

# Eleocharis mamillata Lindb. fil. and allied species

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## ***Eleocharis mamillata* Lindb. fil. and allied species**

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In his paper on the group of *Eleocharis palustris* s. l. in Northern Europe, Lindberg (1902) divided the aggregate species into three, viz. *Eleocharis eupalustris*, *Eleocharis uniglumis* and *Eleocharis mamillata*, the last-named a new species not previously recognised in any form. The most important characters which he gave to separate the new species from *Eleocharis eupalustris* are:—

1. Stem weak, clearly furrowed, with about 12 vascular bundles and thin palisade tissue (cf. *Eleocharis eupalustris* with strong, smooth or slightly lined haulm, with about 20 vascular bundles and well-developed palisade tissue).
2. Style-base of fruit low, almost sessile, mamillate (cf. *Eleocharis eupalustris*, with style-base longer than broad and clearly joined to fruit by a narrower neck).
3. Bristles with long teeth (5) 6 (8), never absent or rudimentary, always exceeding style-base (cf. *Eleocharis eupalustris*, bristles 4, rarely absent or rudimentary, not exceeding style-base).

Inspection of Scandinavian herbarium material reveals that the Lindberg characters are remarkably constant, and that the plant is quite common and widely distributed, as Lindberg and other Scandinavian workers following him (notably Samuelsson) have shown, in Norway, Sweden and Finland. In the summer of 1948 I was able to see typical *Eleocharis mamillata* in both Sweden and Finland; for example, the plant was seen growing with *Eleocharis palustris* near Uppsala, Sweden, in a small largely overgrown pond in a clearing in the coniferous forest. Here the fruit and haulm characters were both reasonably easy to work in the field; the former required the use of a lens, but the weakness and easy compressibility of the haulms, and the presence of relatively few rather obvious and widely-spaced bundle-ridges on the surface, were fairly clear characters. Intermediates between *Eleocharis palustris* and *Eleocharis mamillata* certainly exist, particularly in respect of the haulm character, but also in fruit characters; but they do not seem to be more numerous in herbaria than are *Eleocharis palustris-uniglumis* intermediates, and the species clearly

deserves the status accorded to *Eleocharis uniglumis*. Thus, in the material under "*Eleocharis palustris*" in Herb. Mus. Bergen, Norway, which had ripe fruit, 25 sheets were referable to *Eleocharis palustris*, 23 to *Eleocharis mamillata*, and only two were intermediate. Identifications on general appearance without reasonably well-developed fruit, are, of course, risky, and much herbarium material is therefore not with certainty classifiable in this way; but the majority of plants can be classified into two groups on haulm structure alone, and there is good reason to believe that this character is reliable, at least in Scandinavia.

The first records for *Eleocharis mamillata* from Central Europe appear to be due to H a y e k (1910), in a note in which he describes a new *Eleocharis* species, *Eleocharis austriaca*. It is clear from his comparative description that the new species occupies an intermediate position between *Eleocharis palustris* and *Eleocharis mamillata*; he states, however, that both these species also occur in Steiermark (Styria, Austria), although *Eleocharis austriaca* is commoner than either. The important points from H a y e k's description of this new species are:—

1. Vascular bundles 15—20, "sub-remote"; palisade rather thin.
2. Style-base gradually attenuate.
3. Bristles 6.

He states that the plant is distinguishable from *Eleocharis palustris* on haulm appearance, on the possession of 6 bristles, and on the style-base which is less clearly set off from the fruit by a neck region; and from *Eleocharis mamillata* on the more numerous bundle-ridges on stiff, grey-green haulms, and on the longer style-base.

Of the sheets of *Eleocharis austriaca* which H a y e k distributed with the attached printed description, I have seen three in different herbaria. All are from the same locality (Styria, cf. Appendix)—presumably a single gathering. The first sheet seen (in Herb. Univ. Helsinki, Finland) fits the description admirably, with the exception of the fruit which mostly has *five* bristles, though occasionally six (or four). The second sheet (in Herb. Mus. Bot. Lund, Sweden) was, however, rather surprising, consisting of three rooted specimens of a plant not distinguishable from *Eleocharis mamillata*, and only a single detached haulm which possessed the *Eleocharis austriaca* characters of the first sheet. In view of this, I thought it the more desirable to see H a y e k's own material in his herbarium (at Göteborg, Sweden). This proved to contain a third sheet; again a mixed sheet as the second, with one plant of *Eleocharis austriaca* and one of *Eleocharis mamillata*. Of the other eleven sheets labelled "*austriaca*" (either by H a y e k on the original label, or in pencil—? also by H a y e k), the only sheets with reasonably well-developed fruit, three in number, were not *Eleocharis austriaca* but *Eleocharis palustris*. Of the remainder, at least three had the haulm



and spike appearance of *Eleocharis austriaca*, however. Finally, a sheet labelled *Eleocharis mamillata*, which seems to be rather intermediate between the two species, is one of the two plants mentioned by H a y e k in his records of *Eleocharis mamillata* (cf. Appendix).

It is difficult to believe, in view of his careful description of *Eleocharis austriaca* and the characters separating it from *Eleocharis mamillata* and *Eleocharis palustris*, that H a y e k did not in fact satisfactorily distinguish the three plants in Styria; although one must admit that on the basis of his distributed material and the sheets in his own herbarium it would be very difficult to disentangle the three species. Fortunately, however, the work of B e a u v e r d provided corroborative evidence of the validity of the new species.

B e a u v e r d was struck by certain differences shown by "*Eleocharis palustris*" material which he had gathered by an alpine lake, and described this as a new species, *Eleocharis benedicta* (1921). (For details of the type material, see Appendix). His description emphasises the following points:—

1. Habit rather densely-tufted, "multicaule".
2. Spike structure of "six helixes" (i. e. a densely-flowered spike).
3. "Dehiscent" glumes.

