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CYANOPROKATYOTE AND ALGAL BIODIVERSITY IN THE TROPICAL LAKE EDWARD (AFRICA) WITH NOTES ON NEW, RARE AND POTENTIALLY HARMFUL SPECIES

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Abstract. The paper presents data on the biodiversity of prokaryotic and eukaryotic algae in the tropical Lake Edward, compiled from publications of the Damas mission (1935-1936), Hecky & Kling (1987) and our own results from a recent investigation of the lake phytoplankton in a three-year period (2016-2018) in the frame of the HIPE (**H**uman **i**m**p**acts on ecosystem health and resources of Lake **E**dward) project (http://www.co2.ulg.ac.be/hipe). The provided checklist is based on modern algal taxonomy with relevant synonymizing of lists of previous authors. In total, 577 taxa from seven divisions were registered in the lake waters and in the Kazinga Channel. The richest division was Ochrophyta (287 taxa, 274 of which from Bacillariophyceae), followed by Chlorophyta (131 taxa), Cyanoprokaryota (134), Streptophyta (14), Euglenophyta (8), Pyrrhophyta (5) and Cryptophyta (1). 52 species (or only 1% of the taxa found) persisted in the lake since 30s of the 20th century till nowadays. More than half of the cyanoprokaryotes (65) are potentially toxic and harmful species. The checklist contains also data on algal abundance and frequency of occurrence, originally provided by the authors. In the phytoplankton samples, collected during the three cruises of the HIPE project, 248 taxa were found, among which the richest division was Cyanoprokaryota (104). From this total of 248 taxa, only 3 were frequent and 199 were very rare (from 1-3 samples) with 121 taxa found in one sample only. During

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2016-2018, the most abundant species in the lake phytoplankton belonged to Cyanoprokaryota, Bacillariophyceae and Chlorophyta. The algae found in the lake have different ecological requirements and besides clear tropical species and some cosmopolites, some "cold water species" from northern and temperate regions were found. For them, as well as for some thermophilic species, considered alien for the lake, transport through different vectors was supposed. In the literature analyzed, 36 new taxa were described. Among them 26 taxa had Lake Edward as a single locality, and 10 were found also in other lakes and adjacent water bodies. Twelve of these new taxa were checked by modern taxonomists, but 24 still need taxonomic reconsideration.

Key words: African great lake, alien species, dominants, phytoplankton, phytobenthos

INTRODUCTION

The knowledge on the algae of the smallest of the Great African lakes – Lake Edward – has to be traced back to the 30^{s} of the twentieth century, when the Belgian scientific mission led by Hubert Damas was conducted. Yet, the publication of this expedition, which studied the lakes Kivu, Edward and Ndalaga (Damas 1938), "remains a model of a limnological study, where the results were presented with precision and interpreted in great detail" (Descy et al. 2012). Different types of samples (from the phytoplankton, nanno-plankton, periphyton and qualitative samples from visible algal mats or filaments) were collected from 14 sampling sites of the lake and from the slow-flowing water Kazinga Channel, which connects lakes Edward and George (**Fig. 1**). These samples provided a good opportunity to make an inventory of the algal biodiversity and were given to the leading taxonomists of that time: to Pierre Frémy – for blue-green algae, to Friedrich Hustedt for diatoms, to Adolf Pascher for golden and synurophycean algae, pyrrophytes, euglenophytes and green flagellates, to Walter Conrad – for green coccal and siphonocladal algae, and for yellow-green algae. They all processed the same samples and the phytoplankton of the lake was found to

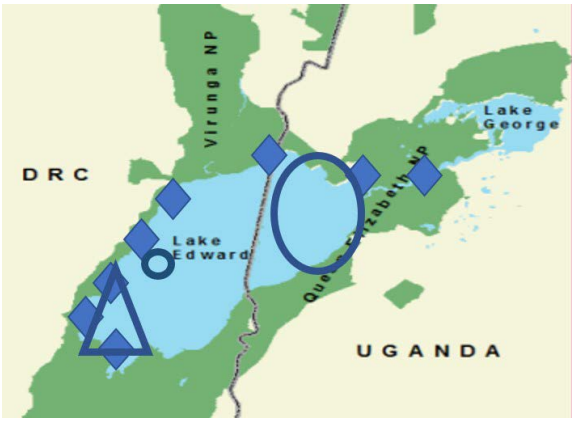

Fig. 1. Map of lakes Edward and George, connected through Kazinga Channel with sampling points:
◆ Main sampling regions of Damas mission (1935-1936)
△ Sampling region of Hecky & Kling (1987)
○ HIPE sampling regions (2016-2018)

be quite abundant and rich in cyanoprokaryotes/cyanobacteria in particular (Conrad & Duvigneaud 1949). In the alkaline (pH about 9) and transparent waters of the lake, phytoplankters developed in a depth range of 0 to 20 m with some algae (*e.g. Tetraëdron minimum* (A. Braun) Hansgirg) reaching a depth of 85 m (Conrad & Duvigneaud 1949). The phytoplankton of the lake was studied again much later, in 1972, in a common study of the lakes Albert, Edward, Kivu, Tanganyika and Malawi (Hecky & Kling 1987). The phytoplankton net samples from Lake Edward were collected by them on 16-17 March 1972 as "composites of two or more depths" at three stations in the east-south part of the lake (**Fig. 1**). Although in the text the authors gave some data on cyanoprokaryotes and green algae, with ten dominant or abundant species, they provided a table with camera lucida drawings of 24 taxa. The next study of the phytoplankton of the lake was carried only in the XXIst century, in the years 2016-2018 in the frame of the HIPE project (**H**uman **i**m**p**acts on ecosystem health and resources of Lake **E**dward) project (http://www.co2.ulg.ac.be/hipe). Then, 29 surface samples (at a depth of 1 m) were collected at littoral and pelagic sites during three cruises, mainly in the western part of the lake (**Figs. 1, 2**). Only one sample was taken in the deepest part of the lake, off the Virunga National Park, Democratic Republic of the Congo.

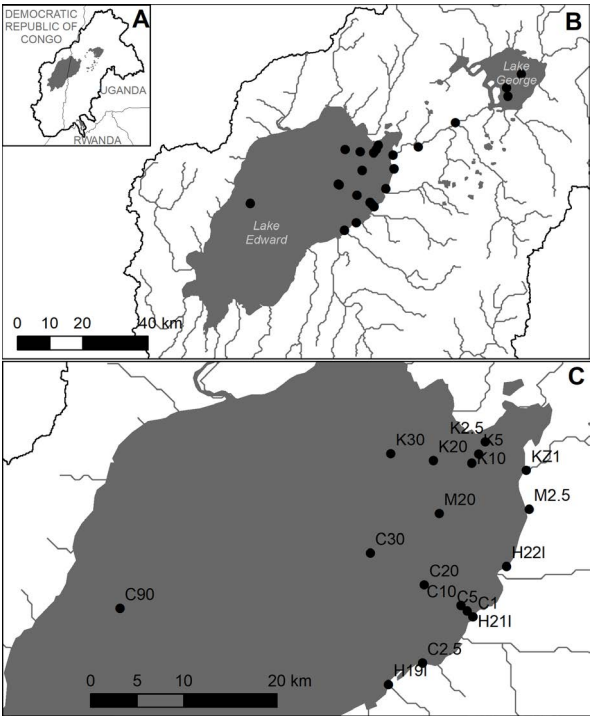

Fig. 2. Map of lakes Edward and George, connected through Kazinga Channel with HIPE sampling points at-different scales (A-C): C, H, K, M - operational sampling codes.

The present paper provides summarized data on algal biodiversity of Lake Edward based on modern taxonomical considerations, which allows more reliable comparison in the long-time changes of the species composition. In addition, data on algal abundance or frequency, originally provided by the authors, are included and the most interesting new and rare taxa are outlined. Last but not least, the potentially toxic taxa, which could have adverse effects on ecosystem and human health, are indicated.

MATERIAL AND METHODS

The data concern Lake Edward (also known as Rutanzige or Edward Nyanza), situated in the Western Rift in East Africa on the border between the Democratic Republic of the Congo (DRC) and Uganda. This lake lies at 920 m a. s. l. just a few kilometers below the equator and is the smallest of the Great African lakes. It is a large (2325 km²), deep (max depth = 112 m), weakly stratified tropical lake, draining the Virunga volcanoes and the Ruwenzori Mountains. The lake is fed mainly by the waters of five rivers (Nyamugasani, Ishasha, Rutshuru, Ntungwe and Rwindi) and receives the waters from the above situated Lake George through the Kazinga Channel (https://en.wikipedia.org/wiki/Lake_Edward). In its northern part it outflows into the Lake Albert through the Semliki river. Lake Edward lies within the Virunga National Park (DRC) and the Queen Elizabeth National Park (Uganda) and does not have extensive human habitation on its shores, except at Ishango (DRC) (https://en.wikipedia.org/wiki/Lake_Edward). It is presently mesotrophic but was eutrophic a few decades ago (Lehman et al. 1998).

Cyanoprokaryote and algal biodiversity (*algal biodiversity* from here on) of the lake reported in the XXth century was estimated on the basis of the publications from the Damas's expedition (1938) and Hecky & Kling (1987). The data on the algal biodiversity in years 2016-2018 were originally obtained by the authors after processing of the phytoplankton samples of HIPE project. The main part of the work was done using conventional light microscopy with magnification 100x and immersion on non-permanent slides for non-siliceous algae, and for Bacillariophyceae on permanent slides mounted with Naphrax after peroxide digestion. For Bacillariophyceae, scanning electron microscopy (SEM) was used on some samples and help in identification was provided by Luc Ector and Carlos Wetzel, at the Luxembourg Institute of Science and Technology (LIST).

The work is based on modern algal taxonomy from main standard recent floras (*e.g.* Krammer & Lange-Bertalot 1991, 1997a, b, 2004; Komárek & Fott 1983; Komárek & Anagnostidis 1999, 2005; Komárek 2013, Moestrup & Calado 2018) and relevant current taxonomic papers (*e.g.* Lange-Bertalot 1980; Taylor et al. 2007; Potapova 2009, Sitoki et al. 2013; Trobajo et al. 2013; Wynne & Guiry 2016; Wynne & Hallan 2016; Strunecký et al. 2017; Aguilera et al. 2018) considering data in AlgaeBase (Guiry & Guiry 2018), DiatomBase (Kociolek et al. 2018), CyanoDB (Hauer & Komárek 2018). Taxonomical synonymizing was done after checking of authors taxonomical notes and indicated identification sources, detailed descriptions and drawings. When taxonomical synonymizing was not possible, the original writing of the Latin names and authors was kept and the relevant names were given between quotes. Only synonyms used in the cited literature on Lake Edward are provided in the checklist. The checklist is organized in a table format and the authors' data on algal abundance or frequency of occurrence are provided. We tried to unify the categories, used by different authors,

whenever possible without missing or diminishing the nuances of difference. Therefore, all the terms, originally used by authors, are mentioned in the legend of **Table 1** as relevant for the proper abbreviation. For the HIPE samples we indicated in brackets the real number of samples in which a given species was found (numbers from 1 to 29). For easier comparison with data of previous authors, we used the following relative scale: species found in 1-3 samples – very rare; in 4-9 samples - rare, in 10-23 samples – common and in 24-29 samples – pretty common=frequent. The abbreviations for these categories (indicated in the legend of **Table 1**) are written before the real number of samples in which the species was found.

