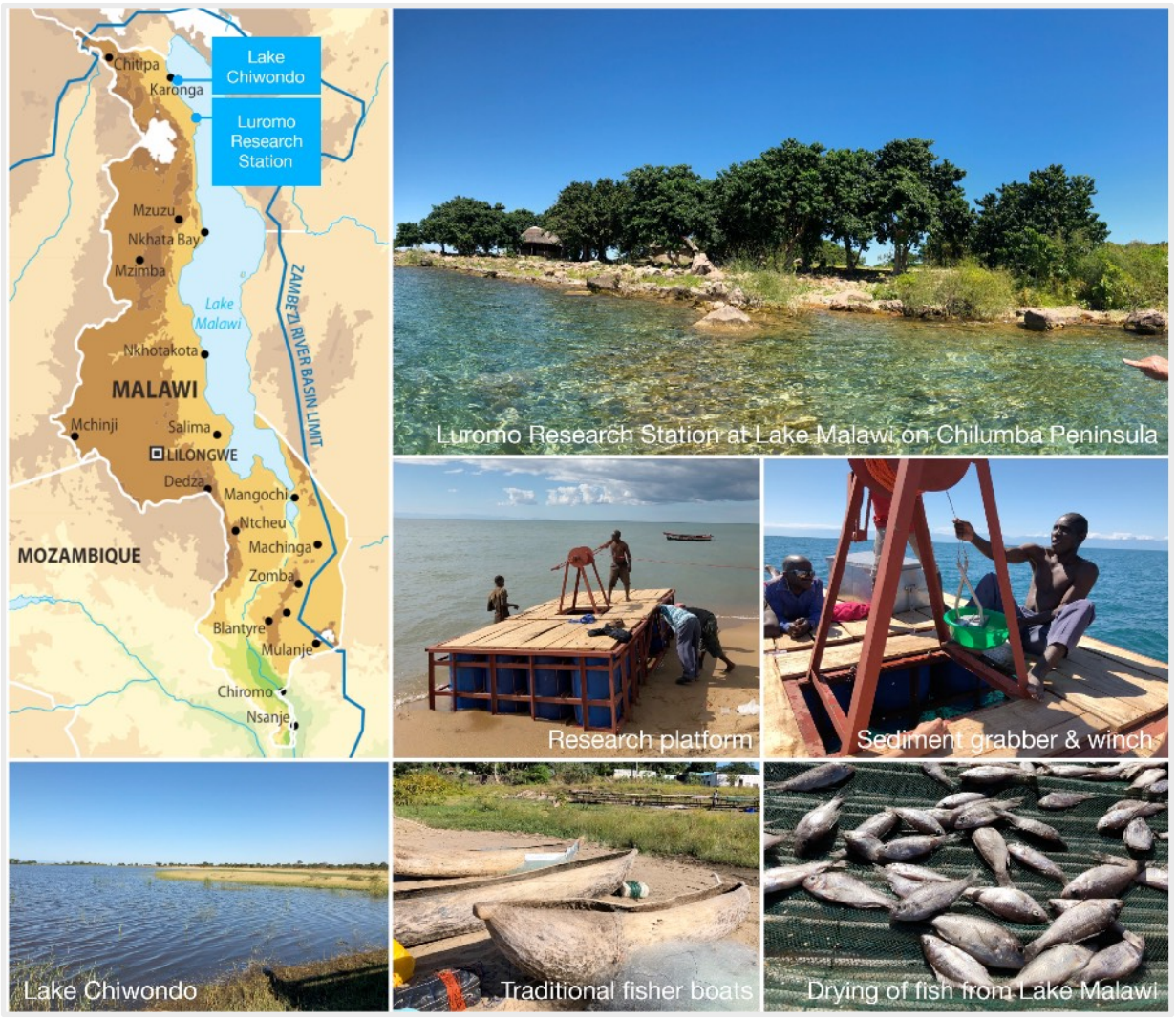
FIELD SCHOOLS IN MALAWI

Funded by Volkswagen Foundation

LEARNING FROM THE PAST TO SHAPE THE FUTURE

Environmental change, health and ecosystem services of Lake Malawi



ORGANIZED BY

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UNIVERSITY OF MALAWI · MZUZU UNIVERSITY · SELF RELIANCE SERVICE PERFECTION · ZIAF Zentrum für interdisziplinäre Afrikaforschung · EBERHARD KARLS UNIVERSITÄT TÜBINGEN · JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

