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## 3 Material and Methods

### 3.1 Study area

The study area is located in the Kenyan or Gregory Rift Valley, which is the Kenyan part of the East African Rift System. The East African Rift System belongs to the Afro-Arabian Rift System, which extends from Turkey through Ethiopia, Kenya and Tanzania to Mozambique, a distance of about 6500 km (Schlüter 1997). The northern part on the African continent is the Ethiopian Rift starting in the Ethiopian Afar triangle. South of Ethiopia the East African Rift System is divided into two branches. The western branch or Western Rift runs from the North of Uganda along the western border of Uganda and Tanzania (Schlüter 1997). In the Western Rift big and deep freshwater lakes like Lake Albert, Lake Edward, Lake Tanganyika and Lake Malawi are situated. The eastern branch or Gregory Rift is the continuation of the Ethiopian Rift system (Moore and Davidson 1978, WoldeGabriel 2002). It runs from the Kenyan-Ethiopian border in the North to Northern Tanzania in the South (Fig. 3). Numerous shallow freshwater and alkaline-saline lakes can be found in the Ethiopian Rift and the Gregory Rift System. The Gregory Rift is a graben bounded by a fault zone about 50 to 80 km apart and is an area of internal drainage (Schlüter 1997). In the North of Kenya, Lake Turkana is situated at an altitude of 300 m. Towards the South the Rift floor reaches a maximum of 2000 m above sea level in the Naivasha area and drops down further south towards Lake Magadi to an altitude of ca. 600 m above sea level. The Victoria Basin, where Lake Victoria and the volcanic Lake Simbi are situated, was created by the uplift of the Albertine Rift shoulder combined with crustal doming of the Kenya Highlands (Schlüter 1997).

The studied freshwater lakes in the Kenyan Rift Valley and the Lake Victoria Basin were Lake Baringo and the Nyanza Gulf of Lake Victoria. The studied alkaline-saline waterbodies were the Lakes Bogoria, Nakuru, Elementeita, Sonachi (crater lake) and Simbi (crater lake). (Fig. 3, Table 1). Fig. 3 shows the study area in the Kenyan part of the Eastern Rift Valley and the Lake Victoria Basin and Table 1 shows some geomorphological features of the investigated lakes.