The type material confirms these characters. The habit character, however, is likely to be of little taxonomic value; and the caducous glumes presumably only reflect the density of the spike and the low pitch of the "genetic spiral", which forces the fruiting glumes outwards and strains their point of attachment to the rachis. (A similar tendency is shown by the glumes of *Eleocharis palustris* ssp. *microcarpa* [W a l t e r s , 1949] which normally possesses a dense spike; the character has clearly nothing of the fundamental taxonomic importance which B e a u v e r d ascribes to it when he groups the *Radicantes*—[roughly S v e n s o n ' s *Palustres*]—into *Dehiscentes* and *Indehiscentes*.) Only the dense spike remains as an important character from the B e a u v e r d description. There is, however, also the surprising statement by B e a u v e r d elsewhere in the paper that the normal number of bristles in the group of "*Eleocharis palustris*" is *five*, reduced to four in many-flowered spikes, and sometimes increased to six in the terminal flower; and that neither size or number of bristles is of taxonomic importance. Now five-bristled *Eleocharis palustris* fruits are excessively rare; and in *Eleocharis uniglumis* the condition is by no means common. It seems that this statement is really based on the *Eleocharis benedicta* material only—for which the bristle numbers are true, i. e. the majority of fruits show five bristles, but some have six or four. Moreover, the fruits of the type material of *Eleocharis benedicta* have a long narrow style-base, and in all other characters, of haulm appearance, spike colour, etc.,



agree perfectly with *Eleocharis austriaca* Hayek as on the sheet in Herb. Univ. Helsinki. There can be no doubt that together they constitute a species with as clearly definable morphological characters, ecological preference and geographical range as *Eleocharis mamillata* and *Eleocharis uniglumis* (see p. 279 for a complete description of the species).

The Swedish systematist Samuelsson, who was, of course, familiar with *Eleocharis mamillata* in the field, inspected the Swiss *Eleocharis* material in Zürich herbaria, and gave in a paper published later (1922) a list of 21 localities for *Eleocharis mamillata* in Switzerland. In this paper he refers to Hayek's record of *Eleocharis mamillata* for Austria as the first for Central Europe, but makes no reference whatever to *Eleocharis austriaca*. It seemed probable from this fact that Samuelsson had not distinguished between *Eleocharis austriaca* and *Eleocharis mamillata* in the Zürich material. Accordingly I felt it desirable to see this material. The results of the study, given in detail in the Appendix, were as expected. The largest number of sheets determined as *Eleocharis mamillata* by Samuelsson were clearly referable to *Eleocharis austriaca*. Four plants agreed closely with the Scandinavian material, and are presumably correctly identified as *Eleocharis mamillata*; and one showed somewhat intermediate fruit characters. No attempt was made to identify plants with no ripe fruit; for, although, as will be suggested later, it may be generally possible to distinguish the two species on vegetative characters, much more detailed work is required on this before a satisfactory basis for such identification is reached. Samuelsson, it appears, relied to a considerable extent on the vegetative characters for his determinations; this, of course, explains much of the confusion, as both species differ from *Eleocharis palustris* in the possession of weaker haulms and fewer vascular bundles, though *Eleocharis mamillata* is more extreme in this respect. One comment of Samuelsson's—a note on one of the Zürich sheets (cf. Appendix, *Eleocharis austriaca* No. 8)—is perhaps worth quoting, as indicating that he was not entirely content with his identifications: "Eine *Scirpus mamillatus* sehr ähnliche Form von *Scirpus palustris* L. Man bemerke die Zahl der Perigonborsten (4) und die Form der Griffelbasis." This plant is typical *Eleocharis austriaca* in every character except that of bristle-number; the majority of fruits having four bristles, although a certain number show five.

It is clear from the inspection of Zürich and other Swiss herbarium material that *Eleocharis austriaca* is quite widespread in the Alps, whereas true *Eleocharis mamillata* is very much rarer. Quite a high proportion of the material under "*Eleocharis palustris*" is indeed referable to *Eleocharis austriaca*; and the relative rarity of intermediates

between *Eleocharis palustris* proper and *Eleocharis austriaca* confirms one's impression of the distinctness of the species.

So far as I am aware, the only European author since Hayek who has considered the question of *Eleocharis mamillata* and allied plants in Central Europe is K. Fritsch, who worked on the flora of Styria, and was naturally familiar with Hayek's work. Fritsch explains (1926, p. 226) that he has attempted to distinguish within the aggregate "*Eleocharis palustris*" five plants, viz. *Eleocharis palustris* sensu stricto, *Eleocharis uniglumis*, *Eleocharis mamillata*, *Eleocharis gracilis* Hayek and *Eleocharis glaucescens* (Willd.) Schult. In the last-named he includes all more or less glaucous plants of the "*palustris*" type (by this he presumably means those with two subequal sterile basal glumes to the spike), and also *Eleocharis austriaca* Hayek. His key to the genus (1922) emphasises as characters of his *Eleocharis glaucescens* the grey-green haulms and the usually six-bristled fruits. It seems likely that most of his records for this species are therefore *Eleocharis austriaca*.

A brief consideration of Hayek's other species *Eleocharis gracilis* must now be made. The material I have seen (in Herb. Univ. Helsinki) completely fails to agree with the type description on the attached label in two of the most important particulars; firstly the basal glume by no means "almost completely encircles the spike"—in fact there is the usual pair of sterile glumes—and secondly the bristles are 4 (5) on a number of young fruits inspected, not as described "mostly six". The material has unfortunately no developed fruit, so that fruit characters could not be checked. Other sheets distributed may, of course, fit the description, and the case may be exactly parallel to that of the *Eleocharis austriaca* material, in that a mixture has been distributed under the name—but a present there seems to be nothing to justify the use of the name, and it appears that Fritsch knows nothing of the plant in the field, but merely adopts Hayek's description and comments. Podpera, in an account of the Cyperaceae of Moravia (1928), includes *Eleocharis gracilis* (and *Eleocharis glaucescens* and *Eleocharis mamillata*), but adds nothing, merely quoting from the work of Hayek and Fritsch.

