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ON THE ECOLOGY OF DESMIDS. I. DESMIDS AND WATER PH

Of the hydrochemical factors on which the occurrence of algae depends, the active reaction of water (pH) has been best investigated. The connection between pH and the distribution of algae has been most profoundly investigated for the group of diatoms. An ecological scale with respect to the active reaction of water has been drawn up for the above-mentioned group (Hustedt, 1937/39). This scale served as a basis for the following grouping of desmids.

Desmids are considered to be an indicator-group of acidic environment, and that opinion is well justified. Taking into account this peculiarity, several quotients of phytoplankton (Thunmark, 1945; Nygaard, 1949) have been created on the basis of the ratio of desmids and other groups of algae. These quotients have been successfully used in the estimation of the trophy of Estonian lakes (Порк, 1964).

Although desmids occur abundantly in water bodies with low pH and poor in minerals and biogens, a far greater part of them than one could suppose supports the alkaline reaction of water. The present article deals, to some extent, with that aspect in the ecology of desmids.

Material

The author was in possession of data on the desmid flora of 264 Estonian lakes of various types (Mäemets, 1964, 1965) and on the active reaction of water in 228 lakes. Algological and hydrochemical samples were collected in 1951—1962 during a complex investigation of lakes undertaken by the Institute of Zoology and Botany of the Academy of Sciences of the Estonian SSR. On the same data, samples were taken each year, and mostly in the same place. The active reaction of water was assessed colorimetrically (electrically when pH<6) and, in most cases, by the staff of the laboratory of geobiochemistry of the Institute.

410 taxa of desmids were identified by the author in the algoflora of the lakes investigated.

In the following table, a list of algae together with the pH intervals of the places of occurrence is presented. The list contains 246 names. On the rest, the data available about pH are scarce. The same algae have been taken into account in further grouping, as well.

	pH		pH
Cylindrocystis Brebissonii	4.7—7.2	*Penium spirostriolatum*	5.8—6.2
Netrium digitus	4.0—8.6	*P. spirostr.* f. *amplificatum*	4.6—5.8
Gonatozygon monotaenium	6.7—7.4	*Closterium acerosum*	6.9—>9.0

C. aciculare	7.2—>9.0
C. acic. var. *subpronum*	8.0—>9.0
C. angustatum	4.6—7.0
C. Baillyanum	5.0—7.6
C. Ehrenbergii	6.2—8.4
C. intermedium	5.0—7.9
C. Jenneri	6.1—6.8
C. Kuetzingii	6.7—8.2
C. libellula	5.0—7.0
C. lib. var. *interruptum*	6.1—6.7
C. lineatum	6.2—8.4
C. lunula	5.4—8.3
C. moniliferum	6.2—8.6
C. navicula	4.2—7.4
C. parvulum	6.7—>9.0
C. praelongum	6.2—>9.0
C. prael. f. *brevius*	6.2—8.2
C. Ralfsii var. *hybridum*	6.1—8.6
C. rostratum	7.0—8.0
C. setaceum	6.2—7.2
C. striolatum	4.6—7.7
C. turgidum	6.2—8.4
C. ulna	5.5—6.8
C. venus	6.2—8.4
Docidium baculum	6.2—8.4
Pleurotaenium coronatum	6.7—8.1
P. Ehrenbergii	6.2—8.6
P. eugeneum	6.2—8.2
P. trabecula	5.8—8.6
P. truncatum	6.7—7.8
Tetmemorus Brebissonii	4.2—8.4
T. Brebissonii f. *minor*	4.5—6.2
T. granulatus	6.0—7.3
T. laevis	4.6—6.0
Euastrum affine	5.6—6.7
E. ansatum	5.6—8.1
E. ansatum f. *pyxidatum*	5.6—8.4
E. bidentatum	5.5—8.0
E. binale	4.0—8.6
E. binale f. *Gutwinskii*	4.0—7.8
E. crassum	4.6—7.7
E. denticulatum	6.0—8.4
E. didelta	5.4—7.8
E. dubium	7.4—7.8
E. dubium var. *ornatum*	6.2—8.4
E. elegans	6.2—8.4
E. Gayanum	5.8—7.0
E. germanicum	7.4—>9.0
E. insulare	7.6—>9.0
E. insulare f. *silesiacum*	6.2—8.4
E. oblongum	4.6—8.2
E. pectinatum var. *inevolutum*	6.2—8.2
E. pulchellum var. *retusum*	6.2—8.4
E. sinuosum	6.2—6.4
E. Turneri	4.2—7.8
E. validum	6.0—6.2
E. verrucosum	6.2—8.6
E. verrucosum var. *alatum*	6.5—8.6
Micrasterias americana	6.8—7.9
M. apiculata	5.4—8.3
M. brachyptera	6.2—8.2
M. crux-melitensis	6.2—8.4
M. crux-mel. var. *protuberans*	6.9—7.7
M. crux-mel. var. *superflua*	6.9—8.6
M. denticulata	6.7—8.4
M. fimbriata	6.2—8.4
M. fimbriata f. *spinosa*	6.2—8.4
M. papillifera	5.4—8.6
M. pinnatifida	6.7—8.6
M. radiata	6.2—8.2
M. radiata var. *dichotoma*	6.2—8.4
M. rotata	5.4—8.2
M. sol	6.9—8.4
M. sol f. *ornata*	6.7—8.4
M. Thomasiana	5.4—7.8
M. Thomasiana var. *notata*	5.2—8.6
M. truncata	4.5—>9.0
M. truncata var. *bahusiensis*	6.2—7.8
Actinotaenium cucurbita	4.2—8.6
A. palangula	4.6—8.4
A. turgidum	6.8—8.4
Cosmarium abbreviatum	7.2—8.8
C. amoenum	5.0—8.4
C. annulatum	6.4—8.4
C. binum	7.3—8.6
C. bioculatum	5.4—>9.0
C. Boeckii	6.5—>9.0
C. botrytis	5.4—>9.0
C. connatum	6.2—8.8
C. conspersum var. *latum*	6.7—8.4
C. contractum	6.1—7.7
C. contr. var. *Jacobsenii*	7.0—8.3
C. contr. f. *ellipsoideum*	6.7—8.4
C. contr. var. *minutum*	6.2—7.9
C. controversum	6.0—7.0
C. Debaryi	6.2—8.8
C. depressum	6.2—>9.0
C. depr. var. *achondrum*	7.8—>9.0
C. depr. var. *planctonicum*	6.7—>9.0
C. difficile	6.2—>9.0
C. formosulum	6.5—8.6
C. formos. var. *Nathorstii*	7.6—9.0
C. granatum	7.0—>9.0
C. gran. var. *subgranatum*	7.3—>9.0
C. humile	6.7—>9.0
C. impressulum	6.2—>9.0

