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REGINE JAHN

The historical East African freshwater algae collection at the Botanical Museum Berlin-Dahlem (B)

Abstract

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More than 100 samples of East African non-marine waters of almost 100 years ago were rediscovered at B. They contain original material for the names of about 200 algal taxa, among them the diatom genera *Gomphocymbella* and *Rhopalodia* by O. Müller, the bluegreen genera *Chondrogloea*, *Myxoderma* as well as the green algal genera *Botryomonas*, *Chaetonella* and *Characiella* by W. Schmidle.

Introduction

116 jars containing freshwater (non-marine) algae from East Africa were rediscovered at B. The material was collected around the turn of the century during German colonialization of Africa when the Botanical Museum Berlin under its director Adolf Engler was the German center of research and of African botanical collections, and many new plant taxa were described (see the 42 "Beiträge zur Flora von Afrika" edited by Engler in Bot. Jahrb. Syst. 1892–1913). Most of these collections did not survive the 1943 burning of the herbarium. But some collections are extant, such as material that was on loan, wet collections (Hiepko 1987), and some material on permanent exhibition (Mshigeni & Jahn 1995).

Localities, dates and collectors

"German" East Africa was the largest of the German colonies and existed from 1885 until 1919 in an area which is Tanzania, Rwanda and Burundi today (Timler & Zepernick 1987).

The main body of the extant collection is from Lake Nyassa (also called Lake Malawi) from the northern, Tanzanian part, a few samples are from the southern part which belongs to Malawi. Some samples are from the lakes Ikapo, Malomba (Malawi), Ngozi, Rukwa, and the rivers Baka, Mbasi, Rumbira (Fig. 1), Shire (Malawi), Siwa, Songwe, respectively. In addition, quite a number of samples are from diverse small water bodies such as waters next to the mentioned lakes and rivers, hot springs and high mountain creeks. All these samples were taken between

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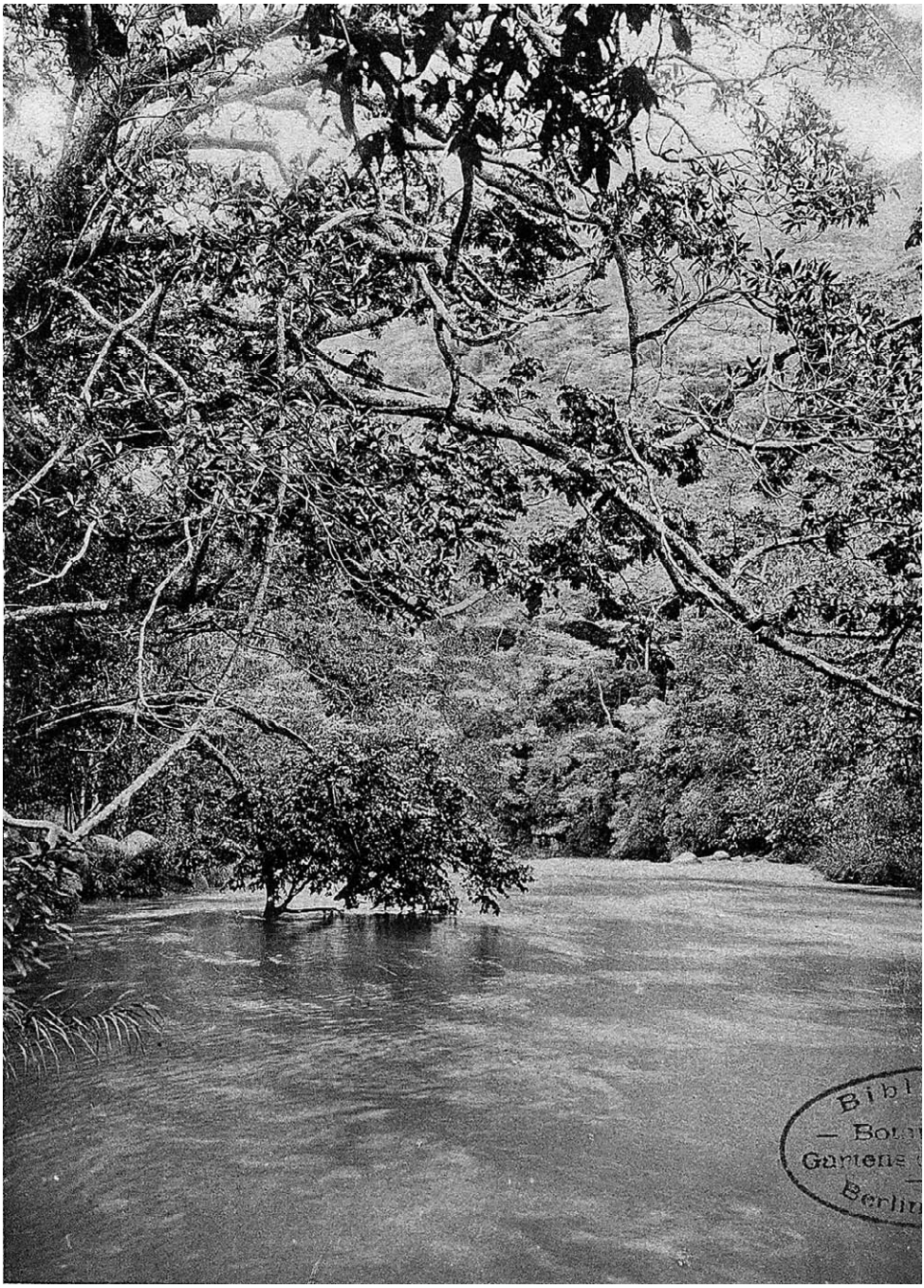


