Typification of three names in the Bolboschoenus maritimus group (Cyperaceae)

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Typification of three names in the *Bolboschoenus maritimus* group *(Cyperaceae)*

Abstract

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In the absence of original herbarium specimens, illustrations are selected as lectotype for two names in the *Bolboschoenus maritimus* group, *Scirpus compactus* and *Scirpus maritimus* var. *cymosus*. To the ambiguous lectotype for *Scirpus compactus* an epitype is added, which fixes the name as a synonym of *Bolboschoenus maritimus*. The lectotype for *Scirpus maritimus* var. *cymosus* belongs to *Bolboschoenus laticarpus*. The holotype of *Scirpus macrostachys* is ambiguous and an epitype is chosen which supports its synonymy with *Bolboschoenus glaucus*. The taxonomic significance of the macrostachyate morphotype is discussed.

Key words: taxonomy, lectotype, epitype, *Scirpus,* macrostachyate morphotype.

Introduction

The taxonomy of the *Bolboschoenus maritimus* group has shown a considerable development during the last ten years. DeFilipps (1980) accepted in *Bolboschoenus* for Europe only one species, *B. maritimus* (L.) Palla (≡ *Scirpus maritimus* L.), with the two subspecies *maritimus* and *affinis* (Roth) Norl. Based on subsequent studies by Browning & al. (1996, 1998), Egorova & Tatanov (2003), Tatanov (2004) as well as by the present authors (Hroudová & al. 1999, Marhold & al. 2004 and the citations therein), six species are currently recognized for Europe: *B. maritimus*, *B. glaucus* (Lam.) S. G. Sm., *B. laticarpus* Marhold & al., *B. yagara* (Ohwi) Y. C. Yang & M. Zhan, *B. planiculmis* (F. Schmidt) T. V. Egorova and *B. popovii* T. V. Egorova. They differ not only in their morphology, but also in their distribution and ecological requirements.

The refined species concepts have left some open questions about synonymy and typification. Here we will deal with three names of which synonymisation and interpretation is different in the treatments of various authors, namely *Scirpus compactus* Hoffm., *S. macrostachys* Willd. and *S. maritimus* var. *cymosus* Rchb.

(1) ***Bolboschoenus maritimus*** (L.) Palla in Hallier & Brand, Syn. Deutsch. Schweiz. Fl., ed. 3, 3: 2532. 1905 ≡ *Scirpus maritimus* L., Sp. Pl.: 51. 1753.
Lectotype (designated by Smith & Kukkonen 1999: 356): Herb. Celsius 2: 212 (UPS). – Epitype (designated by Smith & Kukkonen 1999: 356): [Sweden] E Roslagen, par. Börstill, 2 km W Kallö, near Husbacka, 14.10.1995, *Nilsson 9515* (UPS, isoepitypus PR!) – Fig. 1-2.
= *Scirpus compactus* Hoffm., Deutschl. Fl.: 25. 1800 ≡ *Scirpus maritimus* f. *compactus* (Hoffm.) Junge in Jahrb. Hamburg. Wiss. Anst. Beih. 25 (3): 259. 1908 ≡ *Bolboschoenus compactus* (Hoffm.) Drobov in Trudy Bot. Muz. Imp. Akad. Nauk 11: 92. 1913 ≡ *Bolboschoenus maritimus* subsp. *compactus* (Hoffm.) Hejný in Dostál, Květ. ČSR: 1844. 1950 ≡ *Bolboschoenus maritimus* var. *compactus* (Hoffm.) T. V. Egorova, Fl. Sev.-Vost. Evrop. Časti SSSR 2: 18. 1976. – Lectotype (designated here): [icon] Vahl, Fl. Danica: no. 937. 1787. – Epitype (designated here): [Sweden] E Roslagen, par. Börstill, 2 km W Kallö, near Husbacka, 14.10.1995, *Nilsson 9515* (UPS, isoepitypus PR!) – Fig. 1-2.

