

4th SADC GROUNDWATER CONFERENCE

10th -12th of November 2021
VIRTUAL CONFERENCE



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Plankton Diversity in the Khakhea Bray Aquifer Pan Systems



International Association
of Hydrogeologists
the World-wide Groundwater Organisation



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Introduction

- Temporary wetlands are wetlands characterized by frequent drying (normally they dry completely, at least, once a year).
- The key environmental factors driving the structure of ecological communities in temporary wetlands are the duration, timing and frequency of the wet and dry phases, which varies greatly with region.



Introduction

- Temporary wetlands are therefore unique and contain highly specialized assemblages of rare plant and animal species.
- Diversity studies in these wetlands are essential as these can contribute information needed to maintain a sustainable biodiversity as well as provide useful biological indicators of the ecosystem health.



Biodiversity in temporary wetlands

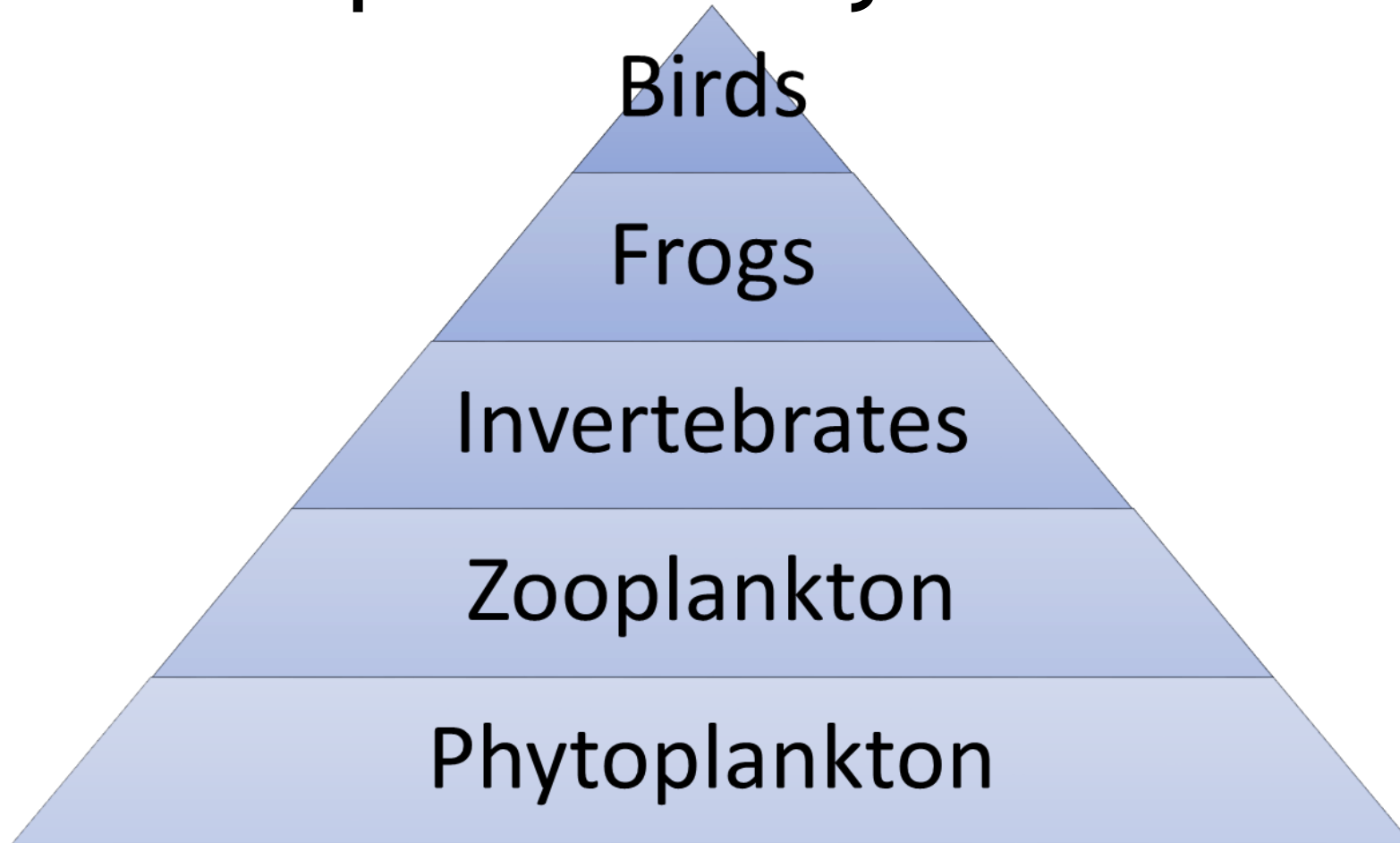
Phytoplankton



Zooplankton



Aquatic ecosystems food webs



Importance of temporary wetlands

- Provide ecosystem services such as:
 1. Wildlife habitat
 2. Source of water
 3. Flood control
 4. Water filtration
 5. Cultural services

Threats to temporary wetlands

- Ecosystem loss and degradation from urbanization and livestock
- Water extraction through irrigation
- Pollution
- Salinization



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Problem Statement

- Plankton fauna from temporary wetlands remain poorly understood, yet knowledge on this group is important to know patterns in groundwater biodiversity to develop sound conservation policies.
- Plankton and micro benthos are a highly neglected part of temporary wetland science.

Research aims

- To understand the relevant processes that shape plankton diversity in the temporary wetlands
- To describe the functional characteristics and species composition of plankton assemblages
- To numerically characterise the contribution of plankton in the wetlands using field investigations and laboratory experiments

