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VI

NOTES ON THE HEPATICÆ OF CALIFORNIA[1]

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The Hepaticæ of California were ably described in 1899 by Howe[2], who recognized eighty-five species and several distinct varieties. During the twenty-four years that have since elapsed, ten additional species from California have been recorded in the literature. Of these the following were proposed as new: *Aplozia pendletonii* Pearson, *Cephalozia patulifolia* Steph., *Fossombronia hispidissima* Steph., and *Scapania perlaxa* Warnst. The others are all northern species with an extensive geographical distribution.

Within the past few years Mrs. E. C. Sutliffe, of the California Academy of Sciences, has interested herself in the Hepaticæ and has collected diligently in several parts of the state. Her careful collections, supplemented by the collections made by various other students, have added eight more species to the flora of California. These and the additions already recorded in the literature are noted in the present report. Attention is likewise called to certain changes in nomenclature that affect the species of California, and a few species are critically discussed. Perhaps the most important

[1]Contribution from the Osborn Botanical Laboratory.
[2]Mem. Torrey Club 7. 1899.

of these are the species of Fossombronia, to which Mrs. Sutliffe has devoted particular care, but it must be admitted that our knowledge of these species is still far from adequate. In the arrangement of the notes Howe's sequence is followed throughout, and all page-references are to his work, unless otherwise noted.

1. **Riccia lescuriana** Aust. (p. 15)

It has recently been shown by Howe[3] that the correct name for this species is *R. beyrichiana* Hampe.

2. **Riccia minima** L. (p. 23)

Most writers now apply to this species the later name, *R. sorocarpa* Bisch. The reasons for doing so have been discussed by the writer.[4]

3. **Riccia americana** M. A. Howe (p. 24)

According to the later views of its author[5] the species should be considered a synonym of *R. austini* Steph.

4. **Riccia fluitans** L.

Lily Lake, Marin County, September, 1921, Mrs. Sutliffe. New to California. This widely distributed species has been reported also from the neighboring states of Nevada and Arizona and is described by Howe (p. 33).

5. **Neesiella rupestris** (Nees) Schiffn.

This species, which (in the writer's opinion) should be known as *Grimaldia rupestris* (Nees) Lindenb., has recently been reported from California by Conklin[6], the record being based on the following specimen: Santa Anita Canyon, San Gabriel Mountains, Los Angeles County, June, 1921, George L. Moxley 997. Through the kindness of Dr. Conklin the writer has had the privilege of examining this specimen and

[3]Bryologist 20: 34. 1917.
[4]See Rhodora 12: 195. 1910.
[5]North Am. Flora 14: 17. 1922.
[6]Bryologist 25: 23. 1922.

would refer it to *Cryptomitrium tenerum* (Hook.) Aust. (p. 45), rather than to the Grimaldia.

6. **Asterella violacea** (Aust.) Underw. (p. 53)

In the opinion of the writer[7] this species is a synonym of *A. bolanderi* (Aust.) Underw.

7. **Asterella gracilis** (F. Web.) Underw. (p. 56)

The writer[8] has recently discussed the synonymy of this species and shown that it should bear the name *A. ludwigii* (Schwaegr.) Underw.

8. **Lunularia cruciata** (L.) Dumort. (p. 60)

At the time Howe published his description of this introduced species it was known in North America in a gemmiparous condition only. A few years later Miss Julia T. Shinn[9] announced the discovery of fruiting material at Niles, California, and Mrs. Sutliffe, in the past year, has collected additional fruiting specimens in Mill Valley, Marin County. They grew, according to her label, "on damp banks beside steps forming a street."

9. **Sphærocarpos californicus** Aust. (p. 65)

Through the careful work of Miss Haynes[10] it has been proved that this species is a synonym of *S. texanus* Aust., which antedates *S. californicus* by two years.