Note. – Although the combination *Bolboschoenus maritimus* subsp. *compactus*, based on the name *Scirpus compactus*, was often used in Central European literature (Dostál 1948-50, 1954, 1958, Casper & Krausch 1980, Egorova 1976), the name was never typified. There is no original material of the name left either in the herbarium of the Moscow University, Russia (MW, Sergey A. Balandin, pers. com.) nor in the herbarium of the University of Göttingen, Germany (GOET, Jochen Heinrichs, pers. com.), nor in the herbarium of the Komarov Institute of Botany in St Petersburg, Russia (LE), where Hoffmann's herbarium is kept (Stafleu & Cowan 1979). There are two illustrations cited in the protologue of *Scirpus compactus*, namely one in Krocker (1787: t. 15) and one in Vahl (1787: no. 937). Krocker's illustration, according to its compact inflorescence, formed only by sessile spikelets, may depict *Bolboschoenus maritimus* or *B. planiculmis*. Other distinguishing characters (especially fruits) are missing, and thus correct determination of the plant is not possible. The plant in Vahl's illustration shows also a compact inflorescence, formed only by sessile spikelets, and, as stated above, this character is typical for *B. maritimus* and *B. planiculmis.* Another character visible is a bifid style on the pistil, as is usual in *B. planiculmis*. However, in *B. maritimus* bifid styles may also be found. Sometimes bifid and trifid styles appear in one inflorescence (Ducháček 2002), and in some populations or in some regions bifid styles may prevail, e.g., in North America (Browning & al. 1995). No fruits are presented in the illustration. The name *Scirpus compactus* usually appears in the synonymy of *B. maritimus* (e.g., Egorova 1976, Kiffe 1998) and there seems no reason to abandon this praxis. Since even the more complete illustration in Flora Danica is demonstrably ambiguous and cannot be unequivocally identified, in order to fix the application of the name, we have selected this illustration as lectotype and added as epitype the specimen, which was already chosen as epitype for *S. maritimus* (Smith & Kukkonen 1999: 356). Thanks to the generosity of S. G. Smith, an isoepitype is now deposited in PR (Fig. 1). This gave us the possibility to study its fruits in detail (Fig. 2). They perfectly match with the fruit morphology indicated for this species.

(2) ***Bolboschoenus glaucus*** (Lam.) S. G. Sm. in Novon 5: 101. 1995 ≡ *Scirpus glaucus* Lam., Tabl. Encycl. 1: 142. 1791.
Holotype: Senegal, *Roussilon* (P-Herb. Lamarck 673/14 n.v.)
= *Scirpus macrostachys* Willd., Enum. Pl.: 78. 1809 [as *"macorostachys"*], nom. illeg., non *Scirpus macrostachyos* Lam., Tab. Encycl. 1: 142. 1791 ≡ *Scirpus maritimus* γ [var.] *macrostachys* Vis., Fl. Dalm. 1: 109. 1842 ≡ *Scirpus maritimus* f. *macrostachys* (Vis.) Junge in Jahrb. Hamburg. Wiss. Anst. Beih. 25 (3): 259. 1908 ≡ *Bolboschoenus macrostachys* (Vis.) Grossh., Fl. Kavkaza 1: 145. 1928 ≡ *Bolboschoenus maritimus* var. *macrostachys* (Vis.) T. V. Egorova, Fl. Partis Eur. URSS 2: 94. 1976 ≡ *Bolboschoenus maritimus* subsp. *macrostachys* (Vis.) Soják in Čas. Nár. Mus. Odd. Přír. 152 (1): 19. 1983. – Holotype: *Savi* (B-Willd. 1236!). – Epitype (designated here): Italy, Vallo, 1963, *R. Wagner* (GJO).

Fig. 1. Isoepitype of the names *Scirpus maritimus* and *S. compactus* deposited in the herbarium PR – [Sweden] E. Roslagen, par. Börstill, 2 km W Kallö, near Husbacka, 14.10.1995, *Nilsson 9515*.