C. laeve	8,8—>9.0
C. margaritatum	6.2—8.4
C. margaritiferum	6.0—8.4
C. Meneghinii	7.7—8.8
C. Micutowiczii	8.4—>9.0
C. obsoletum var. *sitvense*	7.4—8.2
C. obtusatum	6.1—8.6
C. ornatum	6.0—8.4
C. ovale	6.2—8.4
C. pachydermum	6.7—9.0
C. perforatum	7.2—8.4
C. portianum	6.2—>9.0
C. praemorsum	6.2—7.0
C. protractum	7.0—8.8
C. pseudobroomei	6.0—8.2
C. pseudoprotuberans	6.8—8.2
C. punctulatum	7.9—8.4
C. punct. var. *subpunctulatum*	6,2—>9.0
C. pygmaeum	6.0—7.7
C. pyramidatum	4.6—7.0
C. quadratum	6.7—>9.0
C. quadratum f. *Willei*	6.4—7.3
C. quadrum	7.0—8.4
C. Regnellii	5.4—>9.0
C. Regnesi	7.0—8.8
C. reniforme	6.2—>9.0
C. subcostatum	7.1—>9.0
C. subcostatum f. *minor*	5.0—9.0
C. subcostatum var. *Beckii*	6.8—8.8
C. subprotumidum	6.9—>9.0
C. subprot. var. *Gregorii*	6.8—8.4
C. subspeciosum v. *validius*	6.2—8.6
C. subtumidum	7.0—>9.0
C. tesselatum	7.3—8.4
C. tetraophthalmum	6.8—>9.0
C. Turpinii	7.1—8.2
C. Turpinii var. *eximium*	7.3—8.4
C. Turpinii var. *podolicum*	7.4—>9.0
C. venustum f. *minor*	6.0—6.4
C. vexatum	7.0—8.5
C. Wittrockii	6.9—8.8
Xanthidium antilopaeum	4.0—8.6
X. ant. var. *dimazum*	4.6—8.4
X. ant. var. *hebridarum*	6.5—8.2
X. ant. var. *laeve*	5.9—8.4
X. ant. var. *planum*	5.2—8.1
X. ant. var. *triquetrum*	4.6—6.9
X. armatum	4.5—8.6
X. cristatum	7.0—8.4
X. cristatum var. *leiodermum*	6.2—7.0
Arthrodesmus octocornis	5.8—8.4
Staurodesmus brevispina	7.3—8.3
S. brevispina var. *Boldtii*	6.7—8.4
S. convergens	6.7—8.6
S. cuspidatus	6.0—>9.0
S. Dickiei var. *circularis*	7.0—8.4
S. Dickiei var. *rhomboideus*	5.4—7.4
S. extensus	5.4—8.5
S. glaber	6.2—8.1
S. indentatus	7.0—7.6
S. leptodermus	5.4—8.2
S. sellatus	6.2—7.3
S. smolandicus	7.3—8.2
Staurastrum aciculiferum	4.2—5.8
S. alternans	8.1—>9.0
S. anatinum var. *longibrachiatum*	5.2—8.4
S. arachne	6.0—7.0
S. arctiscon	4.8—8.6
S. avicula	7.8—>9.0
S. avicula var. *subarcuatum*	6.8—8.2
S. bicorne	7.4—8.2
S. brachiatum	4.3—6.7
S. brasiliense var. *Lundellii*	6.8—8.2
S. Brebissonii	7.3—8.0
S. Bullardii	7.2—8.6
S. chaetoceras	6.8—8.4
S. cingulum	6.2—8.3
S. cingulum var. *obesum*	6.1—8.4
S. cristatum	7.0—8.4
S. eurycerum	6.8—8.1
S. furcigerum	6.8—>9.0
S. furc. f. *eustephana*	7.0—8.4
S. inconspicuum	4.0—8.4
S. inflexum	6.7—9.0
S. laeve	7.7—8.3
S. lapponicum	6.4—>9.0
S. Luetkemuelleri	8.0—8.2
S. lunatum	7.8—8.6
S. lunatum var. *planctonicum*	6.2—8.6
S. Manfeldtii	7.0—8.6
S. Manf. var. *annulatum*	6.7—8.8
S. margaritaceum	4.2—4.6
S. Messikommeri	6.5—8.6
S. muticum	7.3—8.6
S. oligacanthum var. *podlachicum*	7.0—8.2
S. ophiura	6.8—8.4
S. orbiculare var. *depressum*	7.0—8.6
S. pelagicum	7.4—8.2
S. pingue	7.1—8.6
S. planctonicum	7.4—8.6
S. polymorphum	6.8—8.3
S. polym. var. *divergens*	4.2—5.8
S. pseudopelagicum	6.5—8.4