Fig. 1. Goetze's picture 37 (reproduced from Engler 1902) of "Uferwald am Rumbira nördlich vom Nyassa-See um 500 m über dem Meer (10. April 1899)".

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Fig. 2. Some of Fülleborn's samples from Lake Nyassa and surrounding waters of 1897–1900.

December 1897 and February 1900 either by Friedrich Fülleborn, a medical doctor stationed at the town Langenburg at Lake Nyassa, or Walther Goetze, a young botanist sent out by Engler to collect plants, and who he died on the expedition (Goetze 1899, Engler 1899, 1902). Almost all of Fülleborn's samples are extant whereas several of Goetze's are missing. This part of the collection comprises 91 samples (for some of Fülleborn's jars, see Fig. 2).

The other 25 samples are of diverse origin and collectors (for information on early collectors in Africa, see Engler 1895). The four samples taken by the zoologist Franz Stuhlmann are apparently remnants of bigger collections, two are from Lake Victoria (March 1892) and two from small water bodies in Tanzania (August 1888 & June 1892). 11 samples collected by the botanist Georg Volkens are of his Kilimanscharo expedition (May, September and October 1893) and three samples collected by O. Neumann are from Lake Manyara, Tanzania (November 1893). The set of seven samples of A. Borgert's expedition to Lake Victoria (Kenya, Uganda) of November 1904 are extant in their original jars (Fig. 3).

The collection

The collection consists of samples stored in glas jars (Fig. 2, 3). Except for the two Stuhlmann Victoria samples, which had been filled into plastic bottles about ten years ago, the other samples were still sealed and had not been touched since their determination. Many have dried out, some are still wet. The state of the samples presents no obstacle in investigating diatoms; if non-diatoms have remained identifyable in these samples has to be tested by experts of these groups.

The labels are of different quality: Goetze's samples have the standard label of the "Nyassa-See- und Kinga-Gebirgs-Expedition der Hermann- und Elise- geb. Heckmann-Wentzel-Stiftung" stuck or wrapped onto the outside (Fig. 4, compare with Fig. 1), whereas the Fülleborn samples have their labels inside, written with pencil in old German handwriting (Fig. 2). Only

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Fig. 3. Borgert's samples from Lake Victoria of 1904.

Müller's detailed list of examined samples (1904: 10–13), and Klee & Casper's statement (1992) that Müller's samples are missing, made it possible to recognize the identity as well as the value of these samples.