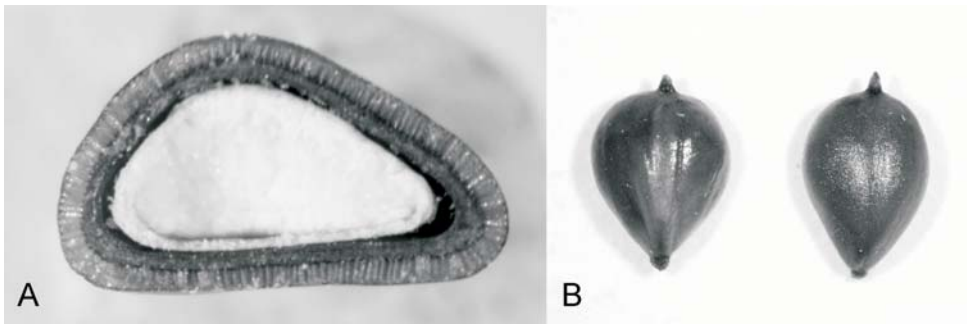

Fig. 2. Cross-section (A) and surface (B) of fruits from the isoepitype specimen of *Scirpus maritimus* deposited in the herbarium PR.

Note. – Plants with long, cylindrical spikelets (2-4(-8) cm long, frequently with non-fruiting flowers present) were described by Willdenow (1809) as *Scirpus macrostachys*. They have been classified variously within the broadly conceived species *Bolboschoenus maritimus*, either as separate taxon (e.g., Soó 1973 as *Bolboschoenus maritimus* var. *macrostachys* "(Willd.) Kneuck."; Schultze-Motel 1967 as *Scirpus maritimus* f. *macrostachys* "(Willd.) Junge"; Egorova 1976 as *Bolboschoenus maritimus* var. *macrostachys* "(Willd.) T. V. Egorova") or included in the synonymy of *S. maritimus* (Koyama 1962, Casper & Krausch 1980). Recently, Browning & al. (1998) included the name *Scirpus macrostachys* into synonymy of *B. glaucus* and this view seems to be now generally accepted (e.g., Egorova & Tatanov 2002, Tatanov 2003). Until now, however, no attention was paid to the holotype specimen (B-Willd 01236, Fig. 3). According to the label, the specimen was collected by Savi and comes from Italy. Thanks to the generous help of Christoph Oberprieler we were able to study this specimen in detail, including SEM photography of its fruit and its cross-section (Fig. 4). There are two flowering fragments on the sheet. The first is in an early stage and according to its general habit it is likely to belong to *B. glaucus*. But there are no fruits, which would confirm this identification. The second fragment, in a later stage of development, resembles more *B. maritimus*. The only fruit found (Fig. 4), however, is poorly developed and does not allow a certain identification. Based on the first plant we prefer to follow the synonymisation of *B. macrostachys* with *B. glaucus* suggested by Browning & al. (1998). However, as the specimen is demonstrably ambiguous and cannot be unequivocally identified, in order to fix the application of the name, we have selected an epitype specimen originating from Italy and deposited in GJO (Fig. 5).

The macrostachyate morphotype. – In this connection, the question deserves attention whether the macrostachyate morphotype (plants with long "catkin-like", cylindrical spikelets) is fixed in genotype and may be used as taxonomic character in the genus *Bolboschoenus,* or represents an ecomorphosis reflecting certain habitat conditions? Information is available on two aspects, (1) influence of habitat versus genotype and (2) variation in spikelet length in various Central European species of the genus *Bolboschoenus.*

(1) *Influence of habitat versus genotype: variation in spikelet length under different conditions.* – The influence of habitat conditions on spikelet length became apparent during a cultivation experiment of several years, which tested the effect of submersion on the development and dormancy of underground organs of plants (Zákravský & Hroudová 1994). Plants of *B. planiculmis* (originally determined as *B. maritimus* subsp. *compactus*) cultivated in a water depth of 80 cm started to produce longer spikelets, many of them corresponding to the "macrostachyate" morphotype, while the plants of the same genotype (multiplied vegetatively) cultivated in limosal-terrestrial conditions formed short spikelets. Year-to-year fluctuations in spikelet length were observed depending on the weather course especially in the submerged treatment. In *B.*