S. pseudopel. var. *tumidum*	6.8—>9.0
S. pseudosebaldi	7.8—8.2
S. Sebaldi var. *ornatum*	6.9—8.2
S. Seb. var. *orn.* f. *planctonica*	6.8—8.4
S. setigerum var. *apertum*	7.0—>9.0
S. Simonyi	4.2—4.6
S. spongiosum var. *perbifidum*	7.3—8.1
S. striolatum	7.3—8.3
S. teliferum	5.0—8.0
S. tetracerum	6.2—>9.0
S. tetracerum f. *trigona*	6.8—>9.0
S. tohopekaligense	6.2—8.6
S. vestitum	4.6—8.4
Cosmocladium pusillum	5.9—8.1
C. saxonicum	6.2—8.2
Sphaerozosma Aubertianum var. *Archeri*	7.1—8.2
S. excavatum	6.2—>9.0
S. granulatum	5.8—>9.0
S. vertebratum	7.0—8.0
Onychonema filiforme	7.4—8.8
Spondylosium panduriforme	6.7—>9.0
S. planum	6.2—>9.0
S. pulchellum	4.2—6.4
Hyalotheca dissiliens	4.0—8.3
H. mucosa	5.4—8.6
Desmidium aptogonum	6.7—8.0
D. apt. var. *Ehrenbergii*	7.4—8.2
D. cylindricum	6.2—6.8
D. Swartzii	6.2—8.6
Bambusina Borreri	4.2—8.6
B. Borr. var. *gracilescens*	4.2—8.0

Results and discussion

Although the active reaction of water depends on other hydrochemical indicators, the occurrence and distribution of water organisms is connected with pH (but not caused by it). On the basis of Estonian materials the dependence of the abundance of species on pH has been observed in the case of water-fleas (Mäemets, 1961) and diatoms (Pork, 1967). Changes in the composition of desmid flora are also in obvious connection with the active reaction of water.

Taking into account the optimum and the amplitude of the occurrence of taxa, desmids may be divided into the following groups.