Only ten samples have a label with a genus or species name plus "n. sp.", indicating that they contain Schmidle's holotypes (see bold faced names in the list of taxa). No original slides or herbarium sheets were found, but since the samples are from the type locality by the same collector and of the same date, they are original material and isotypes for lectotypification may be relocated in this material.

Publications and new taxa

Many new algal taxa such as diatoms, bluegreens, desmids and other green algae were described from these East African samples. I found 14 publications which are based on these samples and contain the descriptions of almost 300 new algal taxa. Fortunately it can be stated now that for almost 200 of these names original material is available.

The first publication describing new East African algae, 22 of them non-marine, is by Hieronymus (1895). It is based on samples of diverse collectors (see Engler 1895), but to only one species name original material can be attributed. Georg Hieronymus was curator at the Botanical Museum at that time and after this paper he apparently handed over the identification of the bluegreens, desmids and other green algae to Wilhelm Schmidle, Mannheim, and the diatoms to Otto Müller, Berlin.

Subsequently, Schmidle (1898, 1899, 1900a, 1901a, 1901b, 1902a) described 118 new taxa based on East African samples. His early paper on the desmids (Schmidle 1898) contains 62 new taxa but because they are based on samples of Stuhlmann and Volkens, for only 15 names original material is left. Since he found many of these new taxa later again (Schmidle 1902a) in extant samples (e. g. sample No. B Öko 2.0034, labelled desmids), their names may be neotypified in Schmidle's sense from this material. Schmidle (1899, 1902) are based on Fülleborn's

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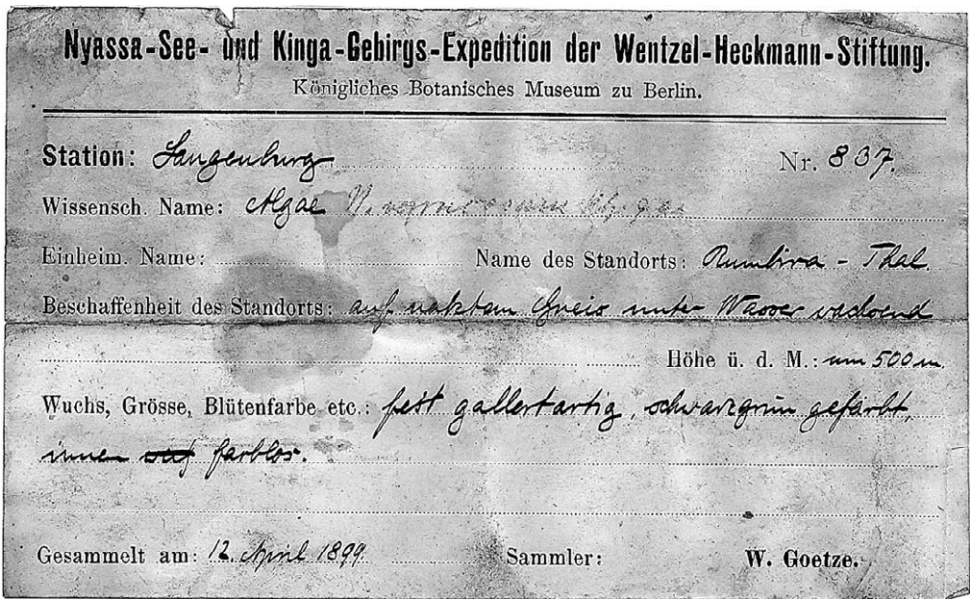


Fig. 4. Label of a Goetze sample from River Rumbira (No. B Öko 2.0073), locality shown in Fig. 1.

and Schmidle (1901b) on Goetze's samples; therefore original material is available for almost all these names of taxa. In another paper, Schmidle (1901a) described eight new taxa from Africa including only one from East Africa; the corresponding specimen is extant and labelled. The same applies to an earlier paper (Schmidle 1900a), where for one out of three names a labelled type is still extant. In summary, original material for the names of 68 taxa described by Schmidle is left (see list of taxa below, labelled specimens, i. e. holotypes, are in bold face).