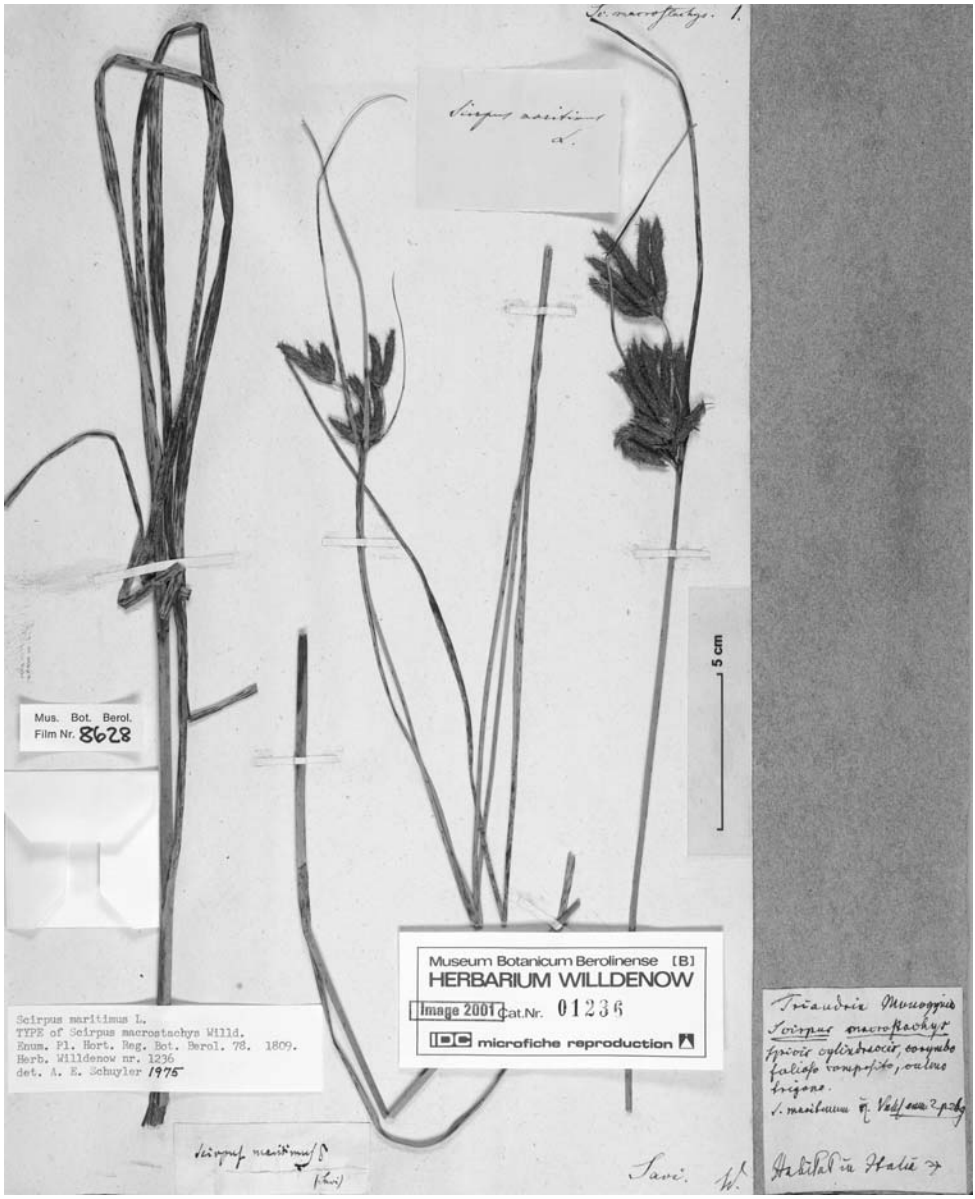

Fig. 3. Holotype of the name *Scirpus macrostachys* Willd. (*Savi*, B-Willd. 1236). – Photograph by courtesy of the Botanischer Garten und Botanisches Museum Berlin-Dahlem.