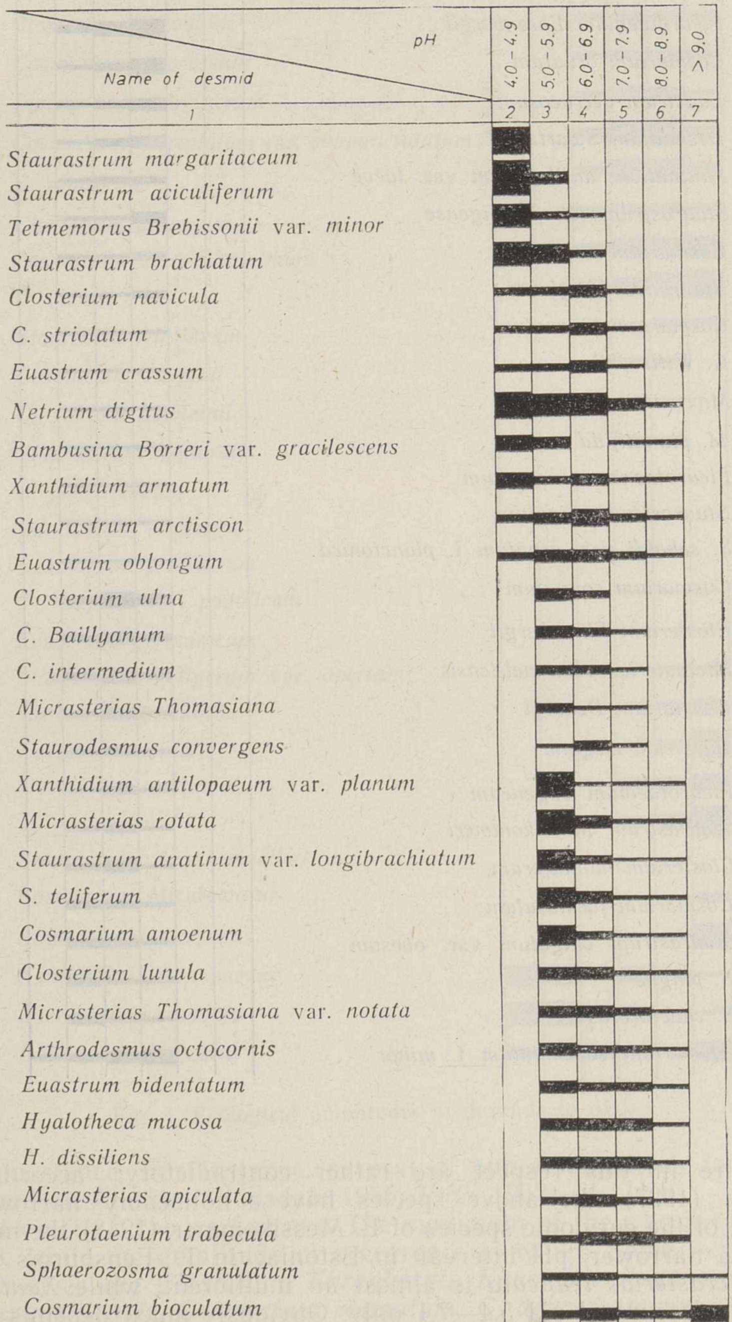
1. Acidobiontic forms. They are mostly desmids occurring at pH<5, e. g. *Tetmemorus Brebissonii, Actinotaenium cucurbita, Staurastrum aciculiferum, S. Simonyi, Bambusina Borreri* var. *gracilescens* et al. that belong here. Typical bog forms having some places of occurrence even in lakes rich in minerals at pH 7—8 constitute the major part of the group. It refers to the secondary importance of pH in their distribution. Acidobiontic forms are comparatively few in the desmid flora of lakes — 9 per cent. (Among all Estonian desmids, taking into account all bog forms, this percentage is higher.)

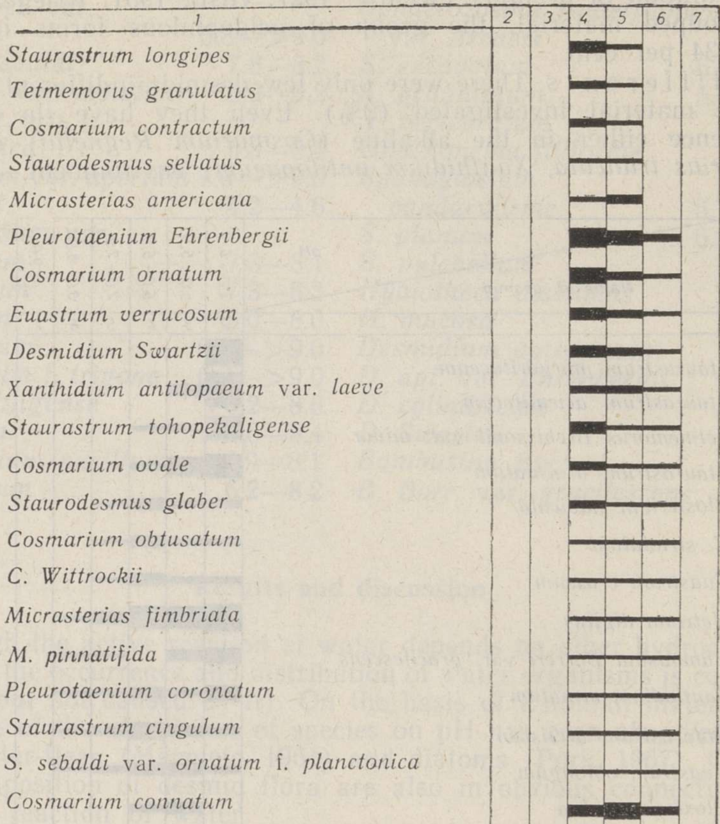
pH-amplitudes and optima of some desmids are represented in Fig. 1. As the number of lakes in pH intervals is different and in order to decrease errors, the frequency of the taxon occurrence is given in per cents. A wider dark area in the figure corresponds to the higher frequency of occurrence. One should take the extreme indicators represented in the table with a certain caution (pH 4.0—4.9; >9) since the number of lakes in those groups is small and the percentage of occurrence is therefore high.

2. Acidophilous forms. This group is usually made up of desmids occurring at pH 5—7 whose pH amplitudes are — mostly in the alkaline direction — wider. They are *Closterium Baillyanum, C. ulna, Pleurotaenium Ehrenbergii, Euastrum bidentatum, E. verrucosum, Micrasterias Thomasiana* var. *notata, M. rotata, Cosmarium amoenum, C. ornatum, Staurastrum anatinum* var. *longibrachiatum, S. tohopekaligense* et al. The environmental reaction 5—7 is considered to be the most favourable

for the evolution of desmids (Wehrle, 1927; Gistl, 1931; Krieger, 1932). In the grouped material, the group of acidophilous forms is rather large — 34 per cent.