For some groups (*e.g.* Cyanoprokaryota), algal abundance was shown by Frémy (1949) for each sample, for others (*e.g.* Bacillariophyceae) abundance or frequency of occurrence were indicated by Hustedt (1949) for groups of samples. In this way, given species could be *very rare* in one group of samples, but *frequent* or *abundant* in another group. In these cases, we cited in the checklist table all possible variations of abundance and occurrence in different sample groups separated by commas (**Table 1**).

It has to be underlined that despite the general knowledge on groups is given by the relevant authors and parts of the reports of Damas mission, it is possible to find data on some additional species in the reports of other authors on different groups. For example, Pascher (1949) mentions *Rhizoclonium* sp. which was not included in the text of Conrad (1949), or some green algae and diatoms were noted by Frémy (1949). Also, due to differences in the taxonomic positioning of some green and yellow-green algae, their numbers in the publications cited above and our tables appear different. For example, *Tetraëdron mutica* (A. Braun) Hansgirg published by Conrad (1949c) among green coccal algae, recently is considered as the yellow-green alga *Goniochloris mutica* (A. Braun) Fott. *Vice versa*, *Botryococcus braunii* Kützing originally published as a yellow-green alga and therefore included in the Xanthophyceae list (Conrad 1949b), has been transferred to the green coccal algae and we also pointed it among them. Some differences could be found in the writings of taxa names or taxonomic levels in the tables and in the texts by authors (*e.g.* form and variety in the table and text by Hustedt 1949). We tried to eliminate all these differences, but yet recommend to future researchers who need to go deeper in the taxonomy of given species to go through all texts of the Mission Damas publications (1949). Some reference to taxa was done also on the basis of the drawings of H. Kling provided in Hecky & Kling (1987). For example, according to their Appendix 3, Fig. 12, it is possible to state that she found *Cylindrospermopsis helicoides*, which was described much later by Cronberg & Komárek (2004) and then was transferred to *Raphidiopsis helicoidea* by Aguilera et al. (2018). In such cases, relevant notes or figure numbers are given in the checklist text.

The potentially toxic cyanoprokaryotic taxa are indicated after Bernard et al. (2017) with some additions from the papers by Maršálek et al. (2003), Teneva et al. (2013), Stoyneva et al. (2015), Cantoral Uriza et al. (2017) and Stoyneva-Gärtner et al. (2017). In addition, especially for the toxicity of

the disputable *Microcystis wesenbergii* (for details see Stoyneva-Gärtner et al. 2017) our current data, which definitely provided evidence on the production of microcystins during the bloom of this species in the reservoir Sinyata Reka (Bulgaria), were taken into account (Stoyneva-Gärtner et al. 2019a, b).

RESULTS

The Checklist containing all taxa reported for Lake Edward in publications from the Damas' Mission (Conrad 1949a-c, Frémy 1949, Hustedt 1949, Pascher 1949a-b) and Hecky & Kling (1987) together with our unpublished data from the HIPE project (2016-2018) is provided below (**Table 1**).

Table 1. Checklist of algae from Lake Edward. Abbreviations: **TTE-P** – Toxin or toxic effect (potential); **MD** – Mission Damas (1935-1936); **Ph** – phytoplankton samples, **Bn** – benthic/periphytic samples (Aufwuchs); **Ql** - qualitative samples, **Kz** – Kazinga Channel, **KB** – Katakuru-Bach, **HcKL** – Hecky & Kling (1987), **HIPE** – cruises 2016-2018; **ab** – "abondant"=abundant (as "m – massenhaft" in Hustedt 1949); **aab** – "assez abondant"=quite abundant; **c** – common; **dom** – dominant; **ec** –"extrêmement commun partout dans le plancton"=extremely common everywhere in the plankton; **f** – frequent (as "assez commun"=pretty common in Conrad 1949b and "h - häufig" in Hustedt 1949); **pab** – "peu abundant"=scarce; **r** – rare (as "s - selten" in Hustedt 1949); **rp** – "répandu partout"=spread everywhere; **sh** – "sehr häufig"=very frequent; **ss** – "sehr selten"=very rare (also as sv – "sehr vereinzelt"=very isolated in Pascher 1949b); **tab** - "très abondant"=very abundant; **tpa** – "très peu abondant"=very scanty; **trp** – "très répandu partout"=widely spread everywhere; **upp** – "un peu partout"=pretty much everywhere; **x** – occurring ("+ - vorhanden" in Hustedt 1949), without information on abundance or frequency of occurrence. For HIPE samples additionally in brackets the real number of samples in which given species was found is indicated (**numbers from 1 to 29**). For toxins (column TTE-P) the abbreviations are: **Antx-a** – Anataxoxin a, **CYN** – Cylndrospermopsin, **MCs** – Microcystins, **?** – toxins known from other species (or from unidentified species) of the same genus, or species was pointed in field samples, where toxins have been identified.

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
CYANOPROKARYOTA								
Anabaena sp.	tab		pab					MCs, Antx-a, ?CYN
Anabaenopsis circularis (G. S. West) Woloszynska & V. Miller in V. Miller 1923	pab						r (4), x, ab	?
Anabaenopsis cunningtonii W. R. Taylor 1932							ss (1)	?
Anabaenopsis doliiformis Noda 1936							ss (1)	?

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Anabaenopsis elenkinii V. V. Miller 1923							ss (1)	?
Anabaenopsis tanganyikae (G. S. West) Woloszynska & V. V. Miller in Miller 1923	pab						ss (2)	?
Anabaenopsis sp.							ss (1)	?
Anagnostidinema amphibium (C. Agardh ex Gomont) Strunecký, Bohunická, J. R. Johansen & J. Komárek 2017 (Syn. *Oscillatoria amphibia* C. Agardh ex Gomont 1892)			aab					SXTs
Anathece bachmannii (Komárek & Cronberg) Komárek, Kastovsky & Jezberová 2011							ss (1)	
Anathece cf. *clathrata* (West & G. S. West) Komárek, Kastovsky & Jezberová 2011							ss (2)	
Anathece minutissima (West) Komárek, Kastovsky & Jezberová 2011 (Syn. *Microcystis minutissima* West 1912)	pab						ss (2)	?
Anathece smithii (Komárková-Legnerová & Cronberg) Komárek, Kastovsky & Jezberová 2011							ss (2)	?
Aphanizomenon/*Anabaena* sp.							ss (1)	
cf. *Aphanizomenon manguinii* Bourrelly in Bourrelly & Manguin 1952							ss (1)	?
Aphanocapsa cf. *delicatissima* West & G. S. West 1912							ss (1)	
Aphanocapsa holsatica (Lemmermann) G. Cronberg & Komárek 1994 (Syn. *Microcystis holsatica* (Lemmermann) Lemmermann 1907)	tpa						ss (2)	?
Aphanocapsa incerta (Lemmermann) G. Cronberg & Komárek 1994 (Syn. *Microcystis incerta* (Lemmermann) Lemmermann 1903)	pab, tpa					dom	ss (1)	?
Aphanocapsa koordersii K. M. Strøm 1923							c (12)	
Aphanocapsa cf. *nubila* Komárek & H. J. Kling 1991							ss (3), x. ab	
Aphanothece elabens (Brébisson ex Meneghini) Elenkin 1938 (Syn. *Microcystis elabens* (Brébisson) Kützing 1846)	pab						ss (1)	?
Aphanothece hegewaldii Kovácik 1988							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Aphanothece nidulans P.Richter in Wittrock & Nordstedt 1884							ss (3)	
cf. *Borzia trilocularis* Cohn ex Gomont 1892							ss (1)	
Calothrix castellii Bornet & Flahault 1886			tab					
Calothrix fusca Bornet & Flahault 1886	pab							
Calothrix epiphytica West & G. S. West 1897	aab							
Chamaesiphon incrustans Grunow in Rabenhorst 1865			pab					
Chroococcidiopsis cf. *cubana* Komárek & Hindák 1975							ss (1)	
Chroococcus dispersus (Keissler) Lemmermann 1904							ss (3)	
Chroococcus cf. *distans* (G. M. Smith) Komarkova-Legnerova et Cronberg 1994							ss (1)	
Chroococcus globosus (Elenkin) Hindák 1978 (cf)							ss (1)	
Chroococcus goetzei Schmidle 1902			aab					
Chroococcus cf. *minimus* (Keissler) Lemmermann 1904							ss (1)	
Chroococcus minor (Kützing) Nägeli 1849							ss (1)	
Chroococcus minutus (Kützing) Nägeli 1849			pab					
Chroococcus cf. *planctonicus* Bethge 1935							ss (2)	
Chroococcus spp.						dom	r (4)	
Coelomoron pusillum (Van Goor) Komárek 1988							ss (3)	
Coelomoron sp.							ss (2)	
Coelosphaerium confertum West & G. S. West 1896							ss (2)	
Coelosphaerium kuetzingianum Nägeli 1849							ss (2)	
Cyanocatena imperfecta (Cronberg & Weibull) Joosten 2006							ss (1)	
Cyanodictyon endophyticum Pascher 1914							ss (1)	
Cyanodictyon filiforme J. Komárková-Legnerová & G. Cronberg 1994							ss (1)	
Cyanodictyon reticulatum (Lemmermann) Geitler 1925							ss (2)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Cyanotetras crucigenielloides Komárek 1995							ss (1)	
Cyanothece sp. (?*Synechococcus* sp.)							ss (1)	?
Cylindrospermopsis africana J. Komárek & H. Kling 1991 (?*Raphidiopsis africana*)							ss (1)	?
Cylindrospermopsis allantoidispora Komárková in Azevedo 1998, nom. inval. (?*Raphidiopsis allantoidispora*); noted as *Cylindrospermopsis* sp. in Hecky & Kling (1987)						x (?Fig. 10, App. 3)	ss (2)	?
Cylindrospermopsis gangetica (G. U. Nair) Komárek 2012 (?*Raphidiopsis gangetica*)							c (12), x, ab	?
Dolichospermum circinale (Rabenhorst ex Bornet & Flahault) P. Wacklin, L. Hoffmann & J. Komárek 2009 (Syn. *Anabaena circinalis* Rabenhorst ex Bornet & Flahault 1886)	pab, aab							Antx-a, MCs, STXs
Dolichospermum flosaquae (Brébisson ex Bornet & Flahault) P. Wacklin, L. Hoffmann & J. Komárek 2009 (Syn. *Anabaena flos-aquae* Brébisson ex Bornet & Flauhault 1886)	pab, tpa		pab					Antx-a
Dolichospermum spiroides (Klebhan) Wacklin, L. Hoffmann & Komárek 2009 (Syn. *Anabaena spiroides* Klebahn 1895)	pab, aab							Antx-a
Eucapsis aphanocapsoides (Skuja) Komárek & Hindák in Komárek et al. 2016							ss (2)	
Eucapsis cf. *microscopica* (Komárková-Legnerová & G. Cronberg) Komárek & Hindák in Komárek et al. 2016							ss (2)	
Glaucospira laxissima (G. S. West) Simic, Komárek & Dordevic 2014 (Syn. *Spirulina laxissima* G. S. West 1907)	pab						ss (3)	
Gloeothece hindakii Stoyneva, Gärtner & Vyverman 2009							r (4)	
Gloeotrichia longiarticulata G. S. West 1907	pab		pab					?
Gloeotrichia sp. (ad *Gloeotrichia natans* Rabenhorst ex Bornet & Flahault 1886)	pab							?MCs
cf. *Gomphosphaeria natans* Komárek & Hindák 1988							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Heteroleibleinia kuetzingii (Schmidle) Compère 1985 (Syn. *Lyngbya kuetzingii* Schmidle 1897)			pab					x
Hormoscilla pringsheimii Anagnostidis & Komárek 1988							ss (1)	
Kamptonema cortianum (Meneghini ex Gomont) Strunecký, Komárek & J. Smarda 2014 (Syn. *Oscillatoria cortiana* Meneghini ex Gomont 1892)			pab					?
Lemmermanniella sp. (ad *Lemmermanniella pallida* (Lemmermann) Geitler 1942)							ss (2)	
Leptolyngbya perelegans (Lemmermann) Anagnostidis & Komárek 1988							ss (1)	?
Leptolyngbya subtilis (West) Anagnostidis 2001							ss (1)	?
Leptolyngbya tenuis (Gomont) Anagnostidis & Komárek 1988 (Syn. *Phormidium tenue* Gomont 1892)			ab					Neurotoxicity on mouse; ?MCs
Leptolyngbya sp.							ss (1)	?MCs
Limnococcus limneticus (Lemmermann) Komárková, Jezberová, O. Komárek & Zapomelová 2010						x	ss (2)	
Limnolyngbya circumcreta (G. S. West) X. Li & R. Li 2016 (Syn. *Lyngbya circumcreta* G. S. West 1907)	tpa, pab					x	r (5)	
Limnolyngbya spp. (ad *L. circumcreta* (G. S. West) X. Li & R. Li 2016)	tpa						ss (2)	
Leibleinia epiphytica (Hieronymus) Compère 1985 (Syn. *Lyngbya epiphytica* Hieronymus in O. Kirchner 1898)	pab							?MCs
Merismopedia elegans A.Braun ex Kützing 1849	pab							?MCs
Merismopedia glauca (Ehrenberg) Kützing 1845 (Syn. *Merismopedia aeruginea* Brébisson in Kützing 1849)							ss (1)	?MCs
Merismopedia hyalina (Ehrenberg) Kützing 1845							ss (1)	?MCs
Merismopedia tenuissima Lemmermann 1898	pab, tpa						ss (1)	?MCs