MOTIVATION

Freshwaters and their animal and plant life are in a state of crises across the world (Weyl, 2010). The fundamental driver of their degradation is the enhanced human activity due to population growth, increased industrialization and consumption of natural resources over the last century. As a result, thecurrent rates of freshwater species population decline are twice as high as those reported for marine and terrestrial life (Weyl, 2010). These ecosystems, however, are of global significance and provide resources on which the livelihoods of millions of people depend.

The burgeoning human pressure including unsustainable agricultural and livestock grazing practice, shoreline occupancy for easy access to fish and water, and deforestation (Hecky et al. 2003) have impacted the environmental status of numerous African lakes during the last century and caused dramatic changes. The magnitude of these impacts can only be understood by a combination of palaeolimnological methods with actualistic water ecology analyses. All these factors make Malawi a perfect training area.

CONCEPTUAL FRAMEWORK

The field school series will consist of two consecutive 3-week field schools aiming at training M.Sc. and Ph.D. students from DR Congo, Germany, Malawi, Tanzania, Kenya and Uganda in paleolimnology, aquatic ecosystem science, human health, sustainable resource use and conservation. All countries have important freshwater ecosystems shared with neighbouringcountries under strong anthropogenic pressure. Freshwater management is thus not only an internal affair but always implies international dialogue and planning. The proposed field schools are thus essential in creating a network of future ecologists who have learned to work together in international teams.

The field school will take place in northern Malawi, at Luromo peninsula (Field station) which is part of the Key Biodiversity Area (KBA) of Chilumba region as well as at Lake Chiwondo, a lagoonal lake of Lake Malawi (see map on front page). African experts with limnological background will be providing information on the physical, chemical and biological events occurring in African lakes. For fisheries management, these studies help to elucidate factors that determine numbers, biomass and distribution of fish populations. In order to support sustainability, this field school will introduce adapted laboratory methods, specifically designed for laboratory work in African institutions.

CONTENT OF THE FIELD SCHOOLS

Our aim is on gaining limnological, biological and chemical background knowledge allowing the reconstruction of past environments of modern lakes under increasing human pressure and its consequences. These results will be compared to modern environmental data and strategies will be discussed how the future of Lake Malawi and its satellite lakes can be shaped. The content is divided into two field schools:

Field School I (2022) | Paleolimnology, paleoclimate, recent ecology and ecosystem state. The first part of the field school series is on teaching how paleo-environments can be reconstructed and how anthropogenic impact on environmental alterations can be detected in lake sediments. The teaching program will include theoretical introductions on climate change and environmental reconstructions as well as an intense practical training. Practical training will comprise of collection of the lake status of the past 150 years by coring and analysing lake sediments in three parallel working groups along a transect of the lake: from near shore over medium deep to ~200 m lake depth. Each group will follow field protocols for coring and subsampling cores, field analysis, samples preparation for laboratory analysis, limnological parameter collection and modern water and biota sampling and identification. Twice during this field school Radio dinosaur will interview the participants.

Field School II (2023) | Biodiversity, water-borne diseases, ecosystem services, sustainable management and conservation strategies. This field school consists of three main themes thatcan be framed under the OneHealth approach. The teaching program will include theory, practicals and exercises, experiments and citizen science components. During field school II, experiments will be performed in three parallel working groups. After three days, groups will change their topics. Working groups are according to the three main themes of the field school (A) Biodiversity assessments & Ecosystem services: transect sampling, habitat scoring and mapping, quantitative sampling and analysis of benthic and pelagic organisms. (B) Water-borne diseases: fish parasites, intermediate host snails sampling, shedding experiments, citizen science approach – questionnaire development and surveys. (C) Sustainable management and conservation strategies: resource use analyses, human-nature impact and conflict analyses, citizen science approach – questionnaire development and surveys, development of local conservation and management plan.