Let us now consider in greater detail the various characters which have been used, by Lindberg, Hayek and Beauverd, to distinguish these species. Those provided by the spike and fruit will be taken first. Both species have two subequal basal glumes, a densely-crowded spike with high phyllotaxis fractions, and caducous fertile glumes (cf. above p. 273). There seems to be little difference between the two species in these respects, and both resemble rather closely in spike structure the ssp. *microcarpa* of *Eleocharis palustris*, although generally the glumes of *Eleocharis mamillata* and of *Eleocharis*



*austriaca* are of a richer brown colour. In glume and fruit size, again, there is a close resemblance between these two species and ssp. *microcarpa* of *Eleocharis palustris*. In fruit shape there is a general difference (as noted, for *Eleocharis mamillata*, by Lindberg); as the photographs show to some extent, the fruits of *Eleocharis mamillata* (and *Eleocharis austriaca* to a less marked degree) tend to be broader and more nearly circular in outline than those of *Eleocharis palustris*. They differ markedly, however, from each other and from *Eleocharis palustris* in the style-base shape. The wide, low, style-base of *Eleocharis mamillata* contrasts sharply with the long, narrow style-base of *Eleocharis austriaca*; and both differ from the *Eleocharis palustris* style-base, which is rather longer than broad and sharply set off from the fruit by a rather narrow "neck".

The fruit surface markings in both species resemble closely those of *Eleocharis palustris* ssp. *microcarpa*; in colour, however, there seems to be a general difference; ripe fruits of *Eleocharis mamillata* and *Eleocharis austriaca* are, with rare exceptions, yellow or yellow-brown, whilst those of *Eleocharis palustris* are usually brown. The final characters provided by the ripe fruit are those of the bristles. The number of bristles has, of course, the advantage of quantitative expression, and is therefore of particular value. The data of Table I show the variation in number to be found firstly within a single plant, and secondly within each species. All stages in the fusion of two (or even, in *Eleocharis mamillata*, three) bristles can be found; all such fused pairs, distally separate, have been counted as two bristles. In *Eleocharis austriaca* a very common arrangement is that of single bristles placed laterally and adaxially, and a basally fused pair situated abaxially. When six bristles are present in either species there is usually both an abaxial and an adaxial pair.

It is clear that on bristle number alone, the separation of *Eleocharis mamillata* from *Eleocharis palustris* is virtually complete. This is not the case with *Eleocharis austriaca*, which is intermediate in this respect; but the constant occurrence of some, usually a majority, of 5-bristled fruits serves to distinguish it. The differences in bristle length found in *Eleocharis palustris* and *Eleocharis uniglumis* (cf. Walters, 1949, p. 204) are not apparently shown by *Eleocharis mamillata* and *Eleocharis austriaca*, which invariably, in the material I have seen, have well-developed bristles exceeding the fruit, and with long teeth. It should, however, be borne in mind that if "forma *nulliseta*" of *Eleocharis austriaca* occurs, it may be very difficult to distinguish from the corresponding form of *Eleocharis palustris*; a few plants have been seen in Scandinavian material which combine the characters of narrow style-base with absence of bristles, but the presence of true *Eleocharis austriaca* has not been confirmed in Scandinavia.



Table I  
Bristle number

No. of fruits	No. of bristles					
<i>Eleocharis mamillata</i>	4	5	6	7	8	9
3 gatherings:						
1.	—	1	0	3	4	1
2.	—	2	7	2	—	—
3.	1 <sup>1</sup>	3	1	—	—	—
Total (25)	1 <sup>1</sup>	6	8	5	4	1
<i>Eleocharis austriaca</i>						
7 gatherings:						
1.	2	10	—	—	—	—
2.	1	3	—	—	—	—
3.	3	2	—	—	—	—
4.	1	2	—	—	—	—
5.	1	2	—	—	—	—
6.	2	2	—	—	—	—
7.	6	11	2	—	—	—
Total (50)	16	32	2	—	—	—

Let us now consider the vegetative characters. I have as yet little or no information concerning the plasticity of the two species in habitats of different types, particularly in different water-levels; but it would seem from the variation in herbarium material, from the behaviour of plants now in cultivation, and (in the case of *Eleocharis mamillata*) from my limited field observations, that both species show a considerable plasticity. The normal habitats in both cases, however, are those of the reed-swamp lining ponds and ditches, in *Eleocharis mamillata* particularly on peat soils; and it may be that the "land" modification with very slender haulms often shown by *Eleocharis palustris* is not so readily produced by these species. Indeed, it is probable that the restriction in habitat and correlated habit shown by *Eleocharis uniglumis*, which is rarely if ever found in reed-swamp, and which appears to be unable to produce the fleshy "aquatic" modification, is paralleled by and in contrast to that of these species, which normally exist in reed-swamp habitats and the "aquatic" modification; whilst the common, plastic and most successful species *Eleocharis palustris* can exist in a wide range of habitats and in both extreme forms. With regard to the proportion of rhizomatous and caespitose development, there can be no doubt that variation analogous to that described for *Eleocharis palustris* (Walters, 1949) occurs; Beauverd's "multicaule" caespitose habit in "*Eleocharis benedicta*" is presumably correlated with particular habitat conditions, and by no means characteristic of *Eleocharis austriaca*.