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Merismopedia tranquilla (Ehrenberg) Trevisan 1845 (Syn. *Merismopedia punctata* Meyen 1839 nom. illeg.)	tpa, pab						r (6)	?MCs
Merismopedia warmingiana (Lagerheim) Forti 1907							r (7)	?MCs
Merismopedia spp.						dom		?MCs
Microseira wollei (Farlow ex Gomont) G. B. McGregor & Sendall ex Kenins 2017 (Syn. *Plectonema wollei* Farlow ex Gomont 1892)	aab							CYN, dexy-CYN, SXTs
Microcrocis obvoluta (Tiffany) T. H. Frank & A. G. Landman 1988, nom. inval.							ss (1)	
Microcystis aeruginosa (Kützing) Kützing 1846	tab, tpa, pab, aab, ab						r (6)	MCs, Antx-a
Microcystis firma (Kützing) Schmidle 1902	tpa						ss (2)	?MCs
Microcystis flos-aquae (Wittrock) Kirchner 1898	tpa, pab, tab, aab, ab		tpa, pab, ab	pab, ab			ss (1)	MCs
Microcystis ichtyoblabe (G. Kunze) Kützing 1843	aab, pab, tpa		tpa	pab				MCs
Microcystis novacekii (Komárek) Compère 1974							ss (2)	MCs
Microcystis prasina (Wittrock) Lemmermann 1904	pab		pab				ss (1)	?MCs
Microcystis pulverea (H. C. Wood) Forti 1907							ss (1)	?MCs
Microcystis robusta (H. W. Clark) Nygaard in Ostenfeld & Nygaard 1925			pab					?MCs
Microcystis wesenbergii (Komárek) Komárek ex Komárek in Joosen 2006						dom	r(7), x, ab	MCs
Microcystis spp. (separate cells)							ss (3)	?MCs
Myxobaktron sp.							ss (3)	
Oscillatoria planctonica Woloszynska 1912	pab							?
Oscillatoria tenuis C. Agardh ex Gomont 1892			aab					?

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Pannus cf. *planus* Hindák 1993							ss (2)	
Pannus punctiferus (Komárek & Komárková-Legnerová) Joosten 2006							ss (1)	
Phormidium diguetii (Gomont) Anagnostidis & Komárek 1988 (Syn. *Lyngbya diguetii* Gomont in Hariot 1895 as "*Digueti*")	pab		ab					?
Planktolyngbya bipunctata (Lemmermann) Anagnostidis & Komárek 1988 (Syn. *Lyngbya bipunctata* Lemmermann 1899)	aab						r (4)	
Planktolyngbya contorta (Lemmermann) Anagnostidis & Komárek 1988 (Syn. *Lyngbya contorta* Lemmermann 1898)	pab, tpa		pab				r (9), x, ab	
Planktolyngbya sp. (ad *P. contorta* (Lemmermann) Anagnostidis & Komárek 1988)							r (4)	
Planktolyngbya limnetica (Lemmermann) Komárková-Legnerová & Cronberg 1992 (Syn. *Lyngbya limnetica* Lemmermann 1898)	aab, pab						r (7)	
Planktolyngbya microspira Komárek & Cronberg 2001							c (10)	
Planktolyngbya cf. *regularis* J. Komárková-Legnerová & Cronberg 1992							ss (1)	
Planktolyngbya tallingii Komárek & H. Kling 1991							c (13), x, ab	
Planktolyngbya spp.							r (5)	
Potamolinea aerugineo-caerulea (Gomont) M. D. Martins & L. H. Z. Branco 2016 (Syn. *Lyngbya aerugineo-caerulea* Gomont 1892)			aab, tpa					Neuro- and hepatooxicity
Pseudanabaena galeata Böcher 1949							ss (1)	
Pseudanabaena limnetica (Lemmermann) Komárek 1974 (Syn. *Oscillatoria limnetica* Lemmermann 1900)	x						ss (1)	Antx-a, MCs
Pseudanabaena moniliformis Komárek & Kling 1991							ss (1)	
Pseudanabaena mucicola (Naumann & Huber-Pestalozzi) Schwabe 1964 (Syn. *Phormidium mucicola* Nauman & Huber-Pestalozzi in Huber-Pestalozzi & Nauman 1929)	aab						r (6), x, ab	? (associated with toxin-producers)

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Pseudanabaena cf. *recta* Komárek & Cronberg 2000							ss (1)	?
Pseudanabaena sp. (? *Phormidium* sp.)							ss (1)	?
Radiocystis geminata Skuja 1948						x	ss (1)	?
Raphidiopsis catemaco (Komáreková-Legnerová & Tavera) Aguilera, Berrendero Gómez, Kastovsky, Echenique & Salerno 2018							ss (1)	?
Raphidiopsis helicoidea (Cronberg & Komárek) Aguilera, Berrendero Gómez, Kastovsky, Echenique & Salerno 2018 (as *Cylindrospermopsis* sp. in Hecky & Kling 1987)						x (?Fig. 12, App. 3)	ss (3)	?
Raphidiopsis philippinensis (W.R.Taylor) Aguilera, Berrendero Gómez, Kastovsky, Echenique & Salerno 2018							r (5), x, ab	?
Raphidiopsis raciborskii (Woloszynska) Aguilera, Berrendero Gómez, Kastovsky, Echenique & Salerno 2018							ss (2)	CYN, CYN-like, dexy-CYN, Hepatotoxic, SXTs
Raphidiopsis setigera (Aptekar) Eberly 1966							ss (1)	
Rhabdoderma lineare Schmidle & Lauterborn in Schmidle 1900							ss (2)	
Romeria gracilis (Koczwara) Koczwara in Geitler 1932							ss (1)	
Romeria okensis (C. Meyer) Hindák 1975							c (11)	
Romeria simplex (Hindák) Hindák 1988							r (6)	
Snowella atomus Komárek & Hindák 1988							ss (1)	
Snowella littoralis (Häyrén) Komárek & Hindák 1988							ss (1)	
Sphaerocavum microcystiforme (Hindák) Azevedo & Sant' Anna 2003 (Syn. *Pannus microcystiformis* Hindák 1993)							ss (3)	
Synechococcus endogloeicus Hindák 1996							ss (1)	?
Synechococcus nidulans (Pringsheim) Komárek in Bourrelly 1970							ss (3), x, ab	?
Synechocystis aquatilis Sauvageau 1892						x		

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Synechocystis endobiotica (Elenkin & Hollerbach) Elenkin 1938							r (4)	
Synechocystis salina Wislouch 1924						x		
Woronichinia microcystoides (Komárek) Joosten 2006							ss (1)	?
Woronichinia sp.							ss (1)	?
Xenotholos kerneri (Hansgirg) M. Gold-Morgan, G. Montejano & J. Komárek 1994 (Syn. *Xenococcus kerneri* Hansgirg 1887)			aab					
EUGLENOPHYTA								
Anisonema ovale G. A. Klebs 1892			x					
Euglena pisciformis Klebs 1883			x					
Euglena sp.	x		x				ss (1)	
Petalomonas angusta (Klebs) Lemmermann 1910			x					
Petalomonas angusta var. *pusilla* (Klebs) Lemmermann 1910			x					
Phacus sp. (? nov. sp.)			x					
Trachelomonas impressa Pascher 1949			x					
Trachelomonas volvocina (Ehrenberg) Ehrenberg 1834			x					
PYRRHOPHYTA								
Cystodinium hyalinum Pascher 1944			ss					
Parvodinium africanum (Lemmermann) Carty 2008							ss (1)	
Peridinium sp. (?*Peridiniopsis* sp.)							ss (1)	
Peridiniopsis sp.							ss (1)	
Woloszynskia sp.							ss (1)	
CRYPTOPHYTA								
Cryptomonas sp.						x		
OCHROPHYTA								
Tribophyceae								
Botrydiopsis arhiza Borzi 1895	x							
Botrydiopsis sp.	upp							
Chloridella neglecta (Pascher & Geitler) Pascher 1932			upp					
Gloeobotrys limneticus (G. M. Smith) Pascher 1938			x					