Borgert's samples of Lake Victoria are the basis for Ostenfeld's paper (1908), in which Otto Müller described one new diatom taxon, and since Daday's (1907) description of *Ceratium brachyceros* is based on parallel samples, it should be possible to typify this name from the same samples.

With regard to the diatoms of Otto Müller (1904, 1905, 1910), it will be possible to typify the names of all his new taxa including his genus *Gomphocymbella*, since they are based on the same Fülleborn and Goetze samples as Schmidle (1899, 1901b, 1902a, 1902b). Unfortunately, of his first 12 *Rhopalodia* taxa (Müller 1897) only five are based on an extant Stuhlmann sample. But since he found many of these taxa again in still existing samples (Müller 1904), their names may be neotypified in Müller's sense from this material. In Müller's paper on the diatoms of El Kab, S Egypt (1899, this material is missing) two taxa are described, which are based on extant East African samples of Volkens' Kilimanscharo expedition. A list of Müller's 115 East African names of diatom taxa and their types will be published later.

List of names of the taxa (excluding diatoms) with extant original material
(bold face marks holotypes, see above)

Cyanophyceae

Anabaena (Sphaerozyga) fuellebornii Schmidle (1902a: 61) (No. 2.0027)
A. hyalina Schmidle (1901b: 245) (No. 2.0096)
A. hyalina Schmidle (1902a: 61) (No. 2.0004, 2.0005–6?)

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Aphanothece goetzei Schmidle (1901b: 242) (No. 2.0081?)
Calothrix africana Schmidle (1901b: 249) (No. 2.0088 wet)
C. *fuellebornii* Schmidle (1902a: 62) (No. 2.0035 wet, 2.0047)
C. goetzei Schmidle (1901b: 248) (No. 2.0086 wet)
Chondrogloea Schmidle (1901b: 247)
Ch. africana Schmidle (1901b: 247) (No. 2.0086 wet)
Chroococcus goetzei Schmidle (1901b: 242) (No. 2.0082)
Ch. parallelepipedon Schmidle (1901b: 242) (No. 2.0076 wet)
Ch. polyedriformis Schmidle (1901b: 241) (No. 2.0074)
Coelosphaerium goetzei Schmidle (1901b: 243) (No. 2.0096)
Cylindrospermum goetzei Schmidle (1901b: 245) (No. 2.0096)
Lyngbye nyassae Schmidle (1902a: 60) (No. 2.0001–19)
Myxoderma Schmidle (1901b: 246)
M. goetzei = Nostochopsis goetzei Schmidle (1900a: 417) (No. 2.0094 wet)
Oscillatoria subbrevis Schmidle (1901b: 243) (No. 2.0088 wet)
Phormidium fuellebornii Schmidle (1902a: 60) (No. 2.0027)
Spirulina gigantea Schmidle (1902a: 59) (No. 2.0033–35)
S. neumannii Schmidle (1901a: 58) (No. 2.00116)

Chlorophyceae

Botryomonas Schmidle (1899: 233)
B. natans Schmidle (1899: 233) (No. 2.0001–3)
Chaetonella Schmidle (1901b: 253) (No. 2.0076)
Ch. goetzei Schmidle (1901b: 253) (No. 2.0076 wet)
Characiella Schmidle (1902a: 82)
Ch. rukwae Schmidle (1902a: 82) (No. 2.0067, 2.0066)
Glaucocystis nostochinearum f. *immanis* Schmidle (1902a: 79) (No. 2.0033–35)
Gloeocystis ikapoae Schmidle (1902a: 79) (No. 2.0047)
Protococcus goetzei Schmidle (1901b: 252) (No. 2.0076 wet)
Scenedesmus bijugatus var. *granulatus* Schmidle (1902a: 80) (No. 2.0027?)
Sorastrum minimum Schmidle (1902a: 85) (No. 2.0027)
Staurogenia cuneiformis Schmidle (1902a: 81) (No. 2.0012–17?, 2.0042–43?, 2.0066–67?)