<sup>1</sup> An exceptional fruit which lacks one of the *lateral* bristles.

The weak appearance of the haulm, with its relatively few striations, is, of course, susceptible to closer analysis, as was done by Lindberg and Hayek, who distinguished the species on average number of vascular bundles and thickness of palisade tissue. The essential difference seems to lie in the spacing of the vascular bundles, which appear in the dried haulm as more or less distinct ridges, and with which is closely correlated the spacing of the stomatal rows; and also in the arrangement of the fibre-rows in the epidermis. These differences are well revealed by preparations of the haulm epidermis, which show that for *Eleocharis austriaca*, and to an even greater extent for *Eleocharis mamillata*, the groups of stomatal rows are separated by a wide strip of epidermis, in which occur fibre-rows at intervals of 3—5 epidermal cell rows. In *Eleocharis palustris*, not only are the stomatal row groups nearer together (and therefore also the vascular bundles) but also the fibre-rows are separated by 1—3 rows of epidermal cells only. These differences are shown in the photographs of epidermis with stomata (Fig. 4, 2—5).

The stomata themselves provide important characters. In length they resemble *Eleocharis palustris* ssp. *microcarpa*, but are in both species somewhat broader. Thus, the stomatal length of *Eleocharis austriaca* has been found to vary between 0.05 and 0.06 mm, and that of *Eleocharis mamillata* between 0.05 and 0.06 mm (cf. ssp. *microcarpa* with a range of 0.05—0.065 mm). The parallel between stomatal size and shape and fruit size and shape is rather remarkable; in both cases that of ssp. *microcarpa* is roughly the same in length, but rather narrower. The appearance of the stomata of *Eleocharis mamillata* and *Eleocharis austriaca* is quite different from that of *Eleocharis palustris* or *Eleocharis uniglumis*; this difference seems to be due to a difference in shape of guard cells and subsidiary cells, by virtue of which in *Eleocharis mamillata* and *Eleocharis austriaca* the swollen end of the guard-cells is clearly demarcated from the end of the subsidiary cell alongside, which is not the case in the other species. To some extent this may be merely a result of the much thinner cell-walls characteristic of the two species; but whatever the precise nature of the difference, it seems to be constant and is easily recognisable.

Cytological preparations of pollen grain mitosis from a plant of *Eleocharis mamillata* (collected in Finland, 1948) and one of *Eleocharis austriaca* (Appendix, No. 31) in cultivation gave in each case  $n = 8$  and 9, both numbers being seen in the same preparations. More counts are needed to confirm this irregularity (which has not been found in the many counts made of *Eleocharis palustris* ssp. *microcarpa*, which gives uniformly  $n = 8$ ); but at any rate the two species seem to be closely similar cytologically.

To conclude this account a complete description of *Eleocharis*



*austriaca* is given, based upon all the material seen, and for comparison a differential description of *Eleocharis mamillata* is added.

*Eleocharis austriaca* Hayek (*Eleocharis benedicta* Beauverd)

Habit variable, rhizome development often considerable. Haulms clearly ridged, medium-sized ones with 12—14 bundle ridges of which 6 or 7 are usually visible on the outer side in flattened herbarium material; basal sheaths yellow-brown with a little reddish colouring. Spike 0.5—1.5 cm, ovate or bluntly ovate-lanceolate, dense-flowered; sterile glumes two, short, very obtuse, green with narrow dark stripe and outer hyaline border; fertile glumes ovate, usually deep reddish-brown with narrow paler midrib and narrow hyaline border, caducous in fruting stage. Fruit 1.2—1.5 mm, broadly elliptic-obovate, yellow-brown when ripe. Style-base typically very narrow, not more than 0.5 mm wide, rather high and gradually attenuate without a narrower "neck". Bristles (4) 5 (6), long but easily broken, with rather long, thin teeth (cf. Fig. 1, 1—2, and Fig. 3, 3—4). Stomatal length 0.05—0.06 mm.

By sub-alpine lakes, ponds and streams in the French, Swiss and Austrian Alps (cf. Appendix); ? elsewhere<sup>1</sup>.

*Eleocharis mamillata* Lindb. fil.

Habit variable as for *Eleocharis austriaca*. Haulms weak, easily cracked, very clearly grooved, medium-sized ones with 8—12 bundle-

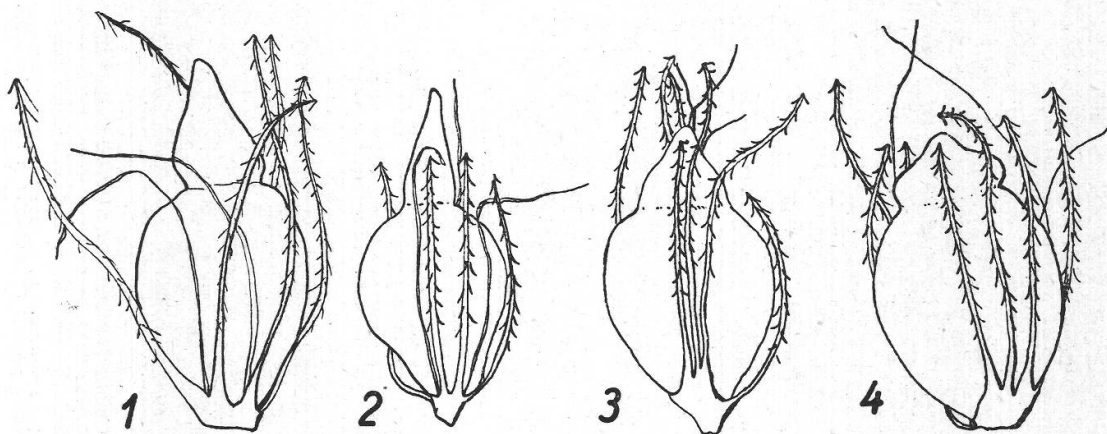


Figure 1

Fruits of *Eleocharis austriaca* (1, 2) and *Eleocharis mamillata* (3, 4), 17 ×  
1. cf. Appendix, No. 27; 2. cf. Appendix, No. 1 ("type sheet"); 3. mixed sheet with 2,  
cf. Appendix, *Eleocharis mamillata*, No. 5; 4. Swedish material