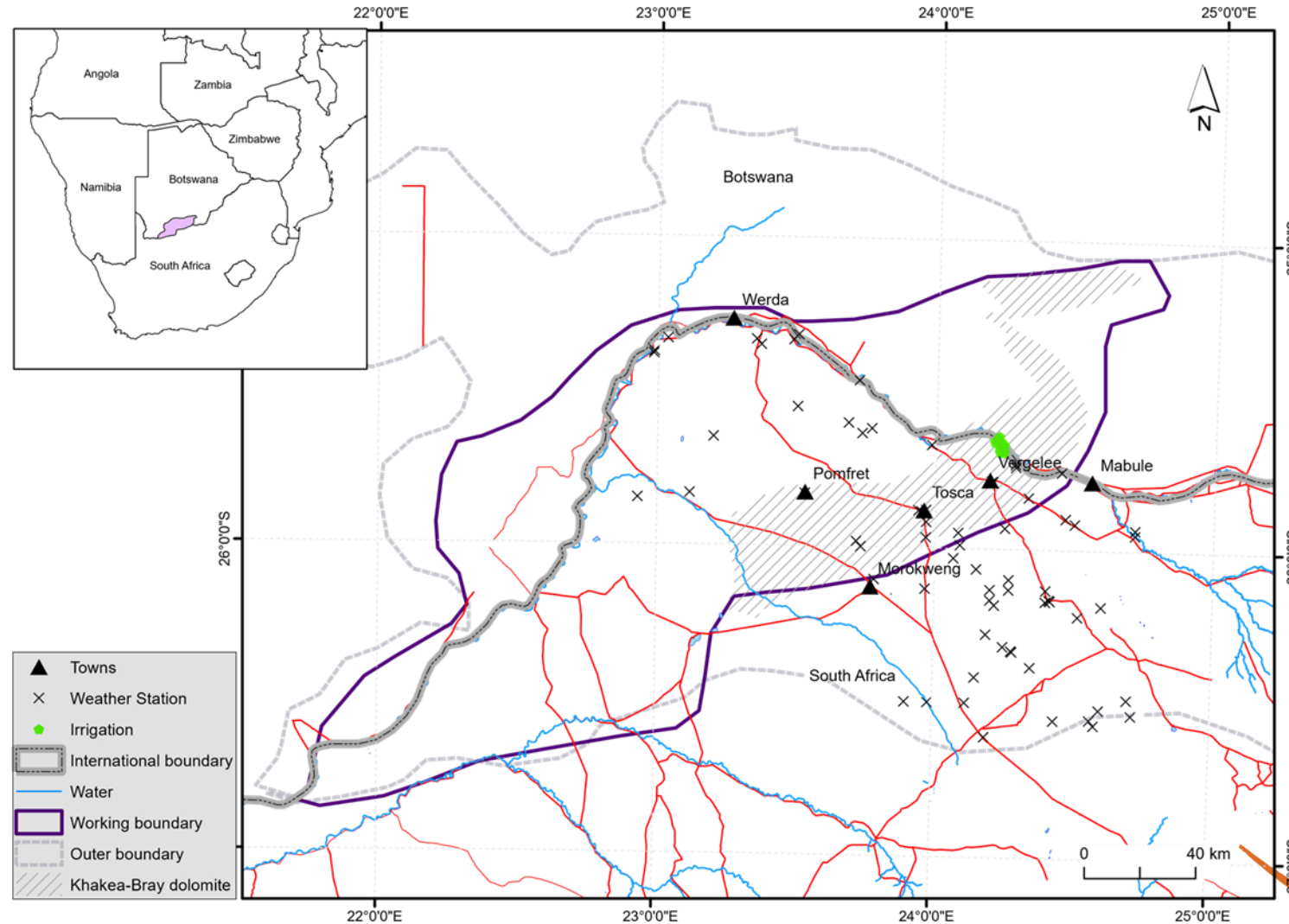
Significance of the study

- Plankton are bio indicators which can be used as early warning signs for assessing environmental health and biogeographic changes taking place in the temporary wetlands over time.
- Understanding plankton diversity in the wetlands will improve knowledge of mechanisms driving diversity and distribution. Hence, this will allow planning of adequate mitigation, conservation and restoration measures for the temporary wetlands.

Objectives

- To determine benthic and pelagic phytoplankton diversity in the temporary wetlands across different sized pans
- To determine the zooplankton diversity in the Khakhea Bray Pan system.
- To determine food web structures in the pan systems in the Khakhea Bray Trans boundary Aquifer.
- To determine the germination success of phytoplankton at different salinity gradients.
- To determine the hatching success of zooplankton at different salinity gradients.

Study Area(Khakhea Bray Transboundary Aquifer)



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Methods

1. Phytoplankton
diversity (Benthic +
Pelagic)

2. Zooplankton diversity
(Benthic + Pelagic)

3. Food Web Structures
(Stable isotope
analysis)

4. Phytoplankton
germination
experiments at
different salinity
gradients

5. Zooplankton
hatching experiments
at different salinity
gradients

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Phytoplankton diversity

- Phytoplankton sampling in each pan during the wet and dry phase.
- Identification using algae identification field guides