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Goniochloris mutica (A. Braun) Fott 1960 (Syn. *Tetraëdron muticum* (A. Braun) Hansgirg 1888 as "*mutica*")	r, f							
Goniochloris pulchra Pascher 1938							r (4)	
Characiopsis tuba (Hermann) Lemmermann 1914			r					
Monodus chodatii Pascher 1925			x					
Ophiocytium parvulum (Perty) A. Braun 1855	x							
Pleurochloris pyrenoidosa Pascher 1938			x					
Tetraplektron torsum (W. B. Turner) Dedusenko-Shchegoleva in Dedusenko-Shchegoleva & Gollerbach 1962							ss (1)	
Chrysophyceae								
Derepyxis sp.			x					
Lagynion vasicola Pascher 1949			x					
Stokesiella sp.			x					
Synurophyceae								
Mallomonas sp.			x					
Bacillariophyceae								
Achnanthes congolensis Hustedt 1949 (Syn. *Achnanthes atomus* var. *congolensis* Hustedt 1949)		ss						
Achnanthes exigua Grunow 1880 (Syn. *Achnanthes exigua* var. *constricta* (Grunow) Hustedt 1921)		x						
Achnanthes inflata (Kützing) Grunow 1868		x						
Achnanthes simplex Hustedt 1936	ss							
Achnanthidium lineare W. Smith 1855							r (5)	
Achnanthidium minutissimum (Kützing) Czarnecki 1994							ss (1)	
Achnanthidium subhudsonis (Hustedt) H. Kobayasi in Kobayashi et al. 2006 (Syn. *Achnanthes subhudsonis* Hustedt 1921)	x	x						
Afrocymbella beccarii (Grunow) Krammer 2003 (Syn. *Gomphocymbella beccari* (Grunow) Forti 1910)	x, f	x, f		x				
Amphora copulata (Kützing) Schoeman & R. E. M. Archibald 1986							ss (1)	
Amphora ovalis (Kützing) Kützing 1844	x	x		x	x			

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Amphora pediculus (Kützing) Grunow ex A. Schmidt 1875 (Syn. *Amphora ovalis* var. *pediculus* Kützing 1844)	x	x		x	x			
Aneumastus tuscula (Ehrenberg) D. G. Mann & A. J. Stickle in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula tuscula* Ehrenberg 1840)	ss							
"*Anomoeneis serians* var. *brachysira* (Brébisson) van Heurck"	x							
Anomoeneis sphaerophora Pfitzer 1871	x	x		x				
Anomoeneis sphaerophora var. *guntheri* O. Müller	x							
Asterionella formosa Hassall 1850	x	x						
Aulacoseira agassizii (Ostenfeld) Simonsen 1979 (Syn. *Melosira agassizii* Ostenfeld 1909)					r			
Aulacoseira ambigua (Grunow) Simonsen 1979 (Syn. *Melosira ambigua* (Grunow) O. Müller 1903)	x, f	x						
Aulacoseira granulata (Ehrenberg) Simonsen 1979 (Syn. *Melosira granulata* (Ehrenberg) Ralfs in Pritchard 1861)	x, r				x			
Aulacoseira granulata var. *angustissima* (O.Müller) Simonsen 1979 (Syn. *Melosira granulata* var. *angustissima* O. Müller 1899)	x			x			c (19)	
Aulacoseira italica (Ehrenberg) Simonsen 1979 (Syn. *Melosira italica* (Ehrenberg) Kützing 1844)	x	x		f				
Belonastrum berolinense (Lemmermann) Round & Maidana 2001							ss (2)	
Caloneis amphisbaena (Bory) Cleve 1894	r							
Caloneis bacillum (Grunow) Cleve 1894	x	x			x		r (4)	
Caloneis incognita Hustedt 1911		x						
Caloneis inflata (Hustedt) Metzeltin & Lange-Bertalot 2007 (Syn. *Caloneis bacilum* f. *inflata* Hustedt 1949)	x	x					ss (1)	
Caloneis clevei (Lagerstedt) Cleve 1894	x	x						
Caloneis incognita Hustedt 1911		x						
Caloneis silicula (Ehrenberg) Cleve 1894	x			x				
Caloneis sp.							ss (2)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Cavinula scutelloides (W. Smith) Lange-Bertalot in Lange-Bertalot & Metzeltin 1996 (Syn. *Navicula scutelloides* W. Smith 1856)					x			
Cocconeis pediculus Ehrenberg 1838							ss (2)	
Cocconeis placentula Ehrenberg 1838	x, f	x, f		x	x		ss (2)	
Cocconeis placentula var. *euglypta* (Ehrenberg) Grunow 1884 as *Cocconeis placentula* var. *euglypta* (Ehrenberg) Cleve (1895)	x	x		x				
"*Coscinodiscus rothi* var. *subsalsa* (Juhl.-Dannf.) Hustedt"	ss							
Craticula ambigua (Ehrenberg) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula cuspidata* var. *ambigua* (Ehrenberg) Kirchner 1878)	x	x						
Craticula cuspidata (Kutzing) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula cuspidata* (Kutzing) Kutzing 1844)		x						
Craticula molestiformis (Hustedt) Mayama 1999 (Syn. *Navicula molestiformis* Hustedt 1949)	x							
Cyclostephanos damasii (Hustedt) Stoermer & Håkansson in Theriot, Håkansson, Kociolek, Round & Stoermer 1988 (Syn. *Stephanodiscus damasi* Hustedt 1949)	x, f, sh	x					c (22), x, ab	
Cyclotella atomus Hustedt 1937							ss (1)	
Cyclotella meneghiniana Kützing 1844	x						ss (1)	
Cymbella affinis Kützing 1844					x		ss (1)	
Cymbella lanceolata (C. Agardh) C. Agardh 1830	x							
Cymbopleura inaequalis (Ehrenberg) Krammer 2003 (Syn. *Cymbella cuspidata* Kützing 1844)	ss							
Cymbella parva (W. Smith) Kirchner 1878	ss							
Cymbella tumida (Brébisson) Van Heurck 1880	r	r						
Cymbopleura stauroneiformis (Lagerstedt) Krammer 2003 (Syn. *Cymbella stauroneiformis* Lagerstedt 1873)	ss						ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Encyonema elginense (Krammer) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Cymbella turgida* (Gregory) Cleve)	x	x			x			
Denticula tenuis Kützing 1844 as "*Denticulus*"	r							
Diadesmis confervacea Kützing 1844 (Syn. *Navicula confervacea* (Kützing) Grunow in Van Heurck 1880)		x		x	x			
Diadesmis contenta var. *biceps* (Grunow) P. B. Hamilton in Hamilton et al. 1992 (Syn. *Navicula contenta* f. *biceps* Arnott ex Hustedt 1930)		x						
Diadesmis contenta var. *parallela* (J.B. Petersen) Spaulding in Spaulding et al. 1997 (Syn. *Navicula contenta* f. *parallela* (J.B.Petersen) Hustedt 1930)	x	x						
Diatoma problematica Lange-Bertalot 1993							ss (1)	
Diatoma tenue var. *elongatum* Lyngbye 1819 (Syn. *Diatoma elongatum* (Lyngbye) C. A. Agardh 1824)		ss						
Diatoma vulgaris Bory 1824 as "*vulgare*"	r	ss			x			
Dickieia danseii Thwaites 1848 (Syn. *Mastogloia elliptica* var. *dansei* (Thwaites) Cleve 1895)	x	x		x				
Didymosphenia geminata (Lyngbye) M. Schmidt in A. Schmidt 1899							ss (1)	
Diploneis elliptica (Kützing) Cleve 1894	x							
Diploneis ovalis (Hilse) Cleve 1891	x							
Diploneis subovalis Cleve 1894	x				x			
Discostella stelligera (Cleve & Grunow) Houk & Klee 2004 (Syn. *Cyclotella stelligera* (Cleve & Grunow) Van Heurck 1882)	x	x						
Dorofeyukea grimmei (Krasske) Kulikovskiy & Kociolek in Kulikovskiy et al. 2019 (Syn. *Navicula grimmei* Krasske in Hustedt 1930)	x	x		x				
Encyonema caespitosum Kützing 1849							ss (2)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Encyonema grossestriatum (O. Müller) D. G. Mann in Round, Crawford & Mann 1990 (Syn. *Cymbella grossestriata* O. Müller 1905)	r							
Encyonema muelleri (Hustedt) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Cymbella mülleri* Hustedt 1937)	x, f	x, ab		x				
Encyonema silesiacum (Bleisch) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990							ss (2)	
Encyonopsis microcephala (Grunow) Krammer 1997							ss (1)	
Encyonopsis subminuta Krammer & Reichart in Krammer 1997							ss (2)	
Epithemia adnata (Kützing) Brébisson 1838 (Syn. *Epithemia zebra* (Ehrenberg) Kützing 1844)	x	x		x				
Epithemia adnata var. *saxonica* (Kützing) R. M. Patrick in R. M. Patrick & Reimer 1975 (Syn. *Epithemia zebra* var. *saxonica* (Kützing) Grunow 1862)	x							
Epithemia argus (Ehrenberg) Kützing 1844	x							
Epithemia cistula (Ehrenberg) Ralfs in Pritchard 1861	x							
Epithemia gibba (Ehrenberg) Kützing 1844 (Syn. *Rhopalodia gibba* (Ehrenberg) O. Müller 1895)	x, f	x		x				
Epithemia porcellus Kützing 1844 (Syn. *Epithemia zebra* var. *porcellus* (Kützing) Grunow 1862)	x	x			x			
Epithemia operculata (C. Agardh) Ruck & Nakov in Ruck et al. 2016 (Syn. *Cyclotella operculata* (C. Agardh) Brébisson 1838)		ss						
Epithemia sorex Kützing 1844	x, f	x						
Epithemia turgida (Ehrenberg) Kützing 1844	ss							
Epithemia vermicularis (O. Müller) Cocqyut & R. Jahn in Cocquyt et al. 2018 (Syn. *Rhopalodia vermicularis* O. Müller 1895)	x, f	sh						
Eunotia epithemioides Hustedt in A. W. F. Schmidt 1913, nom. inval.		x						