3. Indifferents. There were only few desmids indifferent towards pH in the material investigated (2%). Even they have the optimum of occurrence either in the alkaline (*Cosmarium Regnellii*) or acidic (*Micrasterias truncata, Xanthidium antilopaeum*) environment. The data





in literature in this respect are rather contradictory: according to E. Wehrle (1927) the above species have a noticeably narrower pH amplitude; of the euryionic species of E. Messikommer (1942) the majority occurs in a narrower pH interval in Estonia; in T. Fensburg's graphs (1967) *Micrasterias truncata* is almost an indifferent, while *Xanthidium antilopaeum* occurs at pH 5.4—7.1 only. Obviously much depends on the amount of data, although the geographical difference of areas may also

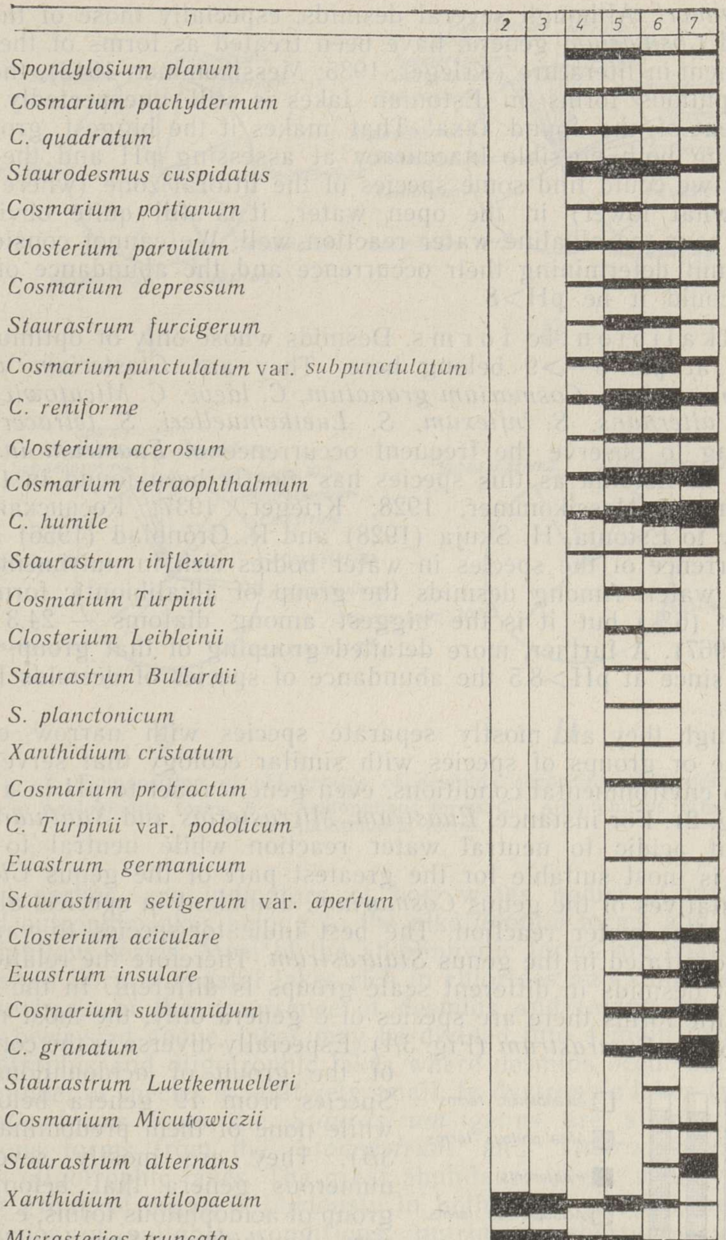


Fig. 1. Ecological amplitudes of desmids to pH.

be of importance. For instance, several of our acidophilous forms have been found on Alaska (Croasdale 1955, 1957, 1962) at pH 8.

4. A l k a l i p h i l o u s f o r m s. The maximum of their occurrence is at pH 7—8, while the amplitude of occurrence is wider. Some more typical representatives are *Closterium Ehrenbergii, Euastrum elegans, Micrasterias crux-melitensis, Cosmarium connatum, C. depressum* var. *planctonicum, C. Turpinii, Staurastrum cingulum* var. *obesum, S. furcigerum, S.*

Messikommeri. Although several desmids, especially those of the *Closterium* and *Cosmarium* genera, have been treated as forms of the alkaline environment in literature (Krieger, 1935; Messikommer, 1942), the amount of alkaliphilous forms in Estonian lakes is still unexpectedly large — 49 per cent of the found taxa! That makes it the biggest group. Even considering both possible inaccuracy at assessing pH and the possible fact that we could find some species of the littoral zone (where pH may be somewhat lower) in the open water, it is still quite obvious that desmids bear the alkaline water reaction well. We cannot consider pH 7 as the limit determining their occurrence and the abundance of species. Rather could it be pH>8.