10. **Riccardia major** Lindb. (p. 72)

In accrediting *R. major* to California Howe compared the species with *R. pinnatifida* (Nees) Trevis. and stated that the latter was distinguished by its "softer, flatter thallus, without indication of a unistratose margin," by "its looser texture,"

[7]See Contr. U. S. Nat. Herb., 20: 303. 1920.
[8]Contr. U. S. Nat. Herb., 20: 269. 1920.
[9]Torreya 2: 124. 1902.
[10]Bull. Torrey Club 37: 223. 1910.

and by its dioicous inflorescence and smooth calyptra, the last two characters being quoted from other writers. In 1900 Schiffner[11] discussed "*Aneura pinnatifida* Nees" at length and showed that the species was an aggregate, based partly on tropical material and partly on European material. The tropical material, in his opinion, represented a species closely related to *R. multifida* (L.) S. F. Gray, while the European material agreed in great part with *Riccardia sinuata* (Dicks.) Trevis., a species antedating Nees von Esenbeck's species by a number of years. Schiffner therefore recommended that *Aneura pinnatifida* should no longer be recognized as a species and that the European specimens of the so-called *A. pinnatifida* should be definitely referred to *R. sinuata.* He showed further that the inflorescence of *R. sinuata* was autoicous (instead of being dioicous) and that the calyptra was covered over with inflated or tubular surface-cells (instead of being smooth), thus agreeing in these respects with *R. major* as described by Howe.

In connection with *R. sinuata* Schiffner discussed *R. major* and reached the conclusion that the two species were very close allies. At the same time he pointed out certain slight distinctions between them and suggested that they be recognized as distinct species, at least provisionally. His differential characters were drawn in part from the sporophyte and in part from the gametophyte. Six years later he[12] showed that the sporophytic differences were less constant than he had supposed but still insisted on the importance of the gametophytic differences and continued to regard *R. major* as a valid species. According to his account *R. sinuata* is a true aquatic; the thallus is rigid, fleshy and brittle and shows a bipinnate or tripinnate branching; the main axis is six to 10 cells thick, and the most delicate branches are never fewer than four or five cells thick; while the axis and leading branches broaden out at the apex. *R. major,* on the other hand, is a swamp plant rather than a true aquatic; the thallus is thinner and less rigid than in *R. sinuata* and shows a simply pinnate or rarely bipinnate branching; the main axis is only five cells thick on the more robust specimens, and the branches are only three

[11]Lotos 48: 357-382. 1900.
[12]Oesterr. Bot. Zeitschr. 56: 170. 1906.

or four cells thick; while the axis and branches never broaden out at the apex.

It will be seen that Schiffner's differential characters are based on variable features, and this is made still more evident by his remarks on a specimen of *R. major* collected by Howe at Duncan's Mills, Sonoma County, California. In this specimen the main axis is described as six cells thick and is said to broaden somewhat at the apex, thus showing (as Schiffner himself admits) an approach to *R. sinuata.* It is not surprising therefore that his conclusions regarding *R. sinuata* and *R. major* have not been universally accepted by European hepaticologists. Müller,[13] for example, does not accept them at all; in his opinion the differential characters are insufficient even for the establishment of a variety and he cites *A. major*[14] "mit ruhigem Gewissen" as a simple synonym of *A. sinuata* (Dicks.) Dumort. Macvicar,[15] on the other hand, accepts *A. major* as a valid species distinct from *A. sinuata.* At the same time he states that "it is doubtful how far" it "is permanently distinct" and cites a specimen from Sussex in which some of the thalli are bi- or tripinnate.

From the data in the literature and from the study of a large series of specimens the writer is inclined to regard *R. major* as a poorly developed form or variety of *R. sinuata,* rather than as a distinct species, its peculiarities being apparently associated with an unfavorable environment. It may be added that some of the material from California represents the more typical form of *R. sinuata,* the thalli being often tripinnate and the main axis seven to nine cells in thickness. This is true, for example, of the two specimens collected by Mrs. Sutliffe in 1922 at the following stations: Big Carson Canyon and Mt. Tamalpais, both in Marin County.

11. **Fossombronia hispidissima** Steph. Mém. Herb. Boissier 16: 35. 1900

Mill Valley, Marin County, Mrs. Sutliffe; near Stanford University, Santa Clara County, C. F. Baker (determined

[13]Rabenhorst's Kryptogamen-Flora 6: 340. 1908.
[14]The combination, *"Aneura major,"* was apparently first used by the writer in connection with a specimen from Alaska (see Zoe 5: 129. 1901).
[15]Student's Handb. British Hep. 55. 1912.

by Stephani and distributed in Pacific Slope Bryophytes, No. 453); Arroyo Grande, San Luis Obispo County, O. D. Allen; Libby Park, Ojai, Ventura County, Miss C. C. Haynes.

