *bracteæ* 3-stichæ, 3—5-jugæ, intimæ liberæ vel subconnatæ, pro more quadripartitæ, laciniis capillaceis e limbo basali angusto ortis. *Pistillidia* sub 12. *Perianthia* prælonga, linearia, superne (saltem) trigona, ore longe 12-laciniato-ciliata. *Calyptra* tenuis libera. *Capsula* oblonga, cæteraque iis *Cephalozicæ* conformia. *Andræcia* terminalia; *bracteæ* foliis conformes incurvæ monandræ.—*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 unicurura.*

1. ARACHNIOPSIS PECTEN Spruce.

Dioica minuta cærulescens. *Caulis* cellulis 5-seriatis—sc. corticalibus 4-, axialibus 1-seriatis—conflatus. *Folia* pectinatim patula longisetacea, cellulis 4 vel 5 linearibus constantia.

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.

Monoica pusilla e viridi grisea, in sicco albescens. *Caules* e cellulis 5-vel 6-seriatis conflati. *Folia* dissita; *crura* .6—·75 mm longa, cellulis 6—10 subduplo longioribus quam latis constantia. *Bracteæ* ♀ intimæ foliis paulo longiores, interdum solum 2—3-partitæ. *Perianthia* cylindracea, 4—6-plo longiora quam lata, ore triplicata et longiciliata.

Hab. ad fluvios *Uaupés* et *Negro*.

Var. capillacea S. Foliorum *crura* tenuissima, cellulis haud numerosis (6—8) sed prælongis, 3—6-plo longioribus quam latis, constantia. —In monte *Campana* Andium Peruviæ, ubi ad speluncæ parietes tanquam araneæ telarum instar dilatatur.

Var. filifolia S. Foliorum *crura* longissima (1.5—1.8 mm) e cellulis 10—14, duplo (raro triplo) longioribus quam latis, conflata. *Perianthia* prælonga (2.3 × 0.4 mm) tereti-fusiformia, ore angusto triplicata. *Bracteæ* intimæ perianthio perpaulo breviores.—Ad *Panuré* fluvii *Uaupés* hanc formam insignem—forsan pro specie propria habendam—legi.

3. ARACHNIOPSIS DISSOTRICA Spruce.

Dioica, cæspite densiore rigidulo griseo-viridi vicens. *Caules* cellulis sub 12-seriatis (quarum corticalibus 6—7-seriatis) conflati, subpinnati, ramis autem omnibus posticis. *Folia* conferta; *crura* subparallela, cellulis 4 vel 5, triplo fere longioribus quam latis, sistencia *Foliola* ad cellulas 2 minutas, transverse collaterales redacta, radicellifera. *Bractea* intimæ foliis triplo longiores 4-partitæ. *Perianthia* linearia-fusiformia trigona, ore longe 12 ciliata. *Andræcia* vel ramum totum vel ejus apicem solum tenentia; *bractea* foliis similes, assurgenti-secundæ monandræ.

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

Descriptionem *Blepharostomatis* adjicio, ut conferatur hoc cum *Arachniopsi*.

BLEPHAROSTOMA Dumort, *Recueil* (1835).

Plantæ humiles cæspitosæ 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-quadratae leptodermes sat chlorophyllosæ sublævissimæ.—Folium caulis bifurcatione præpositum cæteris difforme, sæpius crure unico prælongo constans, vel tripartitum, crure antico longiore. *Foliola* foliis $\frac{1}{2}$ breviora, 3-crura. *Flores* paroici et dioici, terminales. *Andræcii bractea* sub 8-jugæ, foliis æquimagnæ, incurvæ 6-partitæ, cruribus mediis 2 vel 3 bifurcis, *monandræ*. *Bractea* ♂ tristichæ subtrijugæ, intimæ foliis $\frac{1}{2}$ longiores, verticillatæ, minime connatæ, profunde 4-fidæ (pagina basali 4—6 cell. alta); lobis vel bis dichotomis vel plurifidis, laciniis filiformibus. *Bractea* exteriores minus fissæ; in