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Eunotia lunaris (Ehrenberg) Grunow 1877	x, f	x						
Eunotia pectinalis (Kützing) Rabenhorst 1864		x						
Eunotia pectinalis var. *ventricosa* (Ehrenberg) Grunow in Van Heurck 1881 (Syn. *Eunotia pectinalis* var. *ventralis* (Ehrenberg) Hustedt 1911)	x			x				
Fragilaria capucina Desmazières 1830							ss (2)	
Fragilaria fragilarioides (Grunow) Cholnoky 1963 (Syn. *Synedra rumpens* var. *fragilarioides* Grunow in Van Heurck 1881)	x	x						
Fragilaria cf. *pectinalis* (O. Müller) Lyngbye 1819							ss (1)	
Frustulia rhomboides (Ehrenberg) De Toni 1891		x						
Frustulia saxonica Rabenhorst 1853 (Syn. *Frustulia rhomboides* var. *saxonica* (Rabenhorst) De Toni 1891)	x							
Frustulia vulgaris (Thwaites) De Toni 1891	x							
Gomphoneis clevei (Fricke) Gil 1989 (Syn. *Gomphonema clevei* Fricke in A. W. F. Schimidt 1902)	x	x		x				
Gomphonema aequatoriale Hustedt 1949	x	x						
Gomphonema africanum G. S. West 1907	x	x						
Gomphonema gracile Ehrenberg 1838	x							
Gomphonema intricatum Kützing 1844					x			
Gomphonema lateripunctatum E. Reichardt & Lange-Bertalot 1991							ss (2)	
Gomphonema grunowii R. M. Patrick & Reimer 1975 (Syn. *Gomphonema lanceolatum* Ehrenberg 1843)	x	x						
Gomphonema insigne W. Gregory 1856 (Syn. *Gomphonema lanceolatum* var. *insigne* (W. Gregory) Cleve 1894 as "*insignis*")	x							
Gomphonema minutum (C. Agardh) C. Agardh 1831							ss (2)	
Gomphonema minusculum Cleve-Euler 1949, nom. illeg.							ss (3)	
Gomphonema olivaceum (Hornemann) Brébisson 1838							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Gomphonema parvulum (Kützing) Kützing 1849 as "*Gomphonema parvulum* (Kützing) Grunow"	x	x, f						
"*Gomphonema parvulum* var. *lagenula* (Grunow) Hustedt" (? *Gomphonema lagenula* Kützing 1844)		x			x			
Gomphonema pumilum (Grunow) E. Reichardt & Lange-Bertalot 1991 (Syn. *Gomphonema intricatum* var. *pumila* A. Cleve 1932)	x	x					ss (1)	
Gomphonema subclavatum (Grunow) Grunow 1884 (Syn. *Gomphonema longiceps* var. *subclavatum* (Grunow) Hustedt 1930, nom. illeg. as "*subclavata*")		x						
Gomphonitzschia ungeri Grunow 1868	x	x						
Grunowia solgensis (A. Cleve) Aboal in Aboal et al. 2003 (Syn. *Nitzschia interrupta* (Reichelt) Hustedt 1927)	s							
Gyrosigma sciotoense (W. S. Sullivant) Cleve 1895 (Syn. *Gyrosigma spenceri* var. *nodiferum* (Grunow) Cleve 1894 as "*nodifera*")	x	x						
Halamphora montana (Krasske) Levkov 2009 (Syn. *Amphora montana* Krasske 1932)		x						
Halamphora submontana (Hustedt) Levkov 2009 (Syn. *Amphora submontana* Hustedt 1949)		ss						
Halamphora veneta (Kützing) Levkov 2009 (Syn. *Amphora veneta* Kützing 1844)	x							
Hannaea arcus (Ehrenberg) R. M. Patrick in R. M. Patrick & C. W. Reimer 1966 (Syn. *Ceratoneis arcus* (Ehrenberg) Kützing 1844)	ss	ss						
Hantzschia amphioxys (Ehrenberg) Grunow in Cleve & Grunow 1880	x	x		x	x			
Hantzschia distincte-punctata Hustedt in Schmidt et al. 1921	r							
Hippodonta hungarica (Grunow) Lange-Bertalot, Metzeltin & Witkowski 1996 (Syn. *Navicula hungarica* Grunow 1860)	x			x			ss (1)	
Humidophila contenta (Grunow) Lowe, Kociolek, J. R. Johansen, Van de Vijver, Lange-Bertalot & Kopalová							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Iconella engleri (O. Müller) C. Cocquyt & R. Jahn in Jahn, Kusber & Cocquyt 2017 (Syn. *Surirella engleri* O. Müller 1904)	x, f, ab, sh	o		sh			r (7)	
Iconella tenera (W. Gregory) Ruck & Nakov in Ruck et al. 2016 (Syn. *Surirella tenera* W. Gregory 1856)	ss	ss						
Lemnicola exigua (Grunow) Kulikovskiy, Witkowski & Plinski in Plinski & Witkowski 2011 (Syn. *Achnanthes exigua* Grunow 1880)	x	x						
Lemnicola hungarica (Grunow) Round & Basson 1997 (Syn. *Achnanthes hungarica* (Grunow) Grunow 1880)	x			x				
Lindavia comta (Kützing) Nakov, Gullory, Julius, Theriot & Alverson 2015 (Syn. *Cyclotella comta* Kützing 1849)	x	x		x	x			
Luticola cohnii (Hilse) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula mutica* f. *cohnii* (Hilse) Cleve 1894)	x							
Luticola lagerheimii (Cleve) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula lagerheimii* Cleve 1894)		x		x				
Luticola mutica (Kützing) D. G. Mann in Round, R. M. Crawford & D. G. Mann 1990 (Syn. *Navicula mutica* Kützing 1844)	x	x		x				
Luticola terminata (Hustedt) J. R. Johansen in J. R. Johansen et al. 2004 (Syn. *Navicula mutica* var. *tropica* Hustedt 1937)		x						
Mastogloia elliptica (C. Agardh) Cleve in A. W. F. Schmidt 1893	r							
Meridion circulare (Greville) C. Agardh 1831	ss							
Navicula bacilliformis Grunow in Cleve & Grunow 1880				x				
Navicula barbarica Hustedt 1949		x, f						
Navicula capitatoradiata H. Germain ex Gasse 1986 *(Syn. Navicula cryptocephala* var. *intermedia* Grunow in Van Heurck 1880)	x	x					r (7)	
Navicula cari Ehrenberg 1836 (Syn. *Navicula graciloides* A.Mayer 1919)					x			

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Navicula cincta (Ehrenberg) Ralfs in Pritchard 1861					x			
Navicula cryptocephala Kützing 1844	x	x		x	x		ss (1)	
Navicula cuspidata var. *ambiqua* f. *subcapitata* O. Müller 1899	x							
"*Navicula exigua* (Greg.) O. Müller"	x							
Navicula exiguiformis f. *elliptica* Hustedt 1949	x	x						
Navicula finitima Hustedt 1949 non *N. finitima* Janisch 1888					x			
Navicula mereschkowskyi O. Müller	r							
Navicula minima Grunow in Van Heurck 1880 (Syn. *Navicula minima* var. *atomoides* (Grunow) Cleve 1894)		x						
Navicula oblonga (Kützing) Kützing 1844	ss							
Navicula radiosa Kützing 1844	x	x						
Navicula rostellata Kützing 1844 (Syn. *Navicula viridula* var. *rostellata* (Kützing) Cleve 1895)		x			x			
Navicula rhynchocephala Kützing 1844	x				x			
Navicula schroeteri F. Meister 1932	x							
Navicula seminuloides var. *sumatrensis* Hustedt 1937	x							
Navicula cf. *simplex* Krasske 1925	x						ss (1)	
Navicula subcontenta var. africana Hustedt 1949				x				
Navicula subrhynchocephala Hustedt 1935	x	x						
Navicula tripunctata (O. F. Müller) Bory in Bory de Saint-Vincent 1822 (Syn. *Navicula gracilis* Ehrenberg 1832)	x				x			
Navicula truncata Kützing 1844 (Syn. *Caloneis silicula* var. *truncata* Grunow as "*truncatula*" - ? Err. typogr.)	x							
Navicula vandamii Schoeman & R. E. M. Archibald 1987							ss (1)	
Navicula viridula (Kützing) Ehrenberg 1836	x	x						
Navicula zanoni Hustedt 1949	x							
Neidium affine (Ehrenberg) Pfitzer 1871		x						
Neidium affine var. *amphirhynchus* (Ehrenberg) Cleve 1894		x						

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Neidium productum (W. Smith) Cleve 1894		x						
Neidiomorpha binodis (Ehrenberg) M. Cantonati, Lange-Bertalot & N. Angeli 2010 (Syn. *Fragilaria construens* var. *binodis* (Ehrenberg) Grunow 1862)	x							
Nitzschia cf. *accommodata* Hustedt 1949							ss (1)	
Nitzschia acicularis (Kützing) W. Smith 1853	ss							
Nitzschia adapta Hustedt 1949	x, f	x, f						
Nitzschia aequalis Hustedt 1949	x							
Nitzschia amphibia Grunow 1862	x	x, f			x			
Nitzschia amphibia var. *pelagica* Hustedt 1949	x	f						
Nitzschia amphioxoides Hustedt 1949	x	x						
Nitzschia bacata Hustedt 1937	x	f					c (14)	
Nitzschia bacata f. *linearis* Hustedt 1949		x						
Nitzschia capitellata Hustedt in A. W. F. Schimidt 1922, nom. inval.	x						ss (1)	
Nitzschia communis Rabenhorst 1860	x							
Nitzschia congolensis Hustedt 1949	x, f							
Nitzschia consummata Hustedt	x, f	x						
Nitzschia dissipata (Kützing) Rabenhorst 1860	x						ss (1)	
Nitzschia epiphytica O. Müller 1905	x, f	x, ab						
Nitzschia epiphyticoides Hustedt 1949	x, f	x						
Nitzschia inconspicua Grunow 1862							ss (1)	
Nitzschia intermedia Hantzsch in Grunow 1880	x	x					ss (3)	
Nitzschia intermissa Hustedt 1949		x						
Nitzschia jugiformis Hustedt 1922	ss							
Nitzschia cf. *lacuum* Lange-Bertalot 1980 = *Nitzschia fonticola* (Grunow) Grunow in Van Heurck 1881 sensu Hustedt 1949	x, f, ab	x		sh			f (28), x, ab	
Nitzschia lancettula O. Müller 1905	x, f	x		f			c (11)	
Nitzschia linearis W. Smith 1853	x	x						
Nitzschia microcephala Grunow in Cleve & Grunow 1880	ss							
Nitzschia obsidialis Hustedt 1949		x						
Nitzschia obsoleta Hustedt 1949	x	ab						

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Nitzschia palea (Kützing) W. Smith 1856	x	x						
Nitzschia palea var. *tropica* Hustedt 1949	x	x						
Nitzschia perminuta Grunow in Van Heurck 1881	x							
Nitzschia recta Hantzsch ex Rabenhorst 1862	r						ss (1)	
Nitzschia spiculoides Hustedt 1949	x	x						
Nitzschia spiculum Hustedt 1949	x, f	x, f					f (26), x, ab	
Nitzschia stricta Hustedt 1949	x							
Nitzschia subacicularis Hustedt 1922, nom. inval.	x						ss (3)	
Nitzschia tarda Hustedt 1949	x, f							
"*Nitzschia thermalis* Kützing" (? *Nitzschia thermalis* (Ehrenberg) Auerswald in Rabenhorst 1861)	x							
Nitzschia thermalis var. *minor* Hilse 1862	x							
Nitzschia tropica Hustedt 1949				f			f (25), x, ab	
Nitzschia umbonata (Ehrenberg) Lange-Bertalot 1978 (Syn. *Nitzschia stagnorum* Rabenhorst 1860)		x						
Odontidium hyemale (Roth) Kützing 1844 (Syn. *Diatoma hyemalis* (Roth) Heiberg 1863 as "*hiemale*")	r							
Odontidium mesodon (Kützing) Kützing 1849 (Syn. *Diatoma hyemalis* var. *mesodon* (Ehrenberg) Kirchner 1878 as "*hiemale*")	ss							
Orthoseira roeseana (Rabenhorst) Pfitzer 1871 (Syn. *Melosira roeseana* Rabenhorst 1853)				ss				
Pantocsekiella comensis (Grunow) K. T. Kiss & E. Ács in Ács et al. 2016 (Syn. *Cyclotella comensis* Grunow in Van Heurck 1882)		ss			f			
Pantocsekiella ocellata (Pantocsek) K. T. Kiss & Ács in E. Ács et al. 2016 (Syn. *Cyclotella ocellata* Pantocsek 1901)	x							
Pinnularia acoricola Hustedt 1935	ss							
Pinnularia acrosphaeria W. Smith 1853		x		x				
Pinnularia borealis Ehrenberg 1843	x			x				