In his treatment of the genus Fossombronia, Howe (p. 80) referred all his Californian material to *F. longiseta.* In doing this he assigned to the species a wide range of variation in the surface-markings of the spores. At one extreme the spores (as shown in figs. 16, 18 and 19) were of the cristate type, the markings being in the form of narrow, subparallel ridges, sometimes anastomosing irregularly but rarely forming closed meshes. At the other extreme the spores (as shown in figs. 17 and 20) approached the echinate type, the ridges being broken up more or less completely into spines. These extremes were so different that Howe admitted the possibility of there being more than one species included in what he called *F. longiseta;* he stated, however, that he could not "draw separating lines in any satisfactory way," owing to the apparent existence of intermediate types of spores. At the same time he emphasized the fact that all his specimens "from stations north of San Francisco" had "spores of the purely cristate type."

In Stephani's monograph of Fossombronia, published the year after Howe's work, he proposed *F. hispidissima* as a new species and discussed Howe's figures of *F. longiseta.* In his opinion the differences shown were too great to fall within the limits of a single species and he recognized three species, *F. hispidissima, F. longiseta* and *F. pusilla,* as members of the Californian flora. To the first he assigned hispid spores, to the second reticulate spores, and to the third cristate spores.

The writer has examined many specimens of Fossombronia from various parts of California, but has not seen any in which the spores were reticulate. Spores of this type, moreover, are not shown in Howe's figures. Stephani's *"F. longiseta,"* therefore, must remain uncertain in the absence of the specimen upon which his description was based. However this may be, it seems advisable to recognize *F. hispidissima* as a valid species, even if the surface-markings of the spores are not invariably in the form of discrete spines.

As the writer understands the species, the spores measure 30-40μ in diameter, and the periphery of the spherical face

shows about forty projections measuring 3-4μ in length. These projections sometimes represent actual slender cones tapering to sharp points. In other cases they may represent the optical sections of narrow ridges extending for a variable but short distance from the periphery toward the center of the spherical face. In exceptional cases a series of such ridges may be distinctly parallel when a spore is viewed sidewise, but this appearance is no longer to be made out when the spherical face is turned toward the observer's eye. Except for these occasional parallel ridges the thickenings of the spore wall are exceedingly irregular and consist of sharp slender cones or short and narrow ridges closely crowded together and showing no indications of closed meshes. Although ridges may be evident even in the median portion of the spherical face they are so short and so irregular that they look very different from the longer and anastomosing ridges seen in a spore of the cristate type. Howe's figs. 17 and 20 clearly represent *F. hispidissima.* Fig. 20 was drawn from a specimen collected by A. J. McClatchie at Pasadena, so that this locality also may be cited for the species. Fig. 17 was drawn from a plant which Howe thought might have represented a portion of Howe's original material of *F. longiseta.* It came from the Austin collection but no data were given regarding its collector or the part of California where it was found. The type specimen of *F. hispidissima,* collected at San Francisco by Bolander, has not been seen by the writer.

The occurrence of ridges on spores of the echinate type is by no means unusual. Even in *F. cæspitiformis* (Raddi) De Not. of southern Europe and neighboring regions, which is one of the most distinct species with spores of this character, the projections are really short ridges truncate at the tips; and these ridges, in Schiffner's var. *subcristata,*[16] have often a considerable length and give the spores an approximately cristate appearance, especially when viewed from the side. In another echinate species, the rare *F. mittenii* Tindall[17] of Devonshire, England, the projections are again in the form of short ridges with rounded, truncate or even emarginate apices. The European species which seems to come closest to *F. hispidissima* is

[16]Verhandl. Zool.-Bot. Ges. Wien **59**: 34. 1909.
[17]Jour. Bot. **36**: 44. *pl. 282* B. 1898.

F. echinata Macvicar,[18] based on material from Algeria, Dalmatia and southern Italy and since reported by Casares Gil from Spain.[19] In this species the spores are described as densely hispid, the individual projections being 2-4μ long and acute or subacute at the tips. No intimation is made in the published descriptions that any of the projections are ever in the form of ridges, so that Macvicar's species must show the echinate condition in an especially typical way.