5. Alkalibiontic forms. Desmids whose only or optimum occurrence is at pH 8—>9 belong here. They are *Closterium aciculare, Euastrum insulare, Cosmarium granatum, C. laeve, C. Micutowiczii, Staurastrum alternans, S. inflexum, S. Luetkemuelleri, S. tetracerum.* It is interesting to observe the frequent occurrence of *Euastrum insulare* at high pH in Estonia as this species has mostly been found in the acidic environment (Messikommer, 1928; Krieger, 1937; Косинская, 1960). Similarly to Estonia, H. Skuja (1928) and R. Grönblad (1956) also note the occurrence of the species in water bodies rich in nutriments and in brackish water. Among desmids the group of alkalibiontic forms is not abundant (6%) but it is the biggest among diatoms — 24.3 per cent (Pork, 1967). A further, more detailed grouping of that group would be suitable since at pH>8.5 the abundance of species of desmids falls to a minimum.

Although they are mostly separate species with narrow ecological amplitude or groups of species with similar ecology that serve as indicators to environmental conditions, even genera react to pH in a different way (Fig. 2). For instance, *Euastrum, Micrasterias* and *Xanthidium* occur mostly at acidic to neutral water reaction while neutral to alkaline reaction is most suitable for the greatest part of the genus *Closterium.* Representatives of the genus *Cosmarium,* abundant in species, also prefer more alkaline water reaction. The best indicator-species to various pH have concentrated in the genus *Staurastrum.* Therefore the relation of the genera of desmids in different scale groups is different. In the group of acidobiontic forms there are species of 8 genera only, the most numerous of them being *Staurastrum* (Fig. 3*A*). Especially diverse is the composition of the group of acidophilous forms. Species from 19 genera belong here, while none of them predominates (Fig. 3*B*). They are mostly several less numerous genera that belong to the group of acidophilous forms, e. g. *Euastrum, Xanthidium, Spondylosium, Hyalotheca, Desmidium.* The composition of the group of alkaliphilous forms is different. Although species of 13 genera belong here, only *Cosmarium* and *Staurastrum* are predominating ones (Fig. 3*C*). Alkalibiontic forms contain species from 5 genera only, of whom a half of the number of species is made up of *Cosmarium* (Fig. 3*D*).

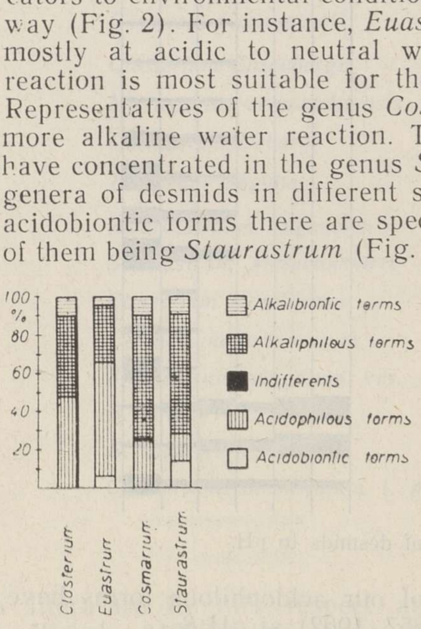


Fig. 2. Relation of pH groups in several genera of desmids.

The group of acidobiontic and alkalibiontic forms are poorer in species, but better indicator-species have concentrated here. Acidobiontic forms, as

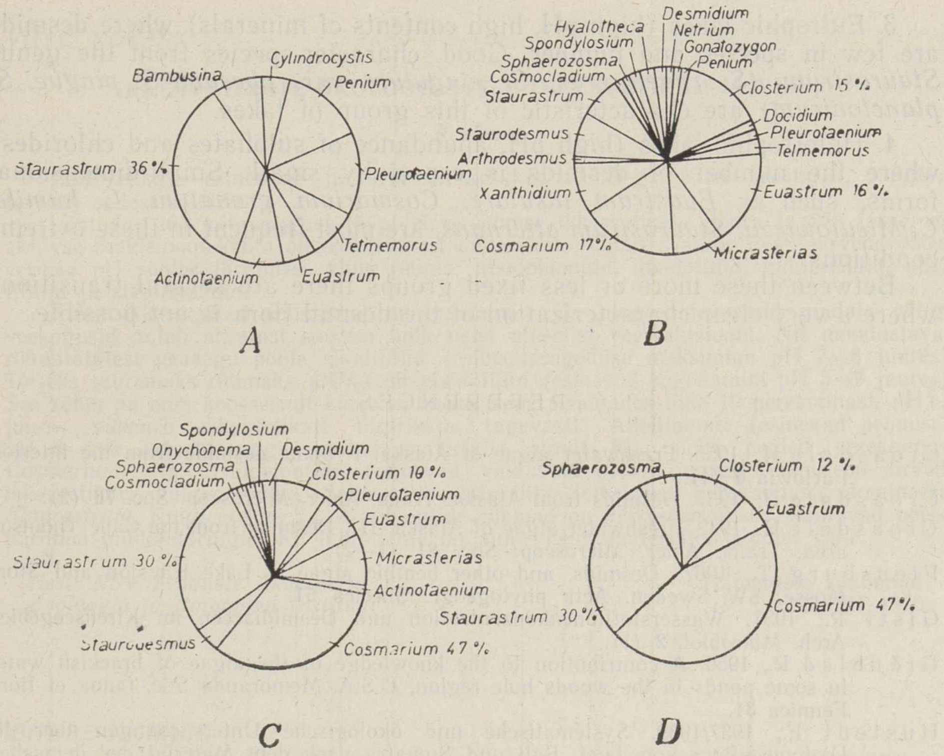


Fig. 3. Composition of pH groups of desmids according to genera.
A — Acidobiontic forms, *B* — Acidophilous forms, *C* — Alkaliphilous forms, *D* — Alkalibiontic forms.