OBJECTIVES OF BOTH FIELD SCHOOLS

A. Evaluate the key physico-chemical properties of Lakes Malawi and Chiwondo (satellite lake)and their relationship
B. Examine the micro-flora and fauna and macro-invertebrate fauna composition and abundance using ecological indices.
C. Examine the sediments of Lake Malawi and Lake Chiwondo as a link the to the past, for reconstructing past environments, as a baseline for reconstructing human impact during the last few hundred years.
D. Determine ecosystem services and its role in public health due to water-borne diseases.
E. Develop sustainable management and conservation strategies in transdisciplinary framework.

TOPICS COVERED DURING FIELD SCHOOLS

Field School I | PAST ENVIRONMENTS	Field School II | ONEHEALTH APPROACH
A | MODERN ANALOG APPROACH ▸ Theory of (paleo)limnological systems ▸ Theory of climatic changes ▸ Measurement of modern water parameters ▸ Preparation of water samples for laboratory ▸ Sampling & analysis of modern plankton & benthic organisms and surface sediments	**A | BIODIVERSITY & ECOSYSTEM SERVICE** ▸ Theory of aquatic ecosystems ▸ African rift lakes ▸ Biodiversity assessments ▸ Habitat – biodiversity link ▸ Environmental gradients ▸ Theory of ecosystem services
B | PALEO-ENVIRONMENTAL IN-FIELD DATA ▸ Theory of proxy systems and their analysis ▸ Coring a transect at both lakes ▸ Core splitting and description ▸ In field analysis of core material ▸ Preparation of sediments for further analysis	**B | WATER-BORNE DISEASES** ▸ Overview of water-born parasitic diseases ▸ Case study 1: Neglected tropical diseases | Schistosomiasis, prevalence, methodology, elimination ▸ Case study 2: Fish parasites | methodology & identification
C | CORE ANALYSIS & OUTREACH ▸ Microscopic analysis: diatoms, pollen, ostracods ▸ Preparation dating of cores ▸ Preparation further analysis at institutions ▸ Scientific outreach: Methodoloy & Results presentation ▸ Public outreach: Exhibition & Radio Dinosaur	**C | SUSTAINABLE MANAGEMENT & CONSERVATION STRATEGIES** ▸ Concepts in aquatic conservation ▸ Gap analyses ▸ General management plans ▸ Theory of Key Biodiversity Areas (KBA) ▸ Red listing theory ▸ Conservation planning ▸ Human footprint analyses ▸ Public outreach & Citizen Science Approach

GENERAL SKILLS GAINED THROUGH THE FIELD SCHOOLS

ADMINISTRATIVE SKILLS	CULTURAL ASPECTS	PRACTICAL WORK
Project Management ▸ Time management ▸ Project Planning ▸ Collection management ▸ Communication ▸ Camp management Science Dissemination ▸ Scientific presentations ▸ Scientific outreach ▸ Public outreach ▸ Social media handling	▸ Working in inter-cultural teams ▸ History of Malawian people ▸ Livelihood dependence on aquaticresources ▸ Overexploitation ▸ Socio-economic challenges ▸ Future perspectives ▸ Citizen Science Approach	Data Collection GPS, mapping, biodiversity indices, statistics, water sampling, coring Data Analysis & Practicals Core splitting & sediment analysis, microscopy, digital documentation, species identifications, fish dissections, shedding of cercariae, data management & mining

TEACHING STAFF (in alphabetic order)