12. **Fossombronia longiseta** Aust. (p. 80)

"California", without definite locality, H. N. Bolander (distributed in Austin's Hep. Bor.-Amer. No. 118); Mill Valley, Marin County, M. A. Howe (distributed in Underwood & Cook's Hep. Amer. No. 157); same locality, Mrs. Sutliffe (a series of specimens); Mt. Tamalpais, Marin County, M. A. Howe 6; Yosemite Valley, Mariposa County, A. W. Evans; Ione, Amador County, Miss Alice Eastwood; Spencer Valley, San Diego County, L. Abrams 3800; Claremost, Los Angeles County, P. A. Munz 4727. This list is based on the specimens in the Yale Herbarium; Howe gives several additional localities for the species, but it is possible that some of his records are based on what is here called *F. hispidissima.* Outside of California the only station for *F. longiseta* known to the writer is Cherry Creek, Santa Catalina Mountains, Arizona, G. E. Nichols.[20]

The segregation of *F. hispidissima* as a species leaves a residue of California Fossombroniæ in which the spores conform to the cristate type. Unfortunately, these cristate spores vary markedly in the number of ridges that they show, this number being most conveniently estimated for comparative purposes by counting the projections at the periphery of the spherical face. In the specimens distributed by Austin in his Hepaticæ Boreali-Americanæ there are usually from 22 to 26 of these projections. Since these spore-bearing specimens were issued by Austin himself they may well be regarded as authentic representatives of *F. longiseta,* especially in the absence of an actual type specimen, to which Howe calls

[18]Rev. Bryol **38**: 73 *f. l.* 1911.
[19]Trab. Mus. Nac. Cien. Nat. Ser. Bot. **8**: 25. 1915.
[20]See Evans, Bryologist **20**: 61. 1917.

attention. Some of the specimens collected by Mrs. Sutliffe in Mill Valley conform pretty closely to these numbers, one having spores with 24 to 27 projections, another with 21 to 24, and still another with 18 to 24. In other Californian material, however, the spores show from 16 to 20 projections; this is the case, for example, in Howe's No. 6 from Mt. Tamalpais and in Abrams' specimen from Spencer Valley. In still other material the spores have from 26 to 32 projections, as in one of Mrs. Sutliffe's Mill Valley specimens and in Miss Eastwood's specimens from Ione. These variations in the number of ridges are shown clearly in Howe's figs. 16, 18 and 19.

In Europe the two best known species with cristate spores are *F. pusilla* (L.) Dumort. and *F. wondraczeki* (Corda) Dumort. In *F. pusilla* the number of peripheral projections is given as 16 to 18 by Müller and as 16 to 24 by Macvicar. In *F. wondraczeki* the numbers are 30 to 32 and 28 to 36, respectively. There is no evidence that these species intergrade, and *F. wondraczeki* seems to be perfectly constant in eastern North America, where *F. pusilla* is apparently unrepresented. It will be noticed that the Californian specimens include forms with just as few spore-ridges as *F. pusilla,* others with as many as *F. wondraczeki,* and still others with an intermediate number. It might therefore at first appear as if three species were present, *F. pusilla, F. wondraczeki* and a species between them, for which the name *F. longiseta* could be retained. It would, however, be difficult, if not impossible, to tell where *F. longiseta* ended and the other species began, owing to the fact that the number of ridges in the intermediate type of spore tends to vary toward both extremes.

In view of these facts it seems advisable to search for differential characters in the gametophyte. It is well known that the leaves in the various species of Fossombronia are unfortunately very inconstant in size, in shape and in the character of their lobing, and that the pseudoperianths are equally inconstant in their features, so that little can be hoped for here. Differences in habit, however, seem to be more trustworthy and apparently these can be utilized in the present instance. In northern Europe, for example, *F. pusilla* and *F. wondraczeki* seem to be definitely annuals, producing their spores in the late summer and early autumn and presenting

no gametophytic adaptations for carrying them through the winter. They thus stand in sharp contrast to such species as *F. angulosa* Raddi, which produce their spores in the late winter or spring and which seem to be definitely perennials. So far as observations go the Californian Fossombroniæ are all perennial and even, in some cases, produce tuberous thickenings of the stem, enabling them to withstand periods of dryness. If this perennial habit proves constant the writer suggests that the name *F. longiseta* be retained for all cristate-spored forms of the region and that a range in the number of peripheral projections from 18 to 32 be admitted. Of course, if it should be demonstrated that the perennial habit or the power to produce tubers was restricted to forms having a more limited range in the number of surface-ridges, a segregation might be indicated.