yagara (originally determined as *B. maritimus* subsp. *maritimus*) similar variations did not appear, all plants formed the same shorter spikelets. Apparently the submersed environment stimulates the formation of long spikelets when combined with other suitable habitat conditions (satisfactory nutrient supply, warm weather). Moreover, the rate of morphological plasticity may differ among species: the response of *B. yagara* to the same range of habitat conditions indicates low plasticity of this taxon. The effect of the genotype on morphological variation became more apparent in a long-term study of the morphological variation of individual clones of *Bolbo-*

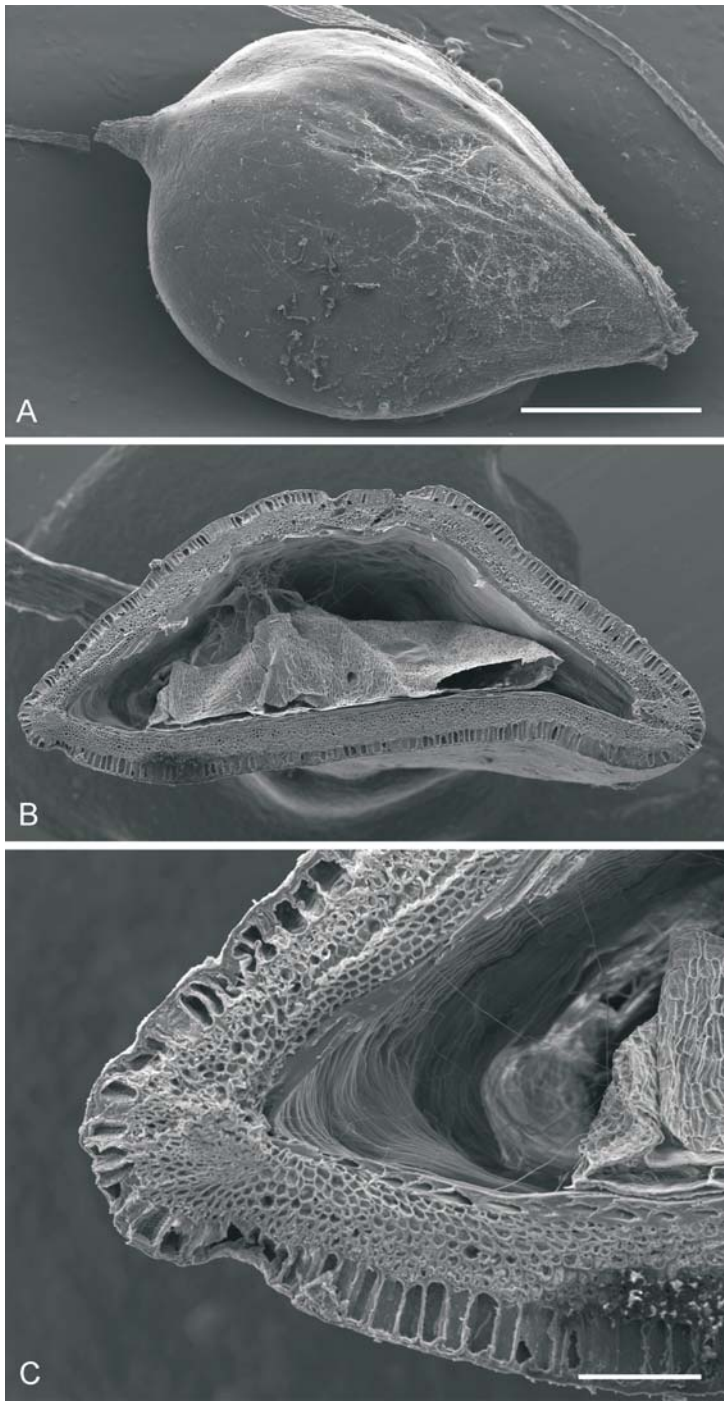

Fig. 4. SEM photographs of whole fruit (A) and cross-sections (B, C) from the holotype of *Scirpus macrostachys*. – By courtesy of the Botanischer Garten und Botanisches Museum Berlin-Dahlem. – Scale bars A = 800 μm, C = 100 μm.

Fig. 5. Epitype of the name *Scirpus macrostachys* – Italy, Vallo, 1963, *R. Wagner* (GJO).