Zooplankton diversity

- Zooplankton samples in each pan during the wet and dry phase.
- Identification will be done using a dichotomomic identification key (Fernando, 2002)



Food web structures

- Samples of the sediment, macrophytes, terrestrial vegetation , zooplankton, phytoplankton, invertebrates and frogs will be collected from the pans and placed in Ziplock bags and stored at -20°C.
- Stable isotope analyses will be conducted at Ithemba Lab using a Europa Scientific 20–20 Isotope Ratio Mass Spectrometer linked to an ANCA SL Prep Unit.

Plankton Hatching Experiments

- Sediment samples were collected in June 2021 from 10 dry pans in the Khakhea Bray basin.
- Propagule hatching will be conducted at constant fluorescent lighting at 18 °C.
- Sediment samples will be cultured in aquaria with different salt concentrations. Each dry sediment sample weighing 70 g will be inundated with 2 L of distilled water (control) or one of the following four salinity treatments: 0.5 g L⁻¹, 2.5 g L⁻¹, 5 g L⁻¹, and 10 g L⁻¹.
- All aquaria are to be sampled twice per week during a period of 28 days after rehydration to see hatching success.

Anticipated Outputs

- Creating a diversity database on plankton species in the pan systems of Khakhea Bray Transboundary Aquifer

Thank you! Tinotenda!!

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- SADC GMI
- Aquatic Systems Research Group
- Wetland Ecology Lab
- Department of Zoology and Entomology,



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Wetland Ecology Lab