flore paroico basi turgidæ et antheridiiferæ. *Perianthia* alte emersa, albida, cellulis subelongatis, unistratis conflata, pyriformi-cylindrica, primitus valde obtuse triplicata, demum inflata fereque teretia, apice constricto solo trigona, ore breviter plurilaciniata. *Calyptra* duplo brevior, tenuis, oblonga, bilabiatim dehiscens, basi pistillidiis sterilibus sub 5 circumdata. *Pedicellus* elongatus, calceolo obconico, ore subinde ligula minuta foliacea hinc aucto, basi infixus. *Capsula* calyptram fere adæquans, cylindrico-oblonga 4-valvis pertenuis bistrata; cellulæ ad parietem lateralem nodis paucis fulcitæ, fibris autem semiannularibus carentes. *Elateres* maximi bispiri obtusissimi, folliculo tenuissimo cito dissoluto. *Sporæ* majusculæ læves.—*Hab. et Distr.* Unica species adhuc nobis cognita, *Bl. trichophyllum* (L.) in tota zona temperata boreali crescit, et in montes sylvestres alte ascendit; rupes humidæ et truncos putrescentes amat.—*Dimensiones* (plantæ Pyrenaicæ e sylva *Transoubat*): *Folia* .5; *f*^{la} .35; *c*₃₀¹—₂₅¹; *br. int.* .8; *per* 1.8 × .6; *cal* .9 .55; *caps* .8 × .5^{mm}.

Jungermania L. Fl. Suec. (1745).

Jungermania § *Blepharostoma* Dum. Syll. Jung. (1831).

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

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

Obs. The leaves are inserted almost transversely on the stem, but have (if anything) a slight tendency to be 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 numerously 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. TRIGONANTHÆ, because of the leading character. It comprises the following genera.

Tribus TRIGONANTHÆ.

MYTILOPSIS S.

MICROPTERYGIUM Nees.

BAZZANIA Gray.

LEPIDOZIA Dumort.

Eulepidozia S.

Microlepidozia S.

BLEPHAROSTOMA Dum.

ARACHNIOPSIS S.

CEPHALOZIA Dum.

Zoopsis H. f. et T.

Pteropsiella S.

Protocephalozia S.

Alobiella S.

Eucephalozia S.

Cephaloziella S.

Lembidium Mitt.

Odontochisma Dum.

ADELANTHUS Mitt.

ANOMOCLADA S.

HYGROBIELLA S.

PLEUROCLADA S.

Linnæus 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 "quæ difficilius distinguuntur, propius collocentur". I cannot flatter myself that I have been more successful in the above list of *Trigonanthæ*. 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

Eucephalozia micromera to Zoopsis, Arachniopsis, BLEPHAROSTOMA, MICROLEPIDOZIA, &c.

... ,, ... *connivens* to Alobiella, Pteropsiella, Protocephalozia.

... ,, ... *catenulata* 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. acroscypha* S., *C. exiliflora* Tayl. and *C. biloba* Lindb., constantly terminal on the main axis.

Not only in *Cephalozia* but in nearly every other genus of TRIGONANTHÆ are the ♂ flowers monandrous. In *Bazzania*, however, the majority of the species are diandrous; yet a few are monandrous, and in a few others the antheridia are either solitary or twin; while in *Adelanthus decurvus* Mitt. the normally large solitary antheridium is occasionally replaced by a pair of small ones. A thinwalled capsule, of two layers, the cells of the inner layer strengthened by semiannular fibres—apparently remnants of a continuous spiral—is also a feature common to all the tribe except *Lepidozia* and *Bazzania*, which have a much stouter capsule, usually of 4 layers in the former and of 5 in the latter. These two genera comprise the most robust and most highly-

developed plants of the tribe. They abound throughout the tropics and the southern hemisphere, nor are they absent from the northern. In *Bazzania* every known species is dioicous, 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 analagous 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.

Caudex brevis prostratus subdivisus rhizomatosus, *caules* lineari-frondiformes suberectos arcuantes, subsimplices vel paucirameos edens, ramis omnibus hypogenis s. posticis, aliis flagellaribus. *Folia* perfecte plano-disticha complicato-carinata subæquivalvia, margine parum hiantia, basi transversa amplexicaulia, valvulis lamellisve ad apicem usque accretis, carina superne angustissime alata; *cellulæ* præminutæ incrassatæ verruculosæ. *Foliola* caulina omnino nulla. *Flores* dioici cladogeni: ♂ amentiformes; *bracteæ* monandæ. *Bracteæ* floris ♀ 2—3-jugæ tristichæ, intimæ foliis sublongiores, tenuissimæ, laxè areolatae, ovatae obtuse complicato-concavæ bifidæ subciliatæ. *Perianthium* liberum elongatum leptoderme, inferne 4-(rarius 3-) angulum, apice 6-7-vel 8-plicatum, ore longiciliatum. *Calyptra* ovalis tenuis. *Capsula* oblongo-cylindrica bistrata, cellulis internis fibra semiannulari carentibus. *Elatères*

longiusculi laxè bispiri. *Sporæ* diametro elaterum tuberculosæ.