It should be mentioned in this connection that the spores with few ridges in the Californian specimens, although simulating those of *F. pusilla* in a marked degree, do not absolutely agree with them, owing to the fact that the ridges are only 2-3μ high, while those of *F. pusilla* are usually 3-5μ high and may be as much as 7μ high in the case of the var. *decipiens* Corbière. Since, however, the ridges in poorly developed plants of *F. pusilla* are often lower, this distinction must be used with caution. It should be mentioned also that Schiffner has recently described and figured, under the name *F. loitlesbergeri,*[21] a perennial species from Dalmatia with cristate spores, in which the number of marginal projections is about 25. The spores thus occupy, so far as the number of ridges is concerned, an intermediate position between those of *F. pusilla* and those of *F. wondraczeki.* Although at first sight *F. loitlesbergeri* might seem to approach *F. longiseta* very closely, its spores are considerably larger, measuring 50-60μ in diameter, and the ridges are 6-7μ high. Since the spores of *F. longiseta* are only 40-50μ in diameter and since the ridges are only 2-3μ high the two species seem to be amply distinct.

[21]Hedwigia 48: 195. *f. 1-14.* 1909.

13. **Fossombronia pusilla** (L.) Dumort.

Stephani's record for California[22] was based on specimens collected by Howe, no definite station being mentioned. These particular specimens have not been available for study, but the writer feels convinced that they must represent some form of *F. longiseta,* probably a form in which the number of ridges on the spores was relatively small. Spores of this character are represented in Howe's fig. 18, drawn from a Mill Valley specimen. Until it is definitely established that such spores are associated with annual gametophytes, there seems to be no conclusive reason why *F. pusilla* should be considered a member of the Californian flora. In fact, the occurrence of the species in North America is very doubtful, all the records (so far as known) being based on sterile or incorrectly determined specimens.

14. **Marsupella sullivantii** (De Not.) Evans

On rocks. Gold Lake, Plumas County, September, 1900, J. B. Leiberg 5496. New to California; widely distributed in northern countries and previously reported from Washington.

15. **Nardia crenulata** (Sm.) Lindb. (p. 94)

In the writer's opinion the true *N. crenulata* has not yet been found in the western part of North America. It is replaced in the Pacific Coast region by the closely related *N. rubra* (Gottsche) Evans,[23] a species which Howe included among the synonyms of *N. crenulata.*

16. **Nardia obovata** (Nees) Lindb. (p. 96)

The writer feels convinced that the specimens from Blue Lake, Humboldt County, upon which Howe's record was based, represent *Jungermannia sphærocarpa* Hook. or some closely related species.[24] Unfortunately the specimens are too

[22]Mém. Herb. Boissier **16**: 25. 1900.
[23]See Bryologist **22**: 62. 1919.
[24]See Rhodora **21**: 163. 1919.

fragmentary for a positive determination, more especially since *J. sphærocarpa* is otherwise unknown from California.

17. **Jungermannia lanceolata** L.

On wet soil along a stream, Lower Salmon Lake, Sierra County, October, 1921, Mrs. Sutliffe. New to California; widely distributed in northern regions and previously known from Washington.

18. **Jungermannia pendletonii** (Pearson) comb. nov.

Aplozia pendletonii Pearson, Bryologist **23**: 50. pl. 2. 1920

This interesting species was discovered by George M. Pendleton on the western side of Mt. Shasta, at an altitude of 4000 feet. Specimens collected on May 8, 1910, were distributed by Miss Haynes in her American Hepaticæ (No. 90), under the name *Jungermannia cordifolia* Hook.; the type specimens were collected on August 4, 1917; and still other material is dated April 16, 1919. Only the 1910 and 1919 specimens have been examined by the writer.

Although *J. pendletonii* is amply distinct from *J. cordifolia* the two species resemble each other very strongly, especially when well developed. Both are characterized by a tufted habit and a dark green color, often blackish when dry and sometimes tinged with a purplish, brownish, or brownish red pigmentation; both show occasional terminal branches of the Frullania type and also intercalary branches, the latter arising near the ventral bases of the leaves; and the leaves in both tend to assume a suberect position, clasping and partially concealing the stem.

