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- *Short note* -

## A matrix key for the determination of Characeae

### Abstract

*Nitella opaca* (Bruzellius) Agardh was recorded in the stone pit Messinghausen (Sauerland, Western Germany) at a depth of 33,4 m. This is the maximum depth limit of aquatic macrophytes which ever has been recorded in Germany. Probably *Nitella opaca* has been introduced by scuba divers.

**Keywords:** Chara, Nitella, determination key

### 1 Introduction

Characeae are notorious difficult aquatic macrophytes to bring on name. Even experienced charologists have many problems with specimens from outside their well known regio. Only 1 key is available for world wide determination (Wood 1965), not easy to use, and based on a taxonomy that is not generally accepted any more.

Therefore two matrix keys (downloadable from: <http://www.biologie.uni-rostock.de/oekologie/RMB.htm>; follow RMB22; Van Raam, Joop) for the determination of Chara- and Nitella-species (and many varieties) from all over the world were constructed.

### 2 Description of the matrix key

The taxonomy used in the matrix keys is summarised in the "Synopsis of the Characeae" (Van Raam 2009), figures and descriptions and figures of many taxa are available in the "Database of the Characeae" (Van Raam 2009).

Traditional keys for the determination of plants are dichotomical constructed:

1) a - object is black - go to 3)

b - object is white - go to 2)

sometimes also multiple alternatives are given:

c - object is brown - go to 10)

and so on.

**Tab. 1** Matrix key for the determination of *Chara* - species of the Baltic Sea area.  
 The excel-sheet, which can be downloaded at:  
<http://www.biologie.uni-rostock.de/oekologie/RMB.htm> (follow RMB22; Van Raam, Joop),  
 must be filled in by as many characters from your specimen as possible and after this sorted  
 successively on the relevant characteristics.

<i>vulgaris</i>	<i>virgata</i>	<i>tomentosa</i>	<i>intermedia</i>	<i>horrida</i>	<i>hispidula</i>	<i>globularis</i>	<i>contraria</i>	<i>connivens</i>	<i>canescens</i>	<i>baltica</i>	<i>aspera</i>	<i>aculeolata</i>	<i>Chara</i>
x	x		x	x	x	x	x			x		x	monoecious
		x						x	x		x		dioecious
									x				axial cortex 1
x			x	x	x		x			x			axial cortex 2
		x						x				x	axial cortex 2-3
	x	x	x				x			x	x	x	axial cortex tylacanth
x				x	x								axial cortex aulacanth
				x		x	x	x					axial cortex isostich
					x				x	x	x	x	spines longer than axes-Ø
		x		x						x			spines equal to axes-Ø
x	x		x				x						spines shorter than axes-Ø
x	x					x	x	x					spines absent / rudimentary
x	x	x	x			x	x	x		x	x		spines single
			(x	x	x				x	(x		x	spines in bunches of 2-5
		x		x	x				x	x	x	x	stipulodes long
x	x		x				x			x			stipulodes short
x						x		x					stipulodes very short
		x		x	x				x	x	x	x	posterior bract-cells developed

These keys are inflexible, it is difficult to add new taxa or change characters. Generally if you want to change something most of the key must be rewritten. Even more trouble for the users if not all characters/dividers as used in the key can be found on your plant. For instance most keys for Characeae use as an essential discriminator: monoecious or dioecious (Migula 1897, Krause 1998). However if your plant is sterile, or antheridia and oogonia are produced in different times of the year, determination stops or becomes difficult, the more so if also gametangial constants are used in the key.

The matrices as here presented are very flexible. You can adapt the matrix to your need, add new taxa and characters, or delete all superfluous taxa and characters.

For local field work not all taxa are needed, it is easy to make an adapted matrix key, generally some 10 Chara and 5 Nitella are enough, and some characters are not needed. The whole can then be printed on 1 A4, or stored in a notebook, blueberry or GSM. As an example Table 1 presents a local matrix for use in the Baltic area.

### References

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- Migula, W. 1897. Die Characeen Deutschlands, Oesterreichs und der Schweiz; Unter Berücksichtigung aller Arten Europas. L. Rabenhorst - Kryptogamenflora von Deutschland, Oesterreich und der Schweiz. 2. Aufl. Vol. 5. Verlag Eduard Kummer, Leipzig. VII & 765 pp., 149 figs.
- Van Raam, J.C. 2009. Database of the Characeae. Ed. 4. CD-ROM. Charaboek, Hilversum (charaboek@hotmail.com).