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Pinnularia brauniana (Grunow) Studnicka 1888 (Syn. *Pinnularia braunii* Cleve 1895)		x						
Pinnularia gibba (Ehrenberg) Ehrenberg 1843		x						
Pinnularia gibba var. *sancta* (Grunow ex Cleve) F. Meister 1932		x		x				
Pinnularia graciloides Hustedt 1937		x						
Pinnularia interrupta W. Smith 1853		x						
Pinnularia mesolepta (Ehrenberg) W. Smith 1853		x						
Pinnularia microstauron (Ehrenberg) Cleve 1891		x						
Pinnularia platycephala (Ehrenberg) Cleve 1891 (Syn. *Navicula platycephala* (Ehrenberg) Cleve & Müller 1882 as "*Navicula platycephala* O. Müller")	ss	ss						
Pinnularia stomatophora (Grunow) Cleve 1895		x						
Pinnularia subcapitata W. Gregory 1856	x	x						
Pinnularia viridis (Nitzsch) Ehrenberg 1843		x						
Placoneis exiguiformis (Hustedt) Lange-Bertalot in Metzeltin, Lange-Bertalot & García-Rodriguez 2005 (Syn. *Navicula exiguiformis* Hustedt 1944)	x, f	x, f					r (4)	
Placoneis gastrum (Ehrenberg) Mereschkowsky 1903 (Syn. *Navicula gastrum* (Ehrenberg) Kützing 1844)	x, f	x, f		x				
Planothidium lanceolatum (Brébisson ex Kützing) Lange-Bertalot 1999 (Syn. *Achnanthes lanceolata* (Brébisson ex Kützing) Grunow 1880)	x			x				
Planothidium capitatum (O. Müller) Van de Vijver, Kopalová, C. E. Wetzel & Ector in Wetzel et al. 2014 (Syn. *Achnanthes lanceolata* var. *capitata* O. Müller 1909)	x							
Planothidium rostratoholoarcticum Lange-Bertalot & Bąk in Bąk & Lange-Bertalot 2015 (Syn. *Achnanthes lanceolata* var. *rostrata* Hustedt 1911)	x	x						
Psammothidium cf. *daonense* (Lange-Bertalot) Lange-Bertalot 1999							ss (3)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Pseudostaurosira brevistriata (Grunow) D. M. Williams & Round 1988 (Syn. *Fragilaria brevistriata* Grunow in Van Heurck 1885)	x	x		f				
Pseudostaurosiropsis geocollegiarum (Witkowski) E. A. Morales 2002							c (12)	
Pseudostaurosiropsis geocollegiarum f. *triradiatum* E. A. Morales 2005							r (7)	
Reimeria sinuata (Gregory) Kociolek & Stoermer 1987							ss (1)	
Rhoicosphenia abbreviata (C. Agardh) Lange-Bertalot 1980 (Syn. *Rhoicosphenia curvata* (Kützing) Grunow 1860)	x	x			x		ss (1)	
Rhopalodia gibba var. *ventricosa* (Kützing) H. Peragallo & M. Peragallo 1900	x, f	x		x				
Rhopalodia gibberula (Ehrenberg) O. Müller 1895	x	x		x	x			
Rhopalodia gracilis O. Müller 1895	x, f	x, sh						
Rhopalodia gracilis f. *linearis* O. Müller	x							
Rhopalodia hirundiniformis O. Müller	x	x			x			
"*Rhopalodia vermicularis* f. *perlonga*" (? *Rhopalodia vermicularis* var. *perlonga* Fricke)	x	x						
Sellaphora damasii (Hustedt) C. E. Wetzel, L. Ector, B. Van de Vijver, Compère & D. G. Mann 2015							ss (2)	
Sellaphora meridionalis Potapova and Ponader 2008							ss (2)	
Sellaphora nyassensis (O. Müller) D. G. Mann 1989 (Syn. *Navicula nyassensis* O. Müller 1910)	x, f	x, f		x				
Sellaphora parapupula Lange-Bertalot in Lange-Bertalot & Metzeltin 1996 (Syn. *Navicula pupula* var. *capitata* Hustedt in Schmidt 1934)	x	x						
Sellaphora perventralis (Hustedt) A. Tuji 2003 (Syn. *Navicula perventralis* Hustedt 1937)	x							
Sellaphora pupula (Kützing) Mereschkovsky 1902 (Syn. *Navicula pupula* Kützing 1844)	x	x		x			ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Sellaphora rectangularis (W. Gregory) Lange-Bertalot & Metzeltin 1996 (Syn. *Navicula pupula* var. *rectangularis* (W. Gregory) Cleve & Grunow 1880)	x							
Sellaphora rostrata (Hustedt) J. R. Johansen in J. R. Johansen et al. 2004 (Syn. *Navicula pupula* var. *rostrata* Hustedt 1911)	x							
Sellaphora seminulum (Grunow) D. G. Mann 1989 (Syn. *Navicula seminulum* Grunow 1860)		x						
Sellaphora thienemannii (Hustedt) C. E. Wetzel, L. Ector, B. Van de Vijver, Compère & D. G. Mann 2015 (Syn. *Navicula thienemannii* Hustedt 1937)		x						
Sellaphora spp.							ss (1)	
Stauroneis phoenicenteron (Nitzsch) Ehrenberg 1843	x	x						
Staurosira construens Ehrenberg 1843 (Syn. *Fragilaria construens* (Ehrenberg) Grunow 1862)	x	x		f				
Staurosira leptostauron (Ehrenberg) Kulikovskiy & Genkal in Kulikovskiy et al. 2011 (Syn. *Staurosirella leptostauron* (Ehrenberg) D. M. Williams & Round 1988)							r (4)	
Staurosira venter (Ehrenberg) Cleve & J. D. Möller 1879 (Syn. *Fragilaria construens* var. *venter* (Ehrenberg) Grunow in Van Heurck 1881)	x			x			ss (2)	
Staurosirella africana (Hustedt) D. M. Williams & Round 1988 (Syn. *Fragilaria africana* Hustedt 1949)	x	x					ss (2)	
Staurosirella pinnata (Ehrenberg) D. M. Williams & Round 1988 (Syn. *Fragilaria pinnata* Ehrenberg 1843)	x			x			ss (1)	
Stephanodiscus astraea (Kützing) Grunow 1880	x	x			x			
Stephanodiscus hantzschii Grunow in Cleve & Grunow 1880	x							

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Stephanodiscus cf. *minutulus* (Kützing) Cleve & Möller 1882 (Syn. *Stephanodiscus aestraea* f. *minutula* (Kützing) Grunow in Van Heurck 1882 as "*minutula*")	x	x					c (19)	
Surirella engleri f. *constricta* O. Müller 1903	x	x		x				
Surirella fasciculata O. Müller 1903				x				
Surirella füllerborni O. Müller	x, f							
Surirella füllerborni f. *constricta* O. Müller	x, f	x						
Surirella librile (Ehrenberg) Ehrenberg 1845 (Syn. *Cymatopleura solea* (Brébisson) W. Smith 1851)	x	x		x				
Surirella regula Ehrenberg 1843 (Syn. *Cymatopleura solea* var. *regula* (Ehrenberg) Grunow 1862)	x							
Surirella robusta Ehrenberg 1841	x							
Surirella splendida (Ehrenberg) Kützing 1844 (Syn. *Surirella robusta* var. *splendida* (Ehrenberg) Van Heurck 1885)	ss							
Surirella subrugosa C. Cocquyt & R. Jahn in Jahn, Kusber & Cocquyt 2017 (Syn. *Cymatopleura solea* var. *rugosa* O. Müller 1904)					x			
Synedra dorsiventralis O. Müller 1910	x	x						
Tabellaria fenestrata (Lyngbye) Kützing 1844	ss	ss			ss			
Tabellaria flocculosa (Roth) Kützing 1844	ss							
Thalassiosira faurii (Gasse) Hasle 1978							ss (2)	
Thalassiosira rudolfii (Bachmann) Hasle 1978 (Syn. *Coscinodiscus rudolfii* Bachmann 1938)	x, f	x, f		x			ss (1)	
Tryblionella calida (Grunow) Mann in Round, R. M. Crawford & D. G. Mann 1990							ss (1)	
Tryblionella levidensis W. Smith 1856 (Syn. *Nitzschia tryblionella* var. *levidensis* (W. Smith) Grunow in Cleve & Grunow 1880)	x	x						
Ulnaria acus (Kützing) M. Aboal in Aboal et al. 2003							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Ulnaria biceps (Kützing) Compère 2001 (Syn. *Synedra ulna* var. *biceps* (Kützing) Schönfeldt 1913)		x						
Ulnaria danica (Kützing) Compère & Bukhtiyarova in Bukhtiyarova & Compère 2006							ss (1)	
Ulnaria delicatissima var. *angustissima* (Grunow) Aboal & P. C. Silva 2004 (Syn. *Synedra acus* var. *angustissima* (Grunow) Van Heurck 1885)	x							
Ulnaria ulna (Nitzsch) Compère 2001 (Syn. *Synedra ulna* (Nitzsch) Ehrenberg 1832)	x	x		x	x		ss (1)	
CHLOROPHYTA								
cf. *Acantosphaera zacchariasii* Lemmermann 1899							ss (2), ab	
Acutodesmus acutiformis (Schröder) Tsarenko & D. M. John 2011 (Syn. *Scenedesmus acutiformis* Schröder 1897)	x							
Ankistrodesmus falcatus (Corda) Ralfs 1848	x							
Binuclearia lauterbornii (Schmidle) Proschkina-Lavrenko 1966 (Syn. *Planctonema lauterbornii* Schmidle 1903)						x	r (8), x, ab	
Botryococcus braunii Kützing 1849	ec		x	aab				
Chlamydomonas komma Pascher 1949			x					
Chlamydomonas lismorensis Playfair 1917			x					
Chlamydomonas pisum Pascher 1949			x					
Chlamydomonas simulans Pascher 1949			x					
"*Chlorella vulgaris*"	x							
Chloromonas modesta (Pascher) Gerloff & Ettl in Ettl 1970 (Syn. *Chlamydomonas modesta* A. Pascher 1949)			x					
Cladophora glomerata var. *crassior* (C. Agardh) C. Hoek 1963 (Syn. *Cladophora crispata* (Roth) Kützing 1843)			ab			x		
Cladophora sp.			x					
Coelastrum microporum Nägeli in A. Braun 1855	c						ss (2)	
Coelastrum pulchrum Schmidle 1892							ss (2)	
Coelastrum reticulatum var. *cubanum* Komárek 1975							ss (3)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Coenochloris fottii (Hindák) Tsarenko 1990 (Syn. *Eutetramorus fottii* (Hindák) Komárek 1979)							ss (1)	
Coenococcus planctonicus Korshikov 1953						x	ss (2)	
Crucigenia tetrapedia (Kirchner) Kuntze 1898								
Crucigenia sp.							ss (1)	
Dictyosphaerium ehrenbergianum Nägeli 1849							ss (2)	
Dictyosphaerium sp.							ss (1)	
Desmodesmus abundans (Kirchner) E. Hegewald 2000							ss (1)	
Desmodesmus armatus (Chodat) E. Hegewald 2000 (Syn. *Scenedesmus armatus* (Chodat) Chodat 1913)	x							
Desmodesmus bicellularis (Chodat) S. S. An, T. Friedl & E. Hegewald 1999 (Syn. *Didymocystis bicellularis* (Chodat) Komárek 1973)							ss (2)	
Desmodesmus brasiliensis (Bohlin) E. Hegewald 2000							ss (1)	
Desmodesmus communis (E. Hegewald) E. Hegewald 2000 (Syn. *Scenedesmus quadricauda* Chodat 1926 p.p.)							ss (3)	
Desmodesmus costato-granulatus (Skuja) E. Hegewald 2000							ss (3)	
Desmodesmus denticulatus (Lagerheim) S. S. An, T. Friedl & E.Hegewald 1999							ss (1)	
Desmodesmus dispar (Brébisson) E. Hegewald 2000 (Syn. *Scenedesmus dispar* Brébisson 1856)	x						r (4)	
Desmodesmus lefevrei (Deflandre) S. S. An, T. Friedl & E. Hegewald 1999 (Syn. *Scenedesmus lefevrei* Deflandre 1924)	x							
Desmodesmus lefevrei var. *muzzanensis* (Huber-Pestalozzi) S. S. An, T. Friedl & E. Hegewald 1999 (Syn. *Scenedesmus lefevrei* var. *muzzanensis* Huber-Pestalozzi 1929)	r							