When the leaves are dissected off and spread out flat certain differences at once become apparent. In *J. cordifolia* the leaves are broadest just above the base and then taper gradually but distinctly to a rounded apex. They are usually described as "heart-shaped," but the basal portion is rounded on the sides rather than cordate and is even very slightly decurrent. The leaf-cells are characterized by their thin but often pigmented walls, by the almost complete absence of trigones,

and usually by the presence of delicate striolations on the cuticle. In some cases, especially toward the margins of the leaves, very minute trigones with concave sides can be demonstrated, but they are so indistinct that they are practically negligible. In *J. pendletonii* the leaves are approximately orbicular and do not show the tapering found in *J. cordifolia,* although the rounded basal portions are not dissimilar in the two species. The leaf-cells yield further distinctions. In *J. pendletonii* the median cells are mostly 40-50μ long and 25-30μ wide, while the marginal cells are 27-32μ in diameter; in *J. cordifolia* the median cells are mostly 40-45× 20-30μ, while the marginal cells are only 20-23μ in diameter, the cells thus showing a more marked decrease in size in passing from the median portion outward. In *J. pendletonii,* moreover, it is usually possible to demonstrate distinct trigones, especially in the marginal portions of the leaves, but the striolations are very indistinct although not entirely absent.

Pearson emphasizes as a characteristic feature of his species the presence of two layers of cells in the basal portion of the leaf, the two layers not being "regularly arranged cell on cell" but crossing each other. This two-layered portion does not stretch entirely across the leaf but occupies a vaguely defined area toward the ventral side. In poorly developed leaves the area is much reduced in size and may be absent altogether. Just how distinctive this feature really is remains to be determined, since very few species of Jungermannia have been studied from this particular point of view. It is not, however, absolutely distinctive. The robust Norwegian material of *J. cordifolia,* for example, collected by E. Jörgensen at Gulen in Sördfjord and distributed in Schiffner's Hepaticæ europaeæ (No. 394), shows small basal leaf areas where the cells are in two layers; and the same thing is true of some of the more vigorous North American specimens examined by the writer. None of these, however, are comparable in distinctness with the much larger areas found in *J. pendletonii.*

The male inflorescence of *J. pendletonii* was unknown to Pearson, but he described the perichætial bracts and perianths and illustrated them in a supplementary note.[25] According

[25]Bryologist 23: 84, 85. *f.* 1-3. 1920.

to his account the perianths are considerably shorter than the bracts, and yet he regards them as "normal-sized and perfect." They are said to be four- or five-plicate in the upper part, abruptly contracted at the mouth, and entirely free from the bracts, the latter being similar to the leaves. The writer is unable to add to this description, since the specimens at his disposal are wholly sterile, but it seems hardly probable that the perianths studied by Pearson were associated with fertilized archegonia.

The Californian species of Jungermannia are in need of further study. In September, 1866, Bolander discovered two species, *J. bolanderi* Gottsche and *J. danicola* Gottsche, on Mt. Dana, at an altitude of about 3100 meters. Neither of these species has since been collected, and our knowledge concerning them is still unsatisfactory, as Howe has pointed out (pages 99 and 101). According to his descriptions and Gottsche's figures,[26] *J. danicola* is paroicous and is evidently a member of the *J. sphærocarpa* group. *J. bolanderi,* on the contrary, may be an ally of *J. pendletonii,* and Pearson in a recent letter expressed the fear that the two species might prove synonymous. A very fragmentary specimen of *J. bolanderi* in the herbarium of the New York Botanical Garden shows that this is probably not the case. The leaves do not show a two-layered area; neither do they clasp the stem, but spread obliquely, as Gottsche's figures show. Howe's description of the perianth in an immature condition is much like Pearson's account of that organ in *J. pendletonii,* but fully developed perianths might perhaps yield distinctive characters.

19. **Jungermannia riparia** Tayl.

In the rocky bed of a stream, near Willoughby Mine, Sierra County, October, 1921, Mrs. Sutliffe; near Shasta Retreat, Siskiyou County, September 1, 1922. Miss Eastwood. New to California; widely distributed in Europe but previously known in North America from British Columbia and Washington only.

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[26]Published by Underwood, Bot. Gaz. **13**: *pl. 3, 5.* 1888.

20. **Lophozia baueriana** Schiffn.

Reported from California by Conklin,[27] the record being based on a specimen collected at Sisson by George M. Pendleton. By most writers *L. baueriana* is now regarded as a synonym of *L. hatcheri* (Evans) Steph.

21. **Lophozia exisa** (Dicks.) Dumort.

Lake Lagunitas, Marin County, March, 1922, Mrs. M. L. Campbell *2*, in part. New to California; widely distributed in northern regions and previously known from Washington.

22. **Lophozia hornschuchiana** (Nees) Schiffn.