Species unica, *Mytylopsis albifrons* S., habitat in montibus Andium Peruvianorum orientalium *Campana*, *Guayrapurina*, &c. alt. 1000 metr. supra mare, locis cavis umbrosis, ubi ad folia emortua saxaque latos cæspites 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 radicales; rami nulli paucive et paucifolii, alii flagellares radice-celliferi. Folia subcontigua, vel ubi densiora equitantia, arte explicata cordato-oblonga, toto margine eroso-repanda scaberulaque, apice subacuto incisula; lamellæ lineari-rhomboideæ, anterior dimidio superiore posteriorem alâ ad carinam solum 1—3 cellulas latâ superans; cellulæ præminutæ subrotundæ leviter 6-sinuatae, trigonis magnis ad angulos incrassatae, carinam versus oblongo-hexagonæ, omnes convexulæ et minute verruculosæ. *Perianthia* foliis 2—3plo longiora, obtusangula, reti eodem ac bractearum laxo rectangulari rhomboideove subscarioso. *Capsulæ* cellulæ tessellatæ, ad parietes laterales columnis trabeculisve paucis fulcitæ. *Bracteæ* ♂ paucijugæ minutæ concavæ apice bidentes.—*Caules* 5—15 mm longi, cum foliis 1.2 mm lati; *folii laminæ* .65 × .3; *c* 1/80; *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 rariore adveniat ramus posticus, ad caulis primarii instar ramulosus est.—In *Mytilopsi* autem omnes rami (*Cephalozia* quem ad modum) postici sunt, et foliola nullibi (nisi ad flores) obvia. Ramus ♀ 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 CHILOSCYPHÆ comprises—besides *Chiloscyphus* and *Coleochila* Dum. (= *Mylia* Gray)—*Pleuroschima* Dum. (= *Bazzania* Gray), *Odontoschisma*, *Lepidozia*; while *Cephalozia* is relegated to his tribe *Jungermaniæ*, along with *Jungermania*, *Lophocolea*, &c.!

Lindberg, the latest systematiser of Hepaticæ, has proposed a tribe LEPIDOZIEÆ*, whose first half, comprising *Lepidozia*, *Bazzania*, *Odontoschisma*, and *Cephalozia*, is a natural group of genera; but the second half: *Lophocolea*, *Pedinophyllum*, *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 TRICHOMANOIDEÆ (Hep. Eur. I, III et IV, and Syn. Hep. p. p. XIX et 197), consisting of *Calypogeia* 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 *Calypogeia* (= *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 Jungermaniaceæ* (= Marsupio-carpeæ = Geocalyceæ = Saccogynæ), 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 suprater-raneous and subterraneous perianths, is to be found in those genera whose floral whorls are more or more or less adnate to each other into

* "Hepaticæ in Hibernia lectæ," in 'Acta Soc. Sc. Fennica' a. 1875, p. 539.

† This curious genus, the *Pleurozia* of Dumortier, has not yet found its true place in the system. With *Radula* and *Madotheca*, 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 *Nardiæ* (*Aliculariæ*) as *N. hæmatosticta* (N.), *N. Lescurii* Aust. and *N. Breidleri* (Limp.), whose gibbous, rooting involucre is the precursor of the pendulous bulbiform pouch of *Acrobolbus Wilsoni*; while the vegetative organs are of the same type in both genera. *Southbya* S., as to its stem and foliage, is the exact antitype of *Calypogeia* Raddi (= *Gongylanthus* N. = *Podanthe* Tayl. = *Lindigina* Gottsch. = *Lethocolea* Mitt. = *Gymnanthe*, ex p. Syn. Hep.). It has the same fragile stems, creeping by numerous pale radicles; the *opposite*, densely-packed, broad and tender leaves, which are usually rounded or retuse at the apex, more rarely obsoletely 2—3-dentate, or paucidenticulate. In both genera the involucre adheres at the base to the perianth; only in *Calypogeia* it is prolonged into a pouch. So great is the external resemblance between the two genera, that, when I found two species of *Calypogeia* in the Andes, I at first unhesitatingly referred them to *Southbya*; and it was not until some time afterwards, when I had succeeded in 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 Gottsche's admirable memoir "On the fructification of the *Jungermanniæ Geocalyceæ*," in the 21st volume of the Transactions of the Imperial German Academy "Naturæ Curiosorum."

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

<i>C. ericetorum</i> Raddi.	Species Europææ
<i>C. flagellifera</i> Raddi.	
<i>C. Liebmanniana</i> (Gottsche, <i>Lindigina</i>).	Mexicanæ :
<i>C. Mülleri</i> (Gottsche, <i>Lindigina</i>).	
<i>C. Granatensis</i> (Gottsche, <i>Lindigina</i>).	Andinæ :
<i>C. oniscoides</i> Spruce.	
<i>C. euthemona</i> Spruce.	
<i>C. Bustillosii</i> (Mont., <i>Gymnanthe</i>)	

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

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

The only genus of *Trigonanthæ* 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-

Capenses:

C. scariosa (Lehm., *Jungermania*; *Gymnomitrium* sc. Syn. Hep.)

C. renifolia (Mitt., *Lindigina*).

Oceanicæ et Australienses:

C. squamata (Tayl., *Podanthe*; *Lethocolea Drummondii* Mitt.)

C. prostrata (Mitt., *Lindigina*).

parison, we call those genera that have the involucre free, *Hypocoleæ*; those with the involucre growing upon, or adherent to, the perianth, *Epicoleæ*; and those which have the united involucre and perianth prolonged into a pendulous pouch, *Marsupicoleæ*, or *Marsupiocarpeæ*, we get the following conspectus of the

Affinities of Marsupial Hepaticæ.