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Desmodesmus lunatus (West & G. S. West) E. Hegewald 2000 (Syn. *Scenedesmus denticulatus* var. *lunatus* West et G. S. West 1895)	x						ss (1)	
Desmodesmus magnus (Meyen) Tsarenko 2000							r (4), x, ab	
Desmodesmus microspina (Chodat) Tsarenko 2000 (Syn. *Scenedesmus microspina* Chodat 1926)	x							
Desmodesmus opoliensis (P. G. Richter) E. Hegewald 2000 (Syn. *Scenedesmus opoliensis* P. G. Richter 1895)	x						ss (2)	
Desmodesmus opoliensis var. *carinatus* (Lemmermann) E. Hegewald 2000 (Syn. *Scenedesmus carinatus* (Lemmermann) Chodat 1913)	x							
Desmodesmus protuberans (F. E. Fritsch & M. F. Rich) E. Hegewald 2000							ss (1)	
Desmodesmus serratus (Corda) S. S. An, T. Friedl & E. Hegewald 1999 (Syn. *Scenedesmus serratus* (Corda) Bohlin 1901)	x							
Desmodesmus spinosus (Chodat) E. Hegewald 2000							ss (3)	
Dictyosphaerium ehrenbergianum Nägeli 1849							ss (2)	
Dictyosphaerium sp.							ss (1)	
Euastropsis richteri (Schmidle) Lagerheim 1895	x							
Golenkinia paucispina W. et G. S. West 1902	x							
Gregiochloris lacustris (Chodat) Marvan, Komárek & Comas 1984							ss (1)	
Hariotina reticulata P. A. Dangeard 1889 (Syn. *Coelastrum reticulatum* (P. A. Dangeard) Senn 1899)	c							
Hyaloraphidium contortum Pascher & Korshikov in Korshikov 1931 (considered as belonging to fungi by Ustinova et al. 2000; but accepted as alga again in Tsarenko 2011)						x		
Kirchneriella aperta Teiling 1912							ss (1)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Kirchneriella lunaris (Kirchner) Möbius 1894	x							
Kirchneriella cf. *obesa* (West) West & G. S. West 1894							ss (3)	
Lagerheimia balatonica (Scherffel) Hindák 1978							ss (3)	
Lagerheimia ciliata (Lagerheim) Chodat 1895							r (6)	
Lagerheimia citriformis (J. W. Snow) Collins 1909							ss (1)	
Lagerheimia longiseta (Lemmermann) Printz 1914							ss (3)	
Lagerheimia quadriseta (Lemmermann) G. M. Smith 1926							r (4)	
Lagerheimia subsalsa Lemmermann 1898						x	ss (3)	
Messastrum gracile (Reinsch) T. S. Garcia in T. S. Garcia et al. 2016 (Syn. *Selenastrum gracile* Reinsch 1866)	x							
Microglena braunii (Goroschankin) Demchenko, Mikhailyuk & Proschold in Demchenko et al. 2012 (Syn. *Chlamydomonas braunii* Goroschankin [Gorozhankin] 1890)			x					
Monactinus simplex (Meyen) Corda 1839 (Syn. *Pediastrum simplex* Meyen 1829 as "*Pediastrum simplex* (Meyen) Lemm."; *Pediastrum simplex* var. *radians* Lemmermann; *Pediastrum simplex* var. *granulatum* Lemmermann 1898)	x		x					
Monoraphidium contortum (Thuret) Komárková-Legnerová in Fott 1969							ss (3)	
Monoraphidium griffithii (Berkeley) Komárková-Legnerová 1969 (Syn. *Ankistrodesmus falcatus* var. *acicularis* (A. Braun) G. S. West 1904)	x							
Monoraphidium sp.						x		
Neglectella solitaria (Wittrock) Stenclová & Kastovsky in Stenclová et al. 2017 (Syn. *Oocystis solitaria* Wittrock in Wittrock & Nordstedt 1879)	x							
Nephrochlamys subsolitaria (G. S. West) Korshikov 1953							ss (2)	
Nephrochlamys sp.						x		

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Octogoniella sphagnicola Pascher 1930							ss (1)	
Oedogonium sp. st.			aab					
Oocystis borgei J. W. Snow 1903							ss (1)	
Oocystis elliptica West 1892	x							
Oocystis lacustris Chodat 1897							ss (2)	
Oocystis marssonii Lemmermann 1898 (Syn. *Oocystis crassa* var. *marssonii* (Lemmermann) Printz 1913)	x					x		
Oocystis naegelii var. *africana* West	x							
Oocystis parva West et G. S. West 1898	x							
Oocystis pusilla Hansgirg 1890	x							
?*Oocystis sphaerica* W. B. Turner 1893	x							
Phacotus lenticularis (Ehrenberg) Diesing 1866 as "*Phacotus lenticularis* (Ehrenberg) Stein"			x					
Pseudocarteria pallida (Korshikov) H. Ettl 1958 (Syn. *Carteria pallida* Korschikov in Pascher 1927)			x					
Pseudopediastrum boryanum (Turpin) E. Hegewald in Buchheim et al. 2005 (Syn. *Pediastrum boryanum* (Turpin) Meneghini 1840)	c		x			x		
Pediastrum asperum Braun (Syn. *Pediastrum boryanum* var. *asperum* A. Braun)				x				
Pediastrum boryanum var. *brevicorne* A. Braun 1855	x							
"*Pediastrum boryanum* var. *divergens* Lemm."	x							
"*Pediastrum boryanum* var. *forcipatum* Racib." (*Pediastrum forcipatum* (Corda) A. Braun 1855 is currently regarded as a synonym of *Pediastrum boryanum* var. *forcipatum* (Corda) Chodat 1902)	x							
"*Pediastrum boryanum* var. *longicorne* Reinsch. f. *glabra* Lemm."	x		x					
Pediastrum cornutum (Raciborski) Troitskaya (Syn. *Pediastrum duplex* var. *cornutum* Raciborski)				x				
Pediastrum duplex Meyen 1829			x	x				
Pediastrum duplex var. *asperum* (A. Braun) Hansgirg 1855 (Syn. *Pediastrum duplex* var. *coronatum* Raciborski 1890)	x							

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
"*Pediastrum duplex* var. *genuinum* f. *convergens* Racib."			x	x				
"*Pediastrum duplex* var. *microporum* A. Braun"			x					
"*Pediastrum duplex* var. *recurvatum* A. Braun"			x					
Pediastrum duplex var. *ugandae* Conrad 1949	x							
"*Pediastrum pearsonii* G. S. West var. *orientale* Skuja"	x							
Pediastrum subgranulatum (Raciborski) J. Komárek & V. Jankovsky (Syn. *Pediastrum duplex* var. *subgranulatum* Raciborski)			x, r					
Pediastrum tricuspidatum Conrad 1949	x							
Pseudodidymocystis lineata (Korshikov) Hindák 1990 (Syn. *Didymocystis lineata* Korshikov 1953)							ss (1)	
Pseudodidymocystis planctonica (Korshikov) E. Hegewald & Deason 1989							ss (2)	
Pseudoschroederia robusta (Korshikov) E. Hegewald & E. Schnepf 1986							ss (1)	
Quadricoccus ellipticus Hortobágyi 1973						x		
Rhizoclonium sp.			x					
Saturnella sp.						x	ss (1)	
Scenedesmus cf. *acunae* Comas Gonzáles 1980							ss (1)	
Scenedesmus acutus Meyen 1829 (Syn. *Scenedesmus crassus* Chodat 1926)			x					
Scenedesmus brevispina (G. M. Smith) Chodat 1926							ss (2)	
Scenedesmus carinatus f. *denticulata* Conrad 1949	x							
"*Scenedesmus longispina* Chodat var. *capricornus* Skuja"	x							
Scenedesmus pleiomorphus Hindák 1988							ss (3)	
Scenedesmus producto-capitatus Schmula 1910			x					
Scenedesmus quadricauda Chodat 1926	trp		aab				r (5)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Scenedesmus similagineus Hortobágyi 1960							ss (1)	
Scenedesmus sp. 1							ss (1)	
Scenedesmus sp. 2 (single cells)							ss (2)	
Selenastrum bibraianum Reinsch 1866							ss (1)	
Schroederia setigera (Schröder) Lemmermann 1898							ss (1)	
Schroederia spiralis (Printz) Korshikov 1953							ss (1)	
Scotiellopsis sp.							ss (1)	
Stauridium tetras (Ehrenberg) E. Hegewald in Buchheim et al. 2005 (Syn. *Pediastrum tetras* (Ehrenberg) Ralfs 1845)	x						r (4)	
Tetradesmus dimorphus (Turpin) M. J. Wynne 2016							ss (3)	
Tetradesmus lagerheimii M. J. Wynne & Guiry 2016 (Syn. *Scenedesmus acuminatus* (Lagerheim) Chodat 1902; *Scenedesmus falcatus* Chodat 1926)	x						ss (1)	
Tetradesmus lunatus Korshikov 1953							ss (3)	
Tetradesmus obliquus (Turpin) M. J. Wynne 2016 (Syn. *Scenedesmus acutus* Meyen 1829; *Scenedesmus obliquus* (Turpin) Kützing 1833)	trp		x				ss (1)	
Tetradesmus cf. *major* (Fischer) Fott & Komárek 1974							ss (1)	
Tetradesmus wisconsinensis G. M. Smith 1913							ss (2)	
Tetraëdron minimum (A. Braun) Hansgirg 1888 (as "*Tetraedron* ? *minimum* (A. Braun) Hansgirg 1888" in Conrad 1949c; in HIPE samples found in typical form and in the "lemon-like" form described from Lake Kivu by Stoyneva et al. 2012)	x						r (9), x, ab	
"*Tetraedron minimum* var. *scrobiculato-apiculatum* (Reinsch., Lagerh.) Skuja"						x		
Tetraëdron pentaedricum West & G. S. West 1895			x					
Tetraëdron regulare Kützing 1845							r (7), x, ab	
Tetraëdron triangulare Korshikov 1953							ss (3)	

Taxon/Mission and sample type/Potential toxicity	1935-1936					1972	2016-2018	
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	HcKl	HIPE	TTE-P
Tetrastrum staurogeniiforme (Schröder) Lemmermann 1900							ss (1)	
Treubaria triappendiculata C. Bernard 1908						x	ss (2)	
Willea apiculata (Lemmermann) D. M. John, M. J. Wynne & P. M. Tsarenko 2014 (Syn. *Crucigeniella apiculata* (Lemmermann) Komárek 1974)							ss (1)	
STREPTOPHYTA								
Cosmarium bioculatum var. *minutissimum* Krieger 1932	r							
Cosmarium inconspicuum West & G. S. West 1896	x							
Cosmarium laeve Rabenhorst 1868						x		
Cosmarium monochondrum Nordstedt 1873	x							
Cosmarium pachydermum var. *aethiopicum* (West & G. S. West) West & G. S. West 1905	x							
Cosmarium depressum var. *planctonicum* Reverdin 1919							r (5)	
Cosmarium tenue W. Archer 1868	x							
Spirogyra sp. st.			pab					
Staurastrum brevispina Brébisson in Ralfs 1848 as "*brevispinum*"	x							
Staurastrum gracile Ralfs ex Ralfs 1848	x							
Staurastrum muticum Brébisson ex Ralfs 1848						x		
Staurastrum cf. *pingue* Teiling 1942						x		
Staurastrum volans West & G. S. West 1895							ss (1)	
Staurastrum sp.							ss (1)	

The results from counts of algal taxa in different periods and types of samples are summarized in **Table 2**.