<sup>1</sup> *Eleocharis leptostylopodiata* Zinserling, to judge from the figure and description given in the author's account in Flora USSR (Vol. III, p. 581) is closely similar to, and may be identical with *Eleocharis austriaca*. It is interesting that Z i n s e r l i n g stresses the widely disjunct distribution of this species in the USSR—it occurs in European Russia, the Caucasus, the Urals, and parts of Siberia.



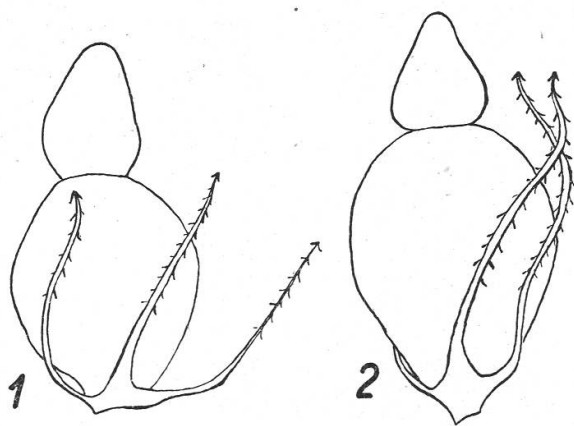


Fig. 2  
Fruits of *Eleocharis palustris*, 17 ×.  
1. ssp. *microcarpa*; 2. ssp. *palustris*  
(ssp. *vulgaris* Walters)  
British material

grooves, of which 4—6 are usually visible on the outer side in flattened herbarium material; basal sheaths usually with some reddish colouring. Spike dense-flowered, size and shape as *Eleocharis austriaca*, fertile glumes brown with rather wide pale midrib, caducous in fruiting stage. Fruit 1.2—1.5 mm, very broadly elliptic-ovate, yellow-brown when ripe. Style-base very wide (0.6—0.8 mm) and very low, “mamillate”, without a narrower “neck”. Bristles (5) 6 (8), long with long thin teeth (cf. Fig. 1, 3—4; Fig. 3, 5, and Fig. 4, 1). Stomatal length 0.05—0.07 mm.

By ponds and lakes, etc., usually on peaty rather than mineral soil; common in Fenno-Scandinavia, ? rare in Central Europe. In European and Asiatic Russia (Zinserling, 1935), Japan (Ohwi, 1944), Alaska (Hultén, 1943); ? in North America (Svenson, 1947; Fernald, 1950, pp. 256—257).

### Summary

*Eleocharis mamillata* Lindb. fil. is a distinct species of the *Eleocharis palustris* aggregate (the “*Palustres*” of Svenson) not uncommon in Fenno-Scandia and well-known to Scandinavian botanists. Most material from Central Europe which has been identified as *Eleocharis mamillata*, however, (including the majority of sheets so determined by Samuelsson [1922]) belongs to a different species, first distinguished by Hayek (1910) as *Eleocharis austriaca*, and later recognised independently by Beauverd (1921) as *Eleocharis benedicta*. This species seems to be common in Switzerland, whilst true *Eleocharis*

Figure 3

1. *Eleocharis palustris* ssp. *microcarpa* (British material). 14 ×
2. *Eleocharis palustris* ssp. *palustris* (ssp. *vulgaris* Walters). 14 ×
3. *Eleocharis austriaca* (cf. Appendix, No. 27). 14 ×
4. *Eleocharis austriaca* (cf. Appendix, No. 1; type). 14 ×
5. *Eleocharis mamillata* (cf. Appendix, No. 5). 14 ×