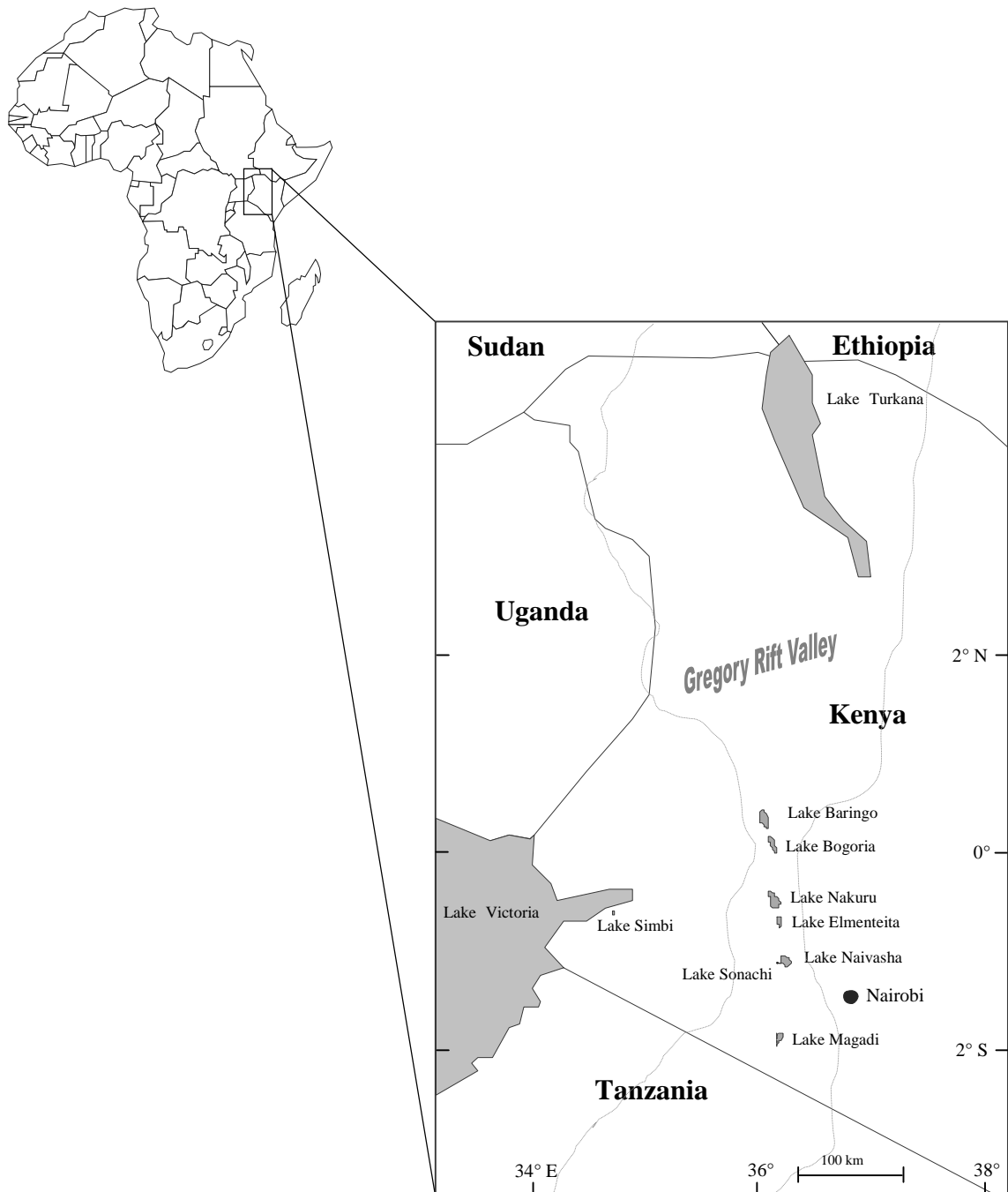


Fig. 3: Map of Africa. The enlargement is showing Western Kenya including the Gregory Rift Valley and a part of the Lake Victoria Basin with the studied Lakes Baringo, Bogoria, Elmenteita, Nakuru, Simbi, Sonachi, and Victoria.

Table 1: Geographical position, altitude, surface area, depth, catchment area, and rainfall of the Lakes Baringo, Bogoria, Nakuru, Elmenteita, Sonachi, Simbi, and Victoria (Melack 1979, Vareschi 1982, Melack 1988, Njuguna 1988, Mwaura and Moore 1991, Schlüter 1993, Oduor 2000, Damnati and Taieb 1996, Verschuren 1999).

	<b>Lake Baringo</b>	<b>Lake Bogoria</b>	<b>Lake Nakuru</b>	<b>Lake Elmenteita</b>	<b>Lake Sonachi</b>	<b>Lake Simbi</b>	<b>Lake Victoria</b>
Geographical position	N 00°36' E 36°01'	N 00°15' E 36°05'	S 00°20' E 36°05'	S 00°27' E 36°15'	S 00°47' E 36°15'	S 00°22' E 34°38'	S 00°05' E 34°42'
Altitude ab. sea level (m)	998	963	1759	1782	1884	1142	1135
	freshwater (subsaline)	alkaline, saline	alkaline, saline	alkaline, saline	alkaline, saline	alkaline, saline	freshwater
Surface area (km <sup>2</sup> )	160	34	40	~20	0.18	0.29	68800
Depth (m)	8	10	0-4.5	0.3-3.1	5.3	23	84
Catchment area (km <sup>2</sup> )	6820	unknown	~ 800	500	~ 1	unknown	184000
Rainfall (mm)	500 - 1000	500 - 1000	~ 880	600 - 1200	~680	unknown	1278

### 3.2 Methods

Each lake and the hot springs were investigated between one and seven times in the period from June 2001 to September 2002. In Table 2 the methods are depicted which were used during the study in the field and in the laboratory. They are related to the articles and manuscripts.

Table 2: Methods used in this study.

Method	Manuscript
Alignment of DNA sequences	VI
Analysis of total nitrogen, total phosphorus, total alkalinity	I, II, III, IV, V
Construction of phylogenetic trees using maximum likelihood algorithm	VI
Dissection of dead flamingos for samples of stomach and gut contents and liver	III
Extraction of genomic DNA	VI
Isolation and cultivation of cyanobacterial strains	IV, V, VI
Measurement of water temperature, pH, conductivity, salinity	I, II, III, IV, V
Microcystin and anatoxin-a analyses by HPLC and MALDI-TOF	I, II, III, IV, V
PCR of 16S – 23S region (16S + ITS)	VI
PCR of cpcB-cpcA region of the phycocyanin-operon	VI
Quantitative and qualitative analyses of phytoplankton using light microscopy and inverse microscopy	I, II, IV, V
Quantitative and qualitative analyses of cyanobacterial mats	III
Sequencing of 16S-23S (16S + ITS)	VI
Sequencing of cpcB-cpcA of the phycocyanin-operon	VI
Water samples for physico-chemical parameters and cyanotoxins	I, II, III, IV, V
Water samples for phytoplankton	I, II, IV, V