Table 1. – Frequency of the macrostachyate morphotype in Central European *Bolboschoenus* species in the herbarium collections listed below. Only reliably determined plants included.

	total number of plants	macrostachyate plants	proportion (%)
B. maritimus	911	120	13.2
B. glaucus	494	39	7.9
B. laticarpus	416	12	2.9
B. planiculmis	327	5	1.5
B. yagara	206	0	0

schoenus taxa in their natural habitats (Krahulec & al. 1996). It was also found in transplantation experiments. A comparison of morphological variation in natural populations of *Bolboschoenus* taxa from the Czech Republic and Slovakia with plants transferred into cultivation showed that the differences between the taxa and those between individuals persisted (Hroudová & al. 1998). This means that the tendency to produce long or short spikelets may be to a considerable extent based on the genotype of individual species or individual populations within the species. Similar observations were made by the authors in plants of *B. glaucus* from Portugal. Plants from two localities transferred into cultivation maintained their characteristic spikelet length: one with inflorescences formed of numerous short spikelets on short rays, the other with more branched inflorescences with long spikelets.

(2) *Variation in spikelet length in various Central European species of the genus Bolboschoenus*. – During the revision of specimens in numerous herbaria (B, BIL, BP, BRA, BRNM, BRNU, GJO, GLM, GZU, JE, KL, KO, KRA, KRAM, LBL, LD, LE, LI, LISI, LOD, M, MSB, P, PR, PRA, PRC, SAV, SLO, SO, SOM, SZCZ, TRN, UGDA, W, WA, WRSL, WU, ZV, abbreviations according to Holmgren & Holmgren 1998-) plants with long, macrostachyate spikelets were found in several species with varying frequency (Table 1). They were most frequent in *B. maritimus* and relatively frequent in *B. glaucus*, but rare in *B. laticarpus* and *B. planiculmis*, and not found so far in *B. yagara*. Certainly the representation of individual species and of special forms in the herbarium collections is influenced by selective collecting. Nevertheless, the frequency of the macrostachyate morphotype is likely to reflect the morphological plasticity of the species.

In conclusion: (a) The macrostachyate morphotype seems to be an ecomorphosis triggered by habitat conditions, but the ability to produce this morphotype is probably fixed in the genotype. (b) This morphotype occurs in several species within the genus *Bolboschoenus* with different frequency: it is most common in *B. maritimus* and least so in *B. yagara*. (c) These results support the opinion of Browning & al. (1998), Egorova & Tatanov (2002) and Tatanov (2003) that the macrostachyate morphotype has no taxonomic importance.

(3) *Bolboschoenus laticarpus* Marhold & al. in Phyton (Horn) 44: 7. 2004.
Holotype: E Bohemia, Jílovka fishpond near the road from Bukovka to Lázně Bohdaneč, 1 km SE of the village of Bukovka, alt. 225 m, 50º6'N, 15º38'E, 5.9.2002, *Z. Hroudová & P. Zákravský* (PRA!).
= *Scirpus maritimus* var. *cymosus* Rchb., Fl. Germ. Excurs. 1: 79. 1830 ≡ *Bolboschoenus maritimus* subsp. *cymosus* (Rchb.) Soják in Čas. Nár. Mus., Odd. Přír. 141: 62. 1972 ≡ *Scirpus maritimus* f. *cymosus* (Rchb.) T. Koyama in Canad. J. Bot. 40: 936. 1962 ≡ *Bolboschoenus maritimus* var. *cymosus* (Rchb.) Kit Tan & Oteng-Yeb., Fl. Turkey 9: 64. 1985. – Lectotype (designated here): [icon] Schkuhr, Bot. Handbuch 1: t. 8 *"Scirpus maritimus"*. 1787-91 – Fig. 6.
– *B. maritimus* × *B. yagara* sensu Browning & al. (1996).
– *B. yagara* × *B. koshewnikowii* sensu Hroudová in Kubát & al., Klíč ke květ. ČR: 795. 2002.