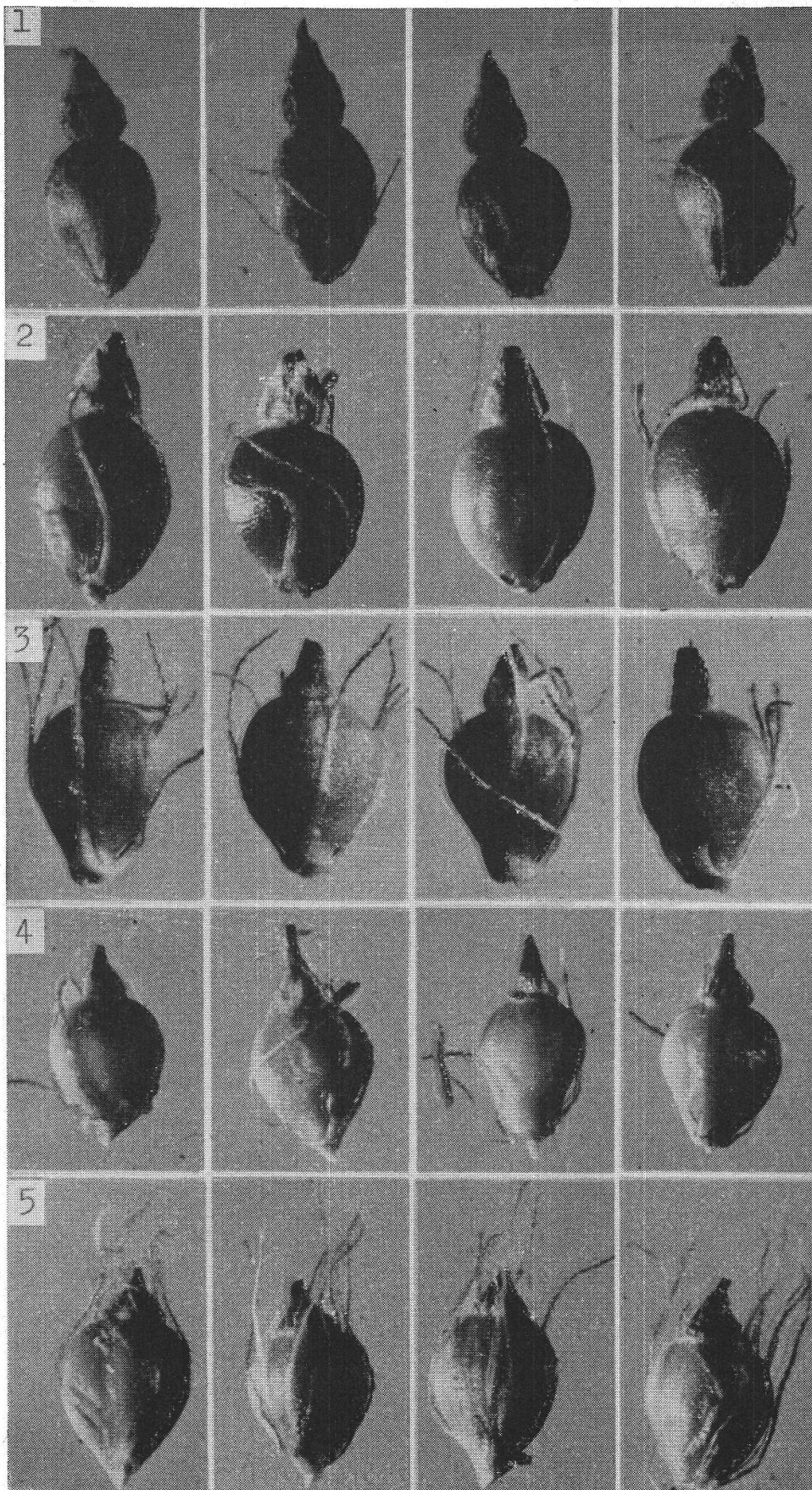


Figure 3



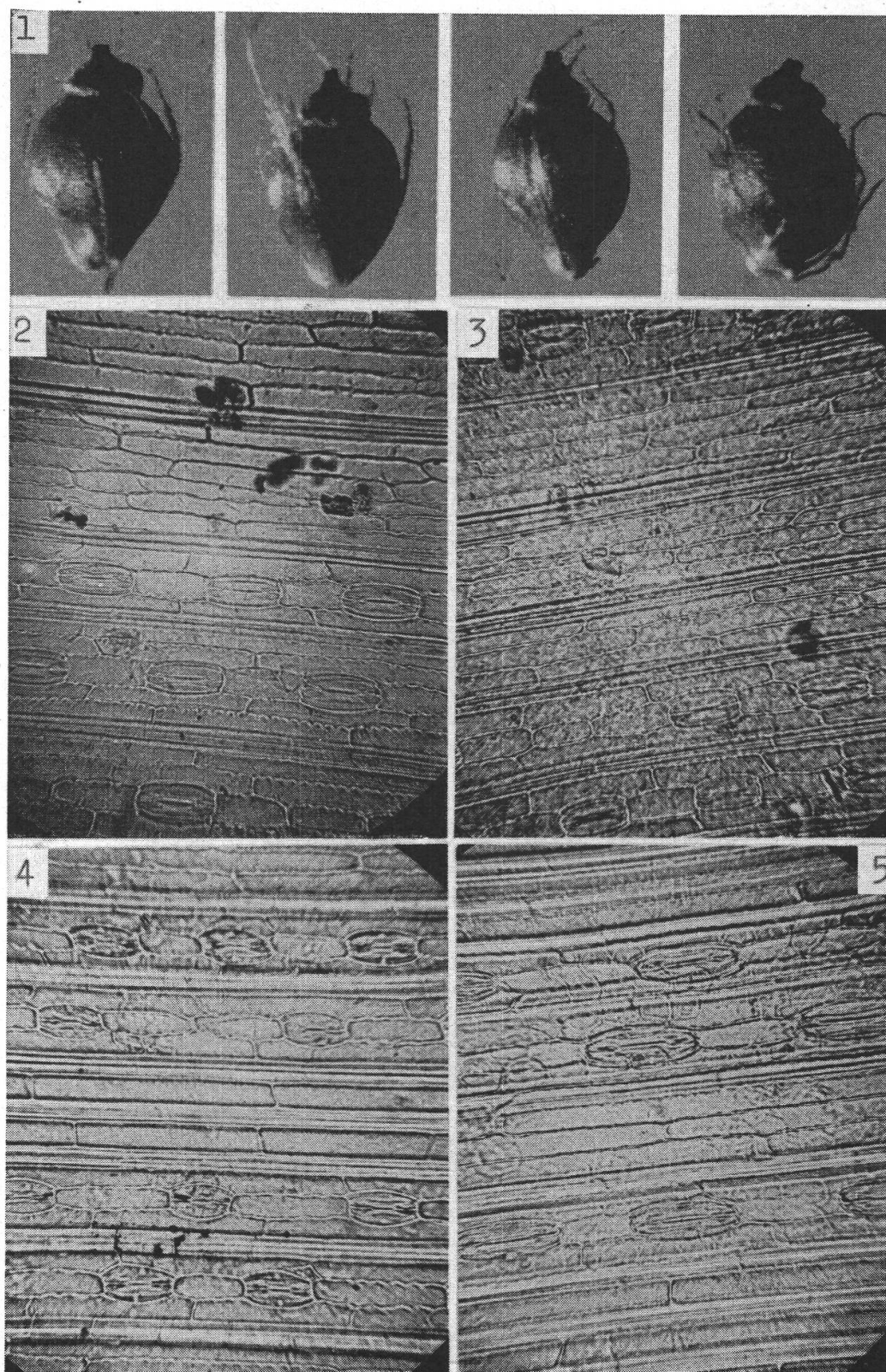


Figure 4



*mamillata* (to judge from the herbarium material seen) is rare. Material of *Eleocharis austriaca* with ripe fruit is easily determined; there are (4) 5 (6) well-developed bristles, and the style-base is very narrow. In *Eleocharis palustris* ssp. *microcarpa* the bristles are almost always 4 in number, and the style base usually slightly longer than broad; whereas in true *Eleocharis mamillata* the bristles are (5) 6 (—8) in number, and the style-base is very broad, low, and "mamillate". Differences in vegetative structure also exist which can be correlated with anatomical differences. Preliminary chromosome counts give  $n = 8$  and 9 (both numbers in the same preparations) for both *Eleocharis mamillata* and *Eleocharis austriaca*.

### Zusammenfassung

*Eleocharis mamillata* Lindb. fil. ist eine gut umschriebene Art aus dem Formenkreis der *Eleocharis palustris* (der Gruppe «*Palustres*» von S v e n s o n). Sie ist in Fennoskandinavien ziemlich verbreitet und den dortigen Floristen wohlbekannt. Die erste, wenig beachtete Angabe der Art aus Mitteleuropa stammt von H a y e k (1910), der sie zugleich mit einer als neu erkannten Sippe aus demselben Formenkreise, der *Eleocharis austriaca* Hayek, von *Eleocharis palustris* unterschied. G u n n a r S a m u e l s s o n (1922) stellte sie zum erstenmal für die Schweiz fest. Seine Bestimmungen beziehen sich aber in der Mehrzahl auf die ihm unbekannt gebliebene *Eleocharis austriaca*, welche um dieselbe Zeit (1921) von B e a u v e r d unter dem Namen *Eleocharis benedicta* neu beschrieben worden ist.

Während *Eleocharis mamillata* in der Schweiz (und überhaupt in Mitteleuropa) eine seltene Pflanze zu sein scheint, ist *Eleocharis austriaca* im schweizerischen Mittellande und in den Alpentälern eine weitverbreitete und ziemlich häufige Art. Mit *Eleocharis mamillata* hat sie die lichtgrünen, etwas durchscheinenden und leicht zusammendrückbaren Halme gemeinsam. Im fruchtenden Zustande ist sie leicht zu erkennen: Sie besitzt meistens 5 (ausnahmsweise an einzelnen Früchten 4 oder 6) Perigonborsten, und die Griffelbasis ist recht schmal. Bei *Eleocharis*

Figure 4

1. *Eleocharis mamillata* (Swedish material). 14 ×
2. Stomata and epidermal cells of *Eleocharis mamillata* (cf. Appendix, No. 4). 150 ×
3. Stomata and epidermal cells of *Eleocharis austriaca* (cf. Appendix, No. 32). 150 ×
4. Stomata and epidermal cells of *Eleocharis palustris* ssp. *microcarpa*. 150 ×
5. Stomata and epidermal cells of *Eleocharis palustris* ssp. *palustris* (British material). 150 ×