JUNGERMANIACEÆ

HYPOCOLEÆ

EPICOLEÆ

MARSUPICOLEÆ

Acrocarpicæ:

<i>Jungermania</i> L.....	{ <i>Nardia</i> Gray. <i>Notoscyphus</i> Mitt. } <i>Acrobolbus</i> Nees.
<i>Jung.</i> § <i>Sphenolobus</i> Ldbg...	<i>Marsupella</i> Dum.....	
<i>Liochlaena</i> N.....	 <i>Symphyomitra</i> S.
<i>Leioscyphus</i> Mitt.	<i>Southbya</i> S.....	{ <i>Calypogeia</i> Raddi = <i>Lindigina</i> Gotts.
<i>Plagiochila</i> Dum. <i>Tylimanthus</i> Mitt.
<i>Scapania</i> Dum.....	{ <i>Schistochila</i> Dum.. = <i>Gottschea</i> N..... } <i>Balantiopsis</i> Mitt.
? <i>Ptilidium</i> N.....	<i>Lepidolæna</i> Dum.	
<i>Herberta</i> Gray... }	{ <i>Lepicolea</i> Dum. ... }	
= <i>Sendtuera</i> N. }	{ <i>Chætocolea</i> S. }	
<i>Leiomitra</i> Lindberg	<i>Trichocolea</i> Dum.	

Cladocarpicæ:

<i>Chiloscyphus</i> Dum.	<i>Harpanthus</i> N.....	{ <i>Geocalyx</i> N.* ? <i>Saccogyna</i> Dum.
? <i>Adelanthus</i> Mitt. <i>Marsupidium</i> Mitt.
<i>Bazzania</i> Gray.....	{ ... <i>Anomoclada</i> S..... }	{ <i>Kantia</i> Gray = <i>Calypogeia</i> N.
<i>Cephalozia</i> § <i>Alobiella</i> S. }		

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

38.* CEPHALOZIA ÆRARIA Pearson MSS.

Dioica cladocarpa minuta, fulva vel pallide badia, dense depresso-cæspitosa. *Caules* $\frac{1}{4}$ -pollicares flexuosi, radicellis crebris intexti, sat validi, parce ramosi, ramique subhyalini foliosi. *Cellulæ* caulis 8 in diametro, corticales sub 15-seriatæ internis paulo majores. *Folia* dissita, squarrose fere patentia, minuta, subcuneata, obscure carinata, profunde (ad $\frac{3}{4}$) biloba, subintegerrima, sinu acuto obtusove angulum rectum includente; lobis ovatis lanceolatisve, basi 2—4 cellulas latis, subacuminatis cellulæque unicâ conicâ (duplo longiore quam latâ) persæpe incurvâ apiculatis; *cellulæ* minutæ oblongæ pellucidæ insigniter guttulatæ, pariete ad angulos præcipue incrassato, cuticula asperula. *Foliola* variabilia, inferiora sæpe minuta obsoletave, superiora foliis subduplo breviora lanceolata, interdum cum folio proximo in folium trilobum connata, suprema raro biloba foliisque vix minora. *Ramulus* ♂ brevissimus; *bracteæ* 3-jugæ, foliis duplo longiores, in flore sterili liberæ, paulo ultra $\frac{1}{2}$ bilobæ, parce spinuloso-denticulatæ, lobis ovatis acuminatis. *Genitalia* pauca. *Cætera* haud visa.—*Folia* .125—.15 longa, .125 lata (inter lobulorum apices mensa); *c* $\frac{1}{70}$ — $\frac{1}{60}$; *br* .25 mm.

“*Jungermania Starkii* Nees,” Carr. et Pears. Hep. Brit. Exsicc., no. 33 (1878).

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 colore viridi; caule tenui crebre ramoso; foliis subimbricatis sinu plerumque lunulato, lobis apiculo linguiformi carentibus, cellulis subquadratis; foliolis nullis.—*C. divaricata* certe diversa flore ♂ acrogeno; foliis distincte carinatis, raro ultra $\frac{1}{2}$ fissis, lobis exungiculatis, cellulis quadratis reticulatis (nec guttulatis).

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

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