*"**Conjugatae**"*
Arthrodesmus fuellebornii Schmidle (1902a: 70) (No. 2.0034, 2.0047)
A. fuellebornii f. *longispina* Schmidle (1902a: 71) (No. 2.0034, 2.0047)
Closterium abruptum f. *angustissima* Schmidle (1902a: 64) (No. 2.0034)
C. didymocarpum Schmidle (1902a: 65) (No. 2.0034)
C. praelongum var. *crassior* Schmidle (1902a: 65) (No. 2.0034)
C. wittrockianum var. *africana* Schmidle (1902a: 65) (No. 2.0027)
Cosmarium (Pleurotaeniopsis) fuellebornii Schmidle (1902a: 67) (No. 2.0034)
C. abruptum var. *supergranulatum* Schmidle (1898: 31) (No. 2.0103)
C. capense var. *nyassae* Schmidle (1902a: 70) (No. 2.0034)
C. dispersum var. *wembaerense* Schmidle (1898: 34) (No. 2.0103)
C. granatum var. *pyramidalis* Schmidle (1898: 34) (No. 2.0103)
C. homalodermum var. *minor* Schmidle (1902a: 69) (No. 2.0034)
C. lindaui Schmidle (1902a: 69) (No. 2.0034)
C. norimbergense f. *dilatata* Schmidle (1898: 35) (No. 2.0103)
C. occultum Schmidle (1902a: 69) (No. 2.0034, 2.0028)
C. praegrandiforme Schmidle (1898: 25) (No. 2.0103)
C. typicum (Turner?) Schmidle (1898: 35) (No. 2.0103)

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C. undiferum Schmidle (1898: 28) (No. 2.0114)
C. wembaerense Schmidle (1898: 32) (No. 2.0103)
Cylindrocystis diplospora var. *stenocarpa* Schmidle (1898: 16) (No. 2.0103)
Dysphinctium novae-semliae var. *granulatum* Schmidle (1898: 21) (No. 2.0114)
Euastrum pseudopectinatum var. *evolutum* Schmidle (1902a: 72) (No. 2.0034)
E. substellatum var. *wembaerense* Schmidle (1898: 43) (No. 2.0103)
Hyalotheca mucosa var. *emucosa* Schmidle (1902a: 76) (No. 2.0034)
Penium clevei var. *africanum* Schmidle (1898: 20) (No. 2.0103)
Pleurotaeniopsis volkensii Hieron. (1895: 20) (No. 2.0110, 2.0111)
Pleurotaenium engleri Schmidle (1898: 23) (No. 2.0103)
Spirogyra fuellebornii Schmidle (1902a: 76) (No. 2.0027?)
S. goetzei Schmidle (1901b: 251) (No. 2.0077 wet)
S. nyassae Schmidle (1899: 230) (No. 2.0001–3)
Staurastrum protuberans Schmidle (1898: 50) (No. 2.0103)
S. pyramidatum var. *bispinosum* Schmidle (1898: 53) (No. 2.0109–2.0111)
S. fuellebornii Schmidle (1902a: 74) (No. 2.0047, 2.0034–35)
S. ikapoae Schmidle (1902a: 74) (No. 2.0047)
S. subtrifurcatum f. *bidens* Schmidle (1902a: 73) (No. 2.0034)
Xanthidium antilopaeum var. *incertum* Schmidle (1902a: 71) (No. 2.0034)

Dinophyceae

Ceratium brachyceros Daday (1907: 251) (No. 2.0123–2.0126)

Conclusion

The rediscovered samples contain the original material for the names of about 200 taxa. In their check-list of the algal flora of the East African Great Lakes Cocquyt & al. (1993) write that a "revision is needed for many tropical taxa and populations of cosmopolitan species in the tropics".

The material could serve further purposes. The samples were the basis for the earliest publications on the East African freshwater algal flora (except for the small paper by Dickie 1879). Changes in biodiversity are normally based on literature records only, where identification, changes in the concept of taxa due to modern methods, and so on, are major obstacles (Jahn & Geissler 1993). But now these records can be checked and the specimens investigated. Therefore, the samples are invaluable evidences of the East African algal flora of 100 years ago, a flora rich in endemism and little investigated even in recent years (Cocquyt & al. 1993).

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