*mamillata* beträgt die Zahl der Perigonborsten (5) 6 (—8), und die Griffelbasis ist sehr breit und niedrig und sitzt der Frucht «mamillat» auf. *Eleocharis palustris* weicht von beiden durch die festern, dunkelgrünen Halme und die fast immer in der Zahl 4 ausgebildeten Perigonborsten ab. Auch die Form ihrer Griffelbasis (nur wenig höher als breit) ist verschieden; doch läßt sich dieser Unterschied gegenüber *Eleocharis austriaca* nur bei sorgfältigem Vergleich und mit einiger Übung erkennen. Anatomische Eigenheiten im Bau des Stengels und der Epidermis gehen mit den erwähnten Eigenschaften parallel. Vorläufige Chromosomenzählungen ergaben sowohl für *Eleocharis mamillata* als auch für *Eleocharis austriaca* die Zahlen  $n = 8$  und  $9$  (in denselben Präparaten).  
(W. Koch)

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My thanks are due to Professor W a l o K o c h , who very kindly supplied living and dried material of *Eleocharis austriaca*, and has encouraged me to publish this work; to the Directors of the various Herbaria, whose material has been placed at my disposal, and to Mr. J. N. H a r t s h o r n e , for help with cytology. The investigation was largely undertaken during the tenure of a grant from the Department of Scientific and Industrial Research.

### Appendix

#### *Eleocharis austriaca* Hayek; list of material identified

1. Type material. H a y e k : Flora Stiriacae Exsiccata, 19 and 20, 1910: "*Stiria media, in stagno exsiccato ad pagum St. Peter prope urbem Graz*, 370 m, Juni 1906, leg. K. F r i t s c h ." (Sheet in Herb. Univ. Helsinki is correct and is to be regarded as the lectotype; sheets in Herb. Mus. Bot. Lund and in Herb. H a y e k , Göteborg, are mixed sheets of *Eleocharis austriaca* and *Eleocharis mamillata*; cf. p. 272.)
2. *Eleocharis benedicta* Beauverd; type material: "No. 4277. Haute-Savoie: plage limoneuse du Lac Bénit, 1580 m, massif des Vergys, 15.8.22." HBG.
3. Sihlhölzli bei Zürich, 1885; A. L o h b a u e r. HZ.
4. "*Eleocharis uniglumis*", Saas-Fee, Wallis, 1899; A. K e l l e r (No. 2308). HZ.
5. Maloja; A. H e e r. HZ.
6. Puschlav, 1902; B r o c k m a n n. HZ.
7. Zürich-Aussersihl, 1891; leg. ?. HZ. (3—7 are det. S a m u e l s s o n "*Eleocharis mamillata*".)
8. Vorderrheintal bei Danis, Graubünden, 1917; K. H a g e r. (Det. S a m u e l s s o n "*Eleocharis palustris*" with note quoted p. 274) HZ.
9. Rhein zwischen Untervaz und Mastrils, 1933; R. L a u t e r b o r n (det. H. L i n d b e r g "*Eleocharis mamillata*"). HZ.
10. "*Eleocharis palustris* ssp. *mamillata* (Lindb.) Beauv." B r a u n - B l a n q u e t : Flora Raetica Exsiccata No. 1018: "Am Bach zwischen Buffalora und Cabbio".