mentioned earlier, are indicators of bog water bodies. Characteristic species of eutrophic lakes belong to the alkalibiontic forms and partly to the alkaliphilous forms. Most of the alkalibiontic forms are characteristic of the desmid flora in coastal lakes rich in chlorides and sulphates.

On the basis of the occurrence of desmids and taking into account what has been said above, lakes may be divided into 4 main groups.

1. Dystrophic and oligotrophic lakes where desmids occur abundantly, but the number of species is relatively small. In dystrophic lakes (pH 4—5) acidobiontic forms from the *Staurastrum* genus are abundant, while acidophilous forms from the *Staurastrum* and *Staurodesmus* genera prevail in oligotrophic lakes. The great abundance of the usually scantily occurring group of algae is obviously in both cases possible because of the existence of suitable conditions: nutriment shortage (and high humosity) hinders the development of other groups of algae and creates favourable conditions for desmids which prefer small contents of biogens and minerals but are rather indifferent towards organic matters.

2. So-called semi-dystrophic lakes (Mäemets, 1965) with water reaction near to neutral (pH 6.7—7.4), with small contents of minerals and average contents of organic matters, where the number of genera, species and forms of desmids is especially great. Big-dimensional species, such as *Pleurotaenium coronatum, Euastrum verrucosum, Cosmarium ovale, C. perforatum, C. tesselatum, C. turgidum, Xanthidium cristatum, Staurastrum arctiscon, S. brasiliense* var. *Lundellii, S. ophiura* et al. dominate. The *Micrasterias* — *M. apiculata, M. radiata, M. cruxmelitensis, M. Thomasiana* var. *notate* etc. occur here more frequently than in other lakes.

3. Eutrophic lakes (high pH, high contents of minerals) where desmids are few in species and number. Good character-species from the genus *Staurastrum* (*S. chaetoceras, S. cingulum* var. *obesum, S. pingue, S. planctonicum*) are characteristic of this group of lakes.

4. Halotrophic lakes (high pH, abundance of sulphates and chlorides) where the number of desmids is especially small. Small-dimensional forms, such as *Euastrum insulare, Cosmarium granatum, C. humile, C. Micutowiczii, Staurastrum alternans,* are most frequent in these extreme conditions.

Between these more or less fixed groups there are several transitions where a very clear characterization of the desmid flora is not possible.

REFERENCES

Croasdale H., 1955. Freshwater algae of Alaska. I. Some desmids from the interior. Farlowia **4** (4).

Croasdale H., 1957. Desmids from Alaska. Trans. Amer. Microscop. Soc. **76** (2).

Croasdale H., 1962. Freshwater algae of Alaska. III. Desmids from the Cape Thomson area. Trans. Amer. Microscop. Soc. **81** (1—2).

Flensburg T., 1967. Desmids and other benthic algae of Lake Kävsjön and Store Mosse, SW Sweden. Acta phytogeogr. Suecica **51**.

Gistl R., 1931. Wasserstoffionenkonzentration und Desmidiaceen im Kirchseegebiet. Arch. Mikrobiol. 2 (1).

Grönblad R., 1956. A contribution to the knowledge of the algae of brackish water in some ponds in the woods hole region, U.S.A. Memoranda Soc. fauna et flora Fennica **31**.

Hustedt F., 1937/1939. Systematische und ökologische Untersuchungen über die Diatomeenflora von Java, Bali und Sumatra nach dem Material der deutschen limnologischen Sunda-Expedition. Arch. Hydrobiol. Suppl. **15, 16.**

Krieger W., 1932. Die Desmidiaceen der deutschen limnologischen Sunda-Expedition. Arch. Hydrobiol. Suppl. **11**.

Krieger W., 1935. Die Desmidiaceen Europas mit Berücksichtigung der außereuropäischen Arten. Rabenh. Krypt.-Flora Deutschl., Österr. u. Schweiz **13** (1).

Krieger W., 1937. Die Desmidiaceen Europas mit Berücksichtigung der außereuropäischen Arten. Rabenh. Krypt.-Flora Deutschl., Österr. u. Schweiz **13** (2).

Messikommer E., 1928. Beiträge zur Kenntnis der Algenflora des Kantons Zürich. III. Folge. Die Algenvegetation des Hinwiler- und Oberhöflerriedes. Vierteljahresschr. Naturforsch. Ges. Zürich 73 (1—2).