On moist earth, decayed wood and rocks, Lower Salmon Lake and vicinity, October, 1921, Mrs. Sutliffe (nine specimens). New to California; widely distributed in northern regions and previously known from Oregon and northward.

23. **Lophozia ovata** (Dicks.) M. A. Howe (page 111)

Most recent writers refer this species to the genus Diplophyllum, where it appears under the name *D. ovatum* (Dicks.) Steph.[28]

24. **Chiloscyphus polyanthos** (L.) Corda (p. 118)

If Schiffner's recent segregations[29] are accepted the occurrence of the true *C. polyanthos* in California must be regarded as doubtful. The genus is represented in the state, however, by the three species cited below. Some of the specimens enumerated are listed by Howe under the typical form of the species and others under *C. polyanthos rivularis* (Schrad.) Nees (p. 119). Several of Howe's specimens have not been seen by the writer.

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[27]Bryologist **15**: 11. 1912.
[28]See Miss Haynes, Bryologist **21**: 89. 1918.
[29]See Beih. Bot. Centralbl. **29**[2]: 74-116-*pl. 1, 2.* 1912.

25. **Chiloscyphus fragilis** (Roth) Schiffn.

Without definite locality, H. N. Bolander; Yosemite Valley, C. M. Cooke.[30]

26. **Chiloscyphus pallescens** (Ehrh.) Dumort.

On wet logs, Big Valley Mountains, Modoc County, M. S. Baker and F. P. Nutting.

27. **Chiloscyphus rivularis** (Schrad.) Loeske.

Without definite locality, H. N. Bolander; Humboldt County, Miss K. Inglis; near Lake Lagunitas, Marin County, Mrs. Sutliffe; Sacramento River, near Sisson, Siskiyou County, M. A. Howe (specimens from this locality were distributed in Underwood & Cook's Hep. Amer., No. 170, as *C. polyanthos rivularis);* McCloud River country, Siskiyou County and near Shasta Retreat, Siskiyou County, Miss Eastwood; near Salmon, Horse and Packer Lakes, Sierra County, Mrs. Sutliffe (six specimens); Horse Corral Meadows and vicinity, Tulare County, F. J. Coulter (five specimens).

28. **Cephalozia affinis** Lindb.

Reported from California by the writer,[31] the record being based on specimens collected by G. M. Pendleton at Sisson, Siskiyou County.

29. **Cephalozia divaricata** (Sm.) Dumort. (p. 127)

During recent years *"C. divaricata"* and its allies have been intensively studied, especially by the European hepaticologists Schiffner and Douin. As a result of his investigations Douin reached the conclusion that this group of plants was not only generically distinct from Cephalozia but that it represented a distinct and well-marked family, to which he gave the name Cephaloziellaceæ. He distinguishes six genera, only two of which, Cephaloziella and Prionolobus, are recognized members of the California flora. His latest paper dealing with the

[30]See Evans, Rhodora **14**: 218. 1912.
[31]Bryologist **17**: 89, 1914.

group was published in 1920[32] and has been of great help to the writer in determining the Californian material. Howe's "*Cephalozia divaricata*" is listed below (at least in part) under the name *Cephaloziella byssacea,* while his var. *scabra* (p. 129) is regarded as a synonym of *C. papillosa.* Two other species are reported for the first time from the state, and a fifth species, *C. palulifolia,* although unknown to the writer, is briefly alluded to.

30. **Cephaloziella byssacea** (Roth) Warnst.

Without definite localities, H. N. Bolander (several specimens); "Mission Hills," H. N. Bolander; Yosemite Valley, A. W. Evans.

31. **Cephaloziella hampeana** (Nees) Schiffn.

On banks, Wheeler's Sulphur Springs, Ventura County, February, 1921, Miss C. C. Haynes 2041. New to California, but widely distributed in Europe and in most parts of North America.

32. **Cephaloziella limprichtii** Warnst.

On earth, Mill Valley, Marin County, February, 1922, Mrs. M. L. Campbell 3. New to California; widely distributed in northern regions but heretofore known from very few North American localities. The synonymy of the species is greatly confused.

33. **Cephaloziella papillosa** (Douin) Schiffn.

Cazadero, Sonoma County, M. A. Howe; Mill Valley and Lake Lagunitas, Marin County, M. A. Howe; Muir Woods (Redwood Canyon), Marin County, Mrs. M. L. Campbell. Howe's specimens were determined by Douin.