(Misox) mit *Eleocharis uniglumis*, *Agrostis alba* var. *prorepens* etc. häufig. 9.7.1928 leg. W. Koch." HL, HG, HBG.

11. "*Eleocharis palustris* ssp. *mamillata* (Lindb.) Beauv." Braun-Blanquet: Flora Raetica Exsiccata No. 1017: "Schwendi, Grisons, 1650 m. 25.8.1927 leg. P. Flüttsch. In flachen Tümpeln herdenweise als Verlander. Seltener als ssp. *palustris*, aber zweifellos noch vielfach übersehen und mit letzterem verwechselt. Steigt bis 1800 m am Maloja." HL, HBG.
12. Schwandererweihe-Richterswil, 1927; E. Oberholzer. HZ.
13. Gottschalkenberg, 1927; E. Oberholzer. HZ.
14. Eschheimertal, Schaffhausen, 1923; W. Koch. HZ.
15. Andermatt, Urserental, Uri, 1933; W. Koch. HZ.
16. Rhein bei Waltensburg, Graubünden, 1924; W. Koch. HZ.
17. Niederhelfenschwil, St. Gallen, 1939; E. Sulger-Büel (det. Koch). HZ.
18. Rämismühle, Tösstal, Zürich, 1929; H. Kägi (det. W. Koch). HZ.
19. Simplon 1933; Wilczek. HL. (10—19 are identified as *Eleocharis mamillata* or *Eleocharis palustris* ssp. *mamillata*.)
20. Ilanz, Bündner Oberland, 1911; K. Hager. HZ.
21. Tössufer, Zürich, 1884; Siegfried. HZ.
22. "Var. *major Sonder*", Buchenloowil, Nord-Zürich, 1902; T. Frymann. HZ. Large aquatic modification of *Eleocharis austriaca*.
23. Simplon, Wallis, 1871, 1872; Favre. HZ.
24. Sierre, 1867; Herb. Favrat, ref. 934. HZ. (Two sheets; mixed gathering of *Eleocharis austriaca* and *Eleocharis palustris* ssp. *microcarpa*.)
25. Rheinauen bei Buchs, St. Gallen, 1905; A. Schnyder. HZ.
26. Haute-Savoie, chalets de Méri, 1910; de Palézieux. HBG.
27. Herb. C. Simon, Flora Helvetica. 1943. HML.
28. Herb. Reehinger, Vienna (ex. Herb. von Pernhoffer), ? locality; 1891. HML.
29. "*Scirpus palustris* L. *culmo compresso*", Herb. Shuttleworth. Dr. J. K. Schmidt, Flora des Aargaus, ? locality (illegible)<sup>1</sup> ("*Eleocharis palustris*", det. C. B. Clarke, 1887). HB.
30. "Tirol: in paludibus prope Lienz (?) Pichler, June 1865." HB. Mixed sheet of *Eleocharis austriaca* and *palustris*.
31. Sihlsee bei Euthal, Schwyz, 1949; E. Oberholzer.
32. Sihlsee bei Studen, Schwyz, 1949; E. Oberholzer.
33. Kloster Magdenau, St. Gallen, 1949; W. Koch (ref. 49/387). (31—33 are in cultivation in Hort. Univ. Cantab., with corresponding herbarium material.)

(Unless otherwise stated, plants were originally determined as *Eleocharis palustris*.)

*Eleocharis mamillata* Lindb. fil.: Central European material identified

1. Sihltal, Schwyz, 1901; M. Dügeli. HZ.
2. La Vallée, 1853; L. Favrat. HZ.
3. Bünzermoos, Aargau; O. Buser. HZ.
4. Dottenwil, St. Gallen, 1849; A. Linden, ex Herb. Favrat. HZ. (All these were det. Samuelsson as *Eleocharis mamillata*.)
5. Type sheets of *Eleocharis austriaca* Hayek; cf. above.

<sup>1</sup> Auensteiner Schachen (vide H. Lüscher, Fl. Kt. Aargau [1918], p. 171), W. Koch.



*Material intermediate between Eleocharis mamillata and Eleocharis austriaca*

1. "Steiermark; unter *Equisetum limosum* im Moor im Unterthal bei Schladnung, 6.8.1902, leg. H a y e k." In Herb. H a y e k, HG (cf. p. 273).
2. Wäggitaler Aa bei Lachen am Zürichsee, Schwyz, 1925; W. K o c h. HZ.

(Material in herbaria has only been identified when there was sufficiently ripe fruit. Some of S a m u e l s s o n's and H a y e k's determinations of plants in the flowering stage have not, therefore, been included in the above lists.)

HB	=	Herb. Mus. Brit.	HL	=	Herb. Univ. Lausanne
HBG	=	Herb. Boiss. Geneva	HML	=	Herb. Mus. Lund, Sweden
HG	=	Herb. Göteborg, Sweden	HZ	=	Herb. Eidg. T. H. Zürich

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