DISCUSSION

According to all data analyzed, it is possible to state that totally 577 taxa from seven divisions have been identified in the lake waters (**Table 2**). In the analyzed literature, 36 new taxa were described from Lake Edward, 12 of which

have been checked by modern taxonomists and 24 are still awaiting taxonomic reconsideration.

Table 2. Number of algal taxa by taxonomic groups found during different missions and in different types of samples from Lake Edward. Abbreviations: **MD** – Mission Damas (1935-1936); **Ph** – phytoplankton samples, **Bn** – benthic/periphytic samples (from "Aufwuchs"); **Ql** - qualitative samples, **Kz** – Kazinga Channel, **KB** – Katakuru-Bach, **HcKL** – Hecky & Kling (1987), **HIPE** – cruises 2016-2018; **MD-TNT-TG** - total number of taxa in the relevant taxonomic group in the samples of Mission Damas; ***TNT-TG*** – total number of taxa in the relevant taxonomic group; **TNT-RS** – total number of taxa in the relevant samples.

Number of taxa/Missions and sample types	1935-1936						1972	2016-18	*TNT-TG*
	MD-Ph	MD-Bn	MD-Ql	MD-Kz	MD-KB	*MD-TNT-TG*	HcKl-Ph	HIPE-Ph	
CYANOPROKARYOTA	**34**	**0**	**20**	**2**	**0**	**46**	**11**	**104**	***134***
EUGLENOPHYTA	**1**	**0**	**8**	**0**	**0**	**8**	**0**	**1**	***8***
PYRRHOPHYTA	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**4**	***5***
CRYPTOPHYTA	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	***1***
OCHROPHYTA	**184**	**139**	**9**	**49**	**33**	**249**	**0**	**70**	***287***
Tribophyceae	4	0	5	0	0	9	0	2	*11*
Chrysophyceae	0	0	3	0	0	3	0	0	*3*
Synurophyceae	0	0	1	0	0	1	0	0	*1*
Bacillariophyceae	180	139	0	49	33	236	0	68	*274*
CHLOROPHYTA	**44**	**0**	**26**	**5**	**0**	**65**	**13**	**66**	***128***
STREPTOPHYTA	**7**	**0**	**1**	**0**	**0**	**8**	**3**	**3**	***14***
TNT-RS	***270***	***139***	***65***	***56***	***33***	***477***	***28***	***248***	***577***

The following new taxa were described from Lake Edward as a single locality: Chlorophyta - *Chlamydomonas komma* Pascher 1949, nom. illeg. (non *Chlamydomonas komma* Skuja 1934), *Chlamydomonas modesta* A. Pascher 1949 (transferred to *Chloromonas modesta* (Pascher) Gerloff & Ettl in Ettl 1970), *Chlamydomonas pisum* Pascher 1949, *Chlamydomonas simulans* Pascher 1949 (non *Chlamydomonas simulans* (B. Fott) Huber-Pestalozii 1961, nom. illeg.), *Pediastrum duplex* var. *ugandae* Conrad 1949, *Pediastrum tricuspidatum* Conrad 1949, *Scenedesmus carinatus* f. *denticulata* Conrad 1949; Euglenophyta - *Trachelomonas impressa* Pascher 1949; Ochrophyta – Bacillariophyceae: *Achnanthes atomus* var. *congolensis* Hustedt 1949 (currently accepted as *Achnanthes congolensis* Hustedt 1949), *Amphora submontana* Hustedt 1949 (transferred to *Halamphora submontana* (Hustedt) Levkov 2009), *Fragilaria africana* Hustedt 1949 (transferred to *Staurosirella africana* (Hustedt) D. M. Williams & Round 1988), *Gomphonema aequatoriale* Hustedt 1949, *Navicula barbarica* Hustedt 1949, *Navicula exiguiformis* f. *elliptica* Hustedt 1949, *Navicula finitima* Hustedt

1949, *Navicula molestiformis* Hustedt 1949 (transferred to *Craticula molestiformis* (Hustedt) Mayama 1999), *Navicula subcontenta* var. *africana* Hustedt 1949 (from Kazinga), *Nitzschia aequalis* Hustedt 1949, *Nitzschia amphioxoides* Hustedt 1949, *Nitzschia congolensis* Hustedt 1949, *Nitzschia obsidialis* Hustedt 1949, *Nitzschia obsoleta* Hustedt 1949, *Nitzschia spiculoides* Hustedt 1949, *Nitzschia stricta* Hustedt 1949, *Nitzschia tarda* Hustedt 1949 and *Stephanodiscus damasi* Hustedt 1949 (transferred to *Cyclostephanos damasii* (Hustedt) Stoermer & Håkansson in Theriot, Håkansson, Kociolek, Round & Stoermer 1988); Chrysophyceae: *Lagynion vasicola* Pascher 1949.

New taxa found in the samples of Damas mission from Lake Edward and from other water bodies were: *Caloneis bacillum* f. *inflata* Hustedt 1949 (transferred to *Caloneis inflata* (Hustedt) Metzeltin & Lange-Bertalot 2007; also in lakes Kivu and Ndalaga), *Navicula zanoni* Hustedt 1949 (also in Lake Kivu), *Nitzschia adapta* Hustedt 1949 (also in lakes Kibuga and Ndalaga), *Nitzschia amphibia* var. *pelagica* Hustedt 1949 (also in Lake Kibuga and in a swamp near Karisimbi), *Nitzschia bacata* f. *linearis* Hustedt 1949 (also in the lakes Kivu and Kibuga), *Nitzschia epiphyticoides* Hustedt 1949 (also in Lake Kivu), *Nitzschia intermissa* Hustedt 1949 (also in Lake Kivu), *Nitzschia tropica* Hustedt 1949 (also in the lakes Kibuga and Ndalaga), *Nitzschia palea* var. *tropica* Hustedt 1949 (also in Lake Kivu), *Nitzschia spiculum* Hustedt 1949 (also in Lake Kivu and in the Kazinga Channel).

Unclear remains the locality of the new chrysophyceaen genus *Arthrogloea* Pascher 1949 with the new species *Arthrogloea annelidiformis* Pascher 1949 although it is clear that the taxon was found in the samples from the mission of H. Damas in the Albert National Park (Pascher 1949b). However, the genus and the species are currently accepted as taxonomic entities in AlgaeBase (Guiry & Guiry 2018).

In the HIPE phytoplankton samples, 199 very rare, 35 rare, 11 common and 3 frequent taxa were found (**Table 1**). Among the 199 very rare species, 121 (61%) were found in one sample only. Besides the clear tropical species, like *Microcystis novacekii* (Komárek) Compère, we found some thermophilic species (*e.g. Chroococcus globosus* (Elenkin) Hindák), which could originate from the nearby volcano regions. It is possible to suggest the introduction of such algae in the lake by birds or other transport vectors. At the same time, some of the rare species are known as distributed in temperate and/or northern regions of Europe or other continents (*e.g. Chroococcus distans* (G. M. Smith) Komarkova-Legnerova et Cronberg, *Gomphosphaeria natans* Komárek et Hindák 1988, *Microcystis firma* (Kützing) Schmidle). They also could be transported in the lake by different vectors. Similar "cold water" taxa were found by previous lake investigators (*e.g. Microcystis ichtyoblabe* (G. Kunze) Kützing), and in both their and our samples as well (*e.g. Microcystis flos-aquae* (Wittrock) Kirchner). These species, alien for the lake (some of which were included in the checklist with a sign for uncertainty), will be discussed in detail elsewhere.

The most frequent species in the lake phytoplankton were *Nitzschia* cf. *lacuum* Lange-Bertalot (probably corresponding to *Nitzschia fonticola* sensu Hustedt 1949), *Nitzschia spiculum* and *Nitzschia tropica* (**Table 1**). The same species were the most abundant among diatoms. At the same time, quite abundant (sometimes even dominant) in the samples were some coccal (*e.g. Aphanocapsa*, *Microcystis*) and heterocytous cyanoprokaryotes (mainly *Raphidiopsis*), as well as green coccal (*e.g. Tetraëdron*) or filamentous green algae (*Binuclearia lauterbornii* (Schmidle) Proschkina-Lavrenko 1966).

The comparison of data of different authors with our contemporary results (**Tables 1, 2**) can be taken only tentatively due to different approaches, aims of investigations, types of samples, sampling sites and techniques for processing and identification as well. In this way the highest number of taxa published after Damas mission is easily explainable by the presence of benthic and qualitative samples with special investigation of the slow-flowing Kazinga Channel (**Table 2**). Therefore, we shall not underline the floristic similarity/dissimilarity, but shall point only the fact that 52 species (1%) were present in the lake since the mission of H. Damas till nowadays (**Table 1**). Five cyanoporokaryote species were found in all the three studied periods: *Aphanocapsa incerta* (Lemmermann) G. Cronberg et Komárek, *Limnolyngbya circumcreta* (G. S. West) X. Li et R. Li, *Microcystis flos-aquae* (Wittrock) Kirchner, *Microcystis prasina* (Wittrock) Lemmerman and *Planktolyngbya contorta* (Lemmermann) Anagnostidis et Komárek (**Table 1**). The high abundance of cyanoprokaryotes found in the 1930s (Conrad & Duvigneaud 1949) obviously continues to be typical of the lake in the 1970s (Hecky & Kling 1987) and continues nowadays (Stoyneva-Gärtner et al. in prep.). Therefore, it has to be noted, that 65 species of Cyanoprokaryota are potentially toxic and need further attention from the scientific community. This is especially important for Africa, where "freshwater is the resource contributing perhaps more than any other to the nutrition and welfare of the African people" (John 1986, p. 1).

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

AUTHOR CONTRIBUTIONS

Both authors contributed equally to the text preparation. In the processing of the HIPE samples J.-P. Descy worked with diatoms, and M.P. Stoyneva-Gärtner – with the other algal groups.

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