Messikommer E., 1942. Beitrag zur Kenntnis der Algenflora und Algenvegetation des Hochgebirges um Davos. Beitr. Geobot. Landesaufn. Schweiz **24**.

Mäemets A., 1961. Eesti vesikirbuliste (*Cladocera*) ökoloogiast ja fenoloogiast. Hüdrobiol. uurim. **2**.

Mäemets A., 1964. Eesti järvede troofilisest tüpoloogiast. VII. Eesti loodusuurijate päeva ettekannete teesid. Tartu.

Mäemets A., 1965. Eesti järvetüüpidest. Eesti Loodus 8 (4).

Nygaard G., 1949. Hydrobiological studies on some danish ponds and lakes. Kongel. Danske Videnskab. Selskab. Biol. Skrift. 7 (1).

Pork M., 1967. Eesti NSV järvede ränivetiktaimed (*Bacillariophyta*). Kandidaadidissertatsioon. Tartu. (Manuscript).

Skuja H., 1928. Vorarbeiten zu einer Algenflora von Lettland IV. Acta horti Bot. Univ. Latv. **3** (2/3)

Thunmark S., 1945. Zur Soziologie des Süsswasserplanktons. Folia Limnol. Scand. **3**.

Wehrle E., 1927. Studien über Wasserstoffionenkonzentrationsverhältnisse und Besiedlung an Algenstandorten in der Umgebung von Freiburg. Br. Zeit-Schr. Bot. **19** (4/5).

Косинская Е. К., 1960. Конъюгаты или сцеплянки. 2. Десмидиевые водоросли. Флора спор. раст. СССР **5** (1).

Порк М., 1964. О фитопланктоне озер Эстонии. Тезисы докл. XI научн. конф. по изуч. внутр. водоемов Прибалтики. Петрозаводск.

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VIIVE KÕVASK

IKKESVETIKATE ÖKOLOOGIAST. I. IKKESVETIKAD JA VEE pH

Resümee

Ikkesvetikate esinemine ja levik on keskkonna pH-ga hästi seostatav, kuigi ei tarvitse sellest sõltuda.

Lähtudes 264 mitmesugust tüüpi järve avavee ikkesvetikate floora ja 228 järve vee aktiivse reaktsiooni kohta olemasolevatest andmetest, rühmitas autor Eesti järvede ikkesvetikad pH suhtes järgmisse viide rühma: atsidobiondid, atsidofiilid, indiferendid, alkalifiilid ja alkalibiondid.

Kuigi ikkesvetikad eelistavad mineraalainete- ja biogeenidevaeseid madala pH-ga veekogusid, talub arvatust suurem hulk neist aluselist veereaktsiooni. Nii moodustavad rühmitatutest peaaegu poole alkalifiilid (esinemissageduse maksimum pH 7—8 juures). Teiseks suuremaks rühmaks (34%) on atsidofiilid (esinevad sagedamini pH 5—7 juures). See rühm on oma koosseisult kõige mitmekesisem, sisaldades liike 19 perekonnast. pH>8 juures väheneb ikkesvetikate liigirikkus tugevasti. Alkalibionte (esinevad peamiselt pH 8—>9 juures) ongi uuritud materjalis ainult 8%, neist pooled perekonnast *Cosmarium*. Ka atsidobiontide (esinevad valdavalt pH<5 juures) rühm on järvede ikkesvetikate hulgas väike. Sellesse kuulub liike kaheksast perekonnast, domineerib *Staurastrum*. Kuigi atsido- ja alkalibiontide rühmad on väikesearvulised, kuuluvad neisse parimad indikaatorliigid. Ka indiferente on autor Eesti materjalis leidnud vähe.

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ВИЙВЕ КЫВАСК

К ЭКОЛОГИИ КОНЪЮГАТ. I. КОНЪЮГАТЫ И pH ВОДЫ

Резюме

Распространение конъюгат хорошо связывается с активной реакцией воды, хотя и не обязательно зависит от последней.

На основе данных о флоре конъюгат пелагиали 264 озер и об активной реакции воды 228 озер выделены следующие группы конъюгат по отношению к pH: ацидобионты, ацидофилы, индиференты, алкалифилы, алкалибионты.

Хотя конъюгаты и предпочитают водоемы, бедные минеральными и биогенными веществами, неожиданно большое количество выдерживает щелочную реакцию воды. И так, почти половину из группированных видов составляют алкалифилы (максимум встречаемости при pH 7—8). Второй большой группой (34%) являются ацидофилы (встречаются чаще всего при pH 5—7). Видовой состав этой группы очень разнообразен, сюда относятся виды из 19 родов. При pH>8 количество видов конъюгат сильно уменьшается. Алкалибионтов (максимум встречаемости при pH 8 —>9) в исследованном материале оказалось только 8%; половину из них составляют виды рода *Cosmarium*. Ацидобионтов (встречаются чаще всего при pH <5) среди конъюгат озер тоже мало. Здесь встречаются виды 8 родов, доминирует *Staurastrum*. Группы ацидо- и алкалибионтов малочисленны, но включают много хороших индикаторных видов. Индиферентов в флоре конъюгат эстонских озер мало.

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