Scirpus maritimus var. *cymosus* Rchb. is another case of a name, which was used in European literature until recently, but no attempt for its typification was ever made. This is most probably because there is no original herbarium material of this name left. Reichenbach (1830) described this

variety as follows: "Culmis altioribus, spiculis pedunculatis sessilibusve [sic!]" referring to five illustrations of *Scirpus maritimus:* Smith & Sowerby (1798-99: no. 542), Curtis (1781-84), Schkuhr (1787-91: t. 8), Vahl (1787: no. 937), Sturm (1803-04: no. 13). Out of these illustrations only that in Schkuhr (1787-91) can be unequivocally identified (Fig. 6). While the structure of the inflorescence of the depicted plant and the trifid style correspond to both *Bolboschoenus laticarpus* or *B. yagara* (central group of sessile spikelets and rays bearing single spikelets or their fascicles, rays more than twice as long as sessile spikelets), the number of sessile spikelets being approximately the same as of spikelets on rays indicates a higher probability of *B. laticarpus*. The broadly obovate fruits with an edge on the abaxial side and with the shape of a wide-based, flat, isolateral triangle in cross-section point clearly to *B. laticarpus*. The illustration in Smith & Sowerby's English botany is likely to depict *B. maritimus* as it shows a compact inflorescence consisting of a fascicle of sessile spikelets and one ray bearing one spikelet (common to *B. maritimus* and *B. planiculmis*), trifid styles and round fruits convex on the abaxial side (distinguishing *B. maritimus* and *B. planiculmis*). The other illustrations do not provide enough details for precise identification because fruits are either not depicted at all or not in enough detail, and *B. maritimus, B. planiculmis* or *B. laticarpus* are possible.

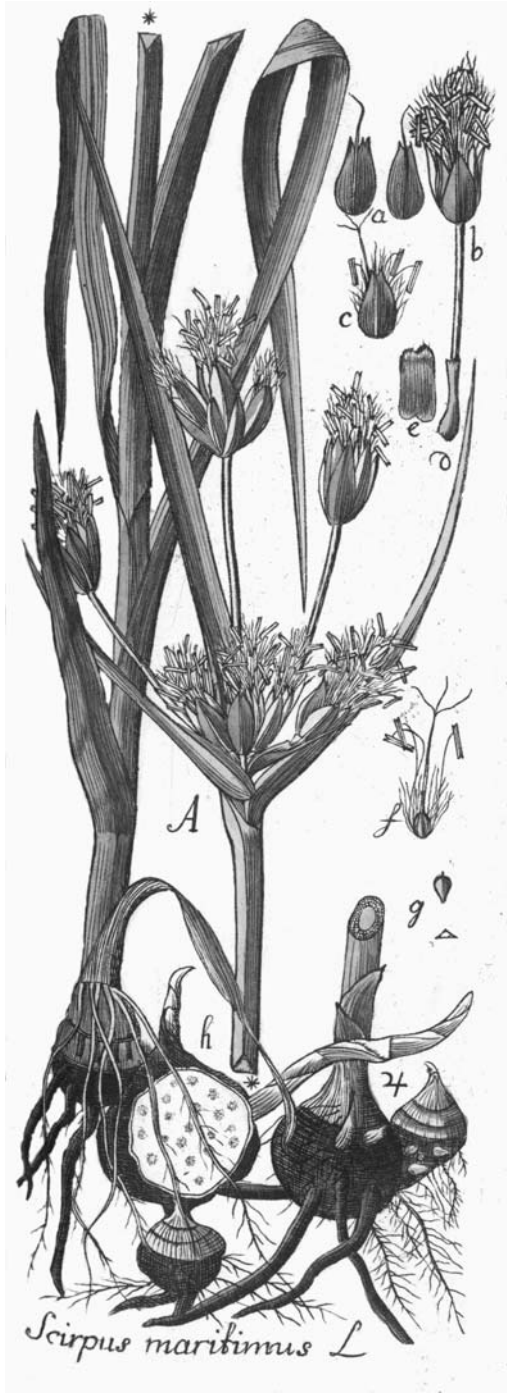

Fig. 6. Lectotype of the name *Scirpus maritimus* var. *cymosus* – Schkuhr, 1787-91, Bot. Handbuch 1: t.8 *"Scirpus maritimus"*.

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