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[32]Mém. Soc. Bot. France 29: 1-90. *f.* 1-9. 1920.

34. Cephaloziella patulifolia (Steph.) Douin, Mém. Soc. Bot. France 29: 70. 1920

Cephalozia patulifolia Steph. Bull. Herb. Boissier II. **8**: 509

This species was based on a specimen collected in California by Bolander, no more definite locality being mentioned in the published descriptions. Through the kindness of Mr. Maxon the writer has had the privilege of studying Bolander's Cephaloziellæ in the U. S. National Herbarium but has found nothing that agrees with Stephani's or Douin's account. According to the latter writer *C. patulifolia* agrees with *C. papillosa* in having rough leaves and underleaves but differs in its autoicous inflorescence. Stephani quotes Howe's var. *scabra* as a possible synonym of *C. patulifolia* but Douin cites it definitely under *C. papillosa.*

35. **Cephalozia Turneri** (Hook.) Lindb. (p. 129)

This species is a representative of the genus Prionolobus and may be known as *P. turneri* (Hook.) Schiffn.

36. **Scapania heterophylla** M. A. Howe (p. 155)

This interesting Scapania is still known only from the type locality, Sisson, Siskiyou County, where it was collected on submerged stones in a mountain stream by Howe in 1894. Since its description by Howe it has been studied by Müller,[33] by Stephani[34] and by Warnstorf.[35] Müller admitted its validity but recognized its close relationship to *S. undulata* (L.) Dumort. Stephani regarded it as "ganz deformiert" and suggested that it might perhaps be referable to some other species of the genus, without attempting to settle the matter definitely. Warnstorf went still further and reduced it to varietal rank under *S. undulata,* its name thus becoming *S. undulata* var. *heterophylla* (M. A. Howe) Warnst. In his opinion the uninjured leaves at the tips of the stems and branches are quite indistinguishable from those of *S. undulata,* and for this

[33]Nova Acta Kais. Leop.-Carol. Akad. Naturf. **83**: 137. 1905.
[34]Sp. Hepat. **4**: 138. 1910.
[35]Hedwigia **63**: 111. 1921.

reason he considers the reduction justifiable. He makes no mention, however, of the unlobed leaves, which Howe describes as interpolated among the more normal bilobed leaves. Until the significance of these is more fully understood, it seems wisest to keep *S. heterophylla* distinct from *S. undulata.*

37. **Scapania perlaxa** Warnst. Hedwigia 63: 70. 1921

The type specimen of this species is preserved in the Botanical Museum at Berlin-Dahlem and was collected by Bolander on wet granite rocks in the Yosemite Valley. The writer has as yet been unable to examine this specimen and has seen no material of Bolander's that agrees with Warnstorf's description, although all the Californian Scapaniæ in the U. S. National Herbarium have been available for study. According to its author, *S. perlaxa* bears a resemblance to *S. geniculata* Massal., a species which Arnell[36] considers a synonym of *S. helvetica* Gottsche and scarcely distinct from the widely distributed *S. irrigua* (Nees) Dumort. The distinctive features emphasized by Warnstorf are the rounded and entire leaf-lobes, the hydrophytic habit, the distant leaves, and the long flagelliform branches. The implied absence of trigones in the leaf-cells might seem to indicate an approach to *S. undulata,* but further studies are clearly necessary before the relationships of the species are adequately established.

38. **Scapania subalpina** (Nees) Dumort.

First recorded from California by Müller,[37] the following two stations being cited: Yosemite Valley, bank of the Merced River, H. N. Bolander, and Sierras, June, 1864, W. H. Brewer. It is now possible to report the species from three additional localities, namely: "wet bank of stream flowing out of Deer Lake, Sierra County, 6950 ft. alt.," Mrs. Sutliffe; Horse Corral Hill and East Fork of Clover Creek, Tulare County, F. J. Coulter.

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[36]Schwedish. Art. Diplophyllum u. Martinellia 37. 1922.
[37]Nova Acta Kais. Leop.-Carol. Akad. Naturf. 83: 69. 1905.

39. **Porella rivularis** (Nees) Trevis.

The correct name for this species seems to be *P. cordæana* (Hüben.) Evans.[38]

The additions and subtractions recorded in the preceding notes represent a net addition of 16 species to the flora of California since the date of Howe's work. The total number of species now known from the state is thus increased to 101.

[38]See Bryologist 22: 72. 1919.