Field School I

Annett Junginger, Dr. | Eberhard Karls Univ. Tübingen | Department of Geosciences | Germany
Christian Albrecht, Prof. | J. Liebig Univ. Giessen | Dep. of Animal Ecol. & Systematics | Germany
Elena Jovanovska, Dr. | Senckenberg Institute Frankfurt | Germany
Friedemann Schrenk, Prof. | Goethe Univ. Frankfurt | Senckenberg Research Institute | Germany
Elias R. Chirwa, Dr. | Mzuzu University | Malawi
Julius Tumusiime, M.Sc | MUST University | Department of Biology | Uganda
Oscar Wembo, Prof. | Univ. of Kisangani | Department of Hydrobiology and Aquaculture | DR Congo
Veronica Muiruri, Dr. | National Museums of Kenya | Dep. of Palynology | Kenya
Zuze Dulanya, Prof. | University of Malawi, Zomba | Malawi

Field School II (preliminary)

Annett Junginger, Dr. | Eberhard-Karls Univ. Tübingen | Department of Geosciences | Germany
Christian Albrecht, Prof. | J.-Liebig Univ. Giessen | Dep. of Animal Ecol. & Systematics | Germany
Elias R. Chirwa, Dr. | Mzuzu University | Dep. of Fisheries | Malawi
Fred Chibwana, Dr. | Univ. of Dar es Salaam | Dep. of Zoology & Wildlife Conservation | Tanzania
Friedemann Schrenk, Prof. | Goethe University Frankfurt | Senckenberg Institute | Germany
Marie Claire Dusabe, M.Sc. | Mbarara Univ. of Science & Technology | Dep. of Biology | Uganda
Oscar Wembo, Prof. | Univ. of Kisangani | Department of Hydrobiology and Aquaculture | DR Congo
Thies Geertz, Dr. | Global Nature Fund | Germany

ADMINISTRATION & LOGISTICS

Friedemann Schrenk, Prof. | Goethe University Frankfurt | Senckenberg Institute | Germany
Stefan Schmid, Dr. | Goethe University Frankfurt (ZIAF)

APPLICATION FOR FIELD I SCHOOL 3.-22.10.2022

REQUIREMENTS

- M.Sc. or Ph.D students (f/m/d) with strong focus on the research topics of Field School I.
- Vaccinations according to the WHO guidelines including Yellow Fever and Covid-19.

COSTS COVERED

- All costs regarding air travel and travel within Malawi incl. visa
- Food and accommodation during the field school
- PCR tests to and out of Malawi
- Complete health insurance including Covid-19 issues

COSTS NOT COVERED

- Travel to/from the airport in home country
- No daily allowances

APPLICATION FOR FIELD SCHOOL I

M.Sc. Students or early Ph.D. students from DR Congo, Germany, Malawi, Tanzania, Kenya and Uganda with a biological or geo-scientific background are invited to apply. Applications should include a cover letter, a single-page statement of the applicant's motivation for participating in the field school, a letter of recommendation from the applicant's supervisor, along with a CV and a copy of the BSc or, if available MSc degree. Please send your full application, **as a single PDF file**, by email **before 30 June 2022** to:

Dr. Annett Junginger | Department of Geosciences | University Tübingen (link)

annett.junginger@uni-tuebingen.de

REFERENCES

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FAO. (1993). Fisheries management in the WE arm of Lake Malawi, the Upper Shire River and Lake Malombe, with particular reference to the fisheries on Chambo (Oreochromis spp.). FAO, CIFA Technical Paper No. 21, Rome.
Hecky, R.E., Bootsma, H.A., and Kingdon, M.L. (2003). Impact of land use on sediment and nutrient yields to Lake Malawi/Nyasa (Africa). J. Gt. Lakes Res. 29 (Suppl. 2): 139–158.
Weyl, O. L. F., Ribbink, A. J. and Tweddle, D. (2010). Lake Malawi: fishes, fisheries, biodiversity, health and habitat', Aquatic Ecosystem Health & Management, 13: 3, 241 — 254.