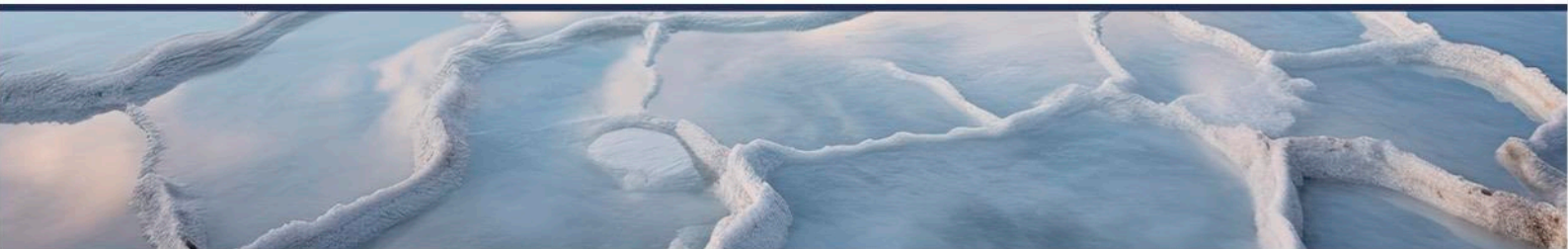


ICSLR'24

15th International Conference on
Salt Lake Research

November 4-8, 2024 / Antalya, Türkiye

Book of Abstracts



15th International Conference on Salt Lake Research (ICSLR'24) Book of Abstract

Edited by : Professor Meryem BEKLİOĞLU, METU, Türkiye
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Esat Arber, PhD, Arber Congress Solutions, Türkiye

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ORGANIZERS



Preface

Dear Colleagues,

We are delighted to present the Book of Abstracts for the "15th International Conference on Salt Lake Research (ICSLR'24)," held in the beautiful city of Antalya, Türkiye, from November 4-8, 2024. ICSLR has long been a milestone in saline lake research, and this year we are pleased to welcome 121 participants who share our commitment to advancing understanding in this field.

The program features 65 oral presentations and 31 posters, as well as 6 plenary, offering ample opportunity for knowledge exchange and collaboration. ICSLR'24 brings together leading experts and emerging researchers alike, fostering valuable connections across diverse specialties within saline and freshwater ecosystems.

Antalya's rich heritage and unique landscapes offer an inspiring setting, adding to the conference experience. We are grateful for your participation and contributions, which will undoubtedly enrich this event and propel further advancements in salt lake research.

Welcome to ICSLR'24.

Warm regards,
The Organizing Committee



Meryem BEKLOĞLU
Co-chair



Zuhail AKYUREK
Co-chair

Plenary Speakers

**Dr. Erik Jeppesen**

"Impact of water abstraction and global warming on water balance, salinity and lake ecosystems in arid and semi-arid regions with special focus on Türkiye lakes"

**Lynn de Freitas**

"Great Salt Lake's future is our future. Sustainability of the ecosystem is imperative"

**Dr. Masoud Tajrishy**

"Urmia Lake Restoration: from Challenges to Solutions"

**Dr. Jianrong Huang**

"Microbial carbon fixation and its influencing factors in Qinghai-Tibet Plateau saline lakes"

**Dr. Xiaoxi Sun**

"Salinity change induces distinct climate feedbacks of nitrogen removal in saline lakes"

**Dr. Tamás Felföldi**

"Microbes of soda lakes - From local phenomena to global data"

Committees

Organizing Committee

Zuhal Akyürek, METU, Türkiye
Cihelio Alves Amorim, METU, Türkiye
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Mustafa Korkmaz, METU, Türkiye
Lichun Ma, Chinese Academy of Geological Sciences, China
Korhan Özkan, METU, Türkiye
Cüneyd Nadir Solak, Dumlupınar University, Türkiye
Nihan Tavşanoğlu, Çankırı Karatekin University, Türkiye
Wayne Wurstbough, Utah State University, USA
Egor Zadereev, Institute of Biophysics SB RAS, Russia

Scientific Committee

Zuhal Akyürek, METU, Türkiye
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Bonnie Baxter, Great Salt Lake Institute, USA
Meryem Beklioğlu, METU, Türkiye
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Antonio Camacho, University of Valencia, Spain
Miguel Cañedo-Argüelles, Spanish National Research Council, Spain
Faith Coleman, Federation University Australia, Australia
Diógenes Costa, Federal University of Rio Grande do Norte, Brazil
Bindy Datson, Actis Environmental Services, Australia
Tianlong Deng, Tianjin University of Science and Technology, China
Maria Farias, National University of Tucuman, Argentina
Zsofia Horvath, Institute of Aquatic Ecology & Centre for Ecological Research, Hungary
Peter Hudson, South Australian Museum, Australia
Katia Hueso, Institute of Saltscapes and Salt Heritage, Spain
Erik Jeppesen, METU, Türkiye & Aarhus Univ, Denmark
Lichun Ma, Chinese Academy of Geological Sciences, China
Aharon Oren, The Hebrew University of Jerusalem, Israel
Wayne Wurtsbaugh, Utah State Univ, USA
Mianping Zheng, Chinese Academy of Geological Sciences, China
Egor Zadereev, Institute of Biophysics SB RAS, Russia

Scientific Topics

- Geological history and paleoecology of saline lakes
- Physical-chemical processes and modeling of saline lakes
- Structure, functioning and dynamics of saline lake ecosystems
- Impact of desalination and freshwater salinization on ecosystem structure and functioning
 - Impact of climate change and land use on the ecology of saline lake
 - Biodiversity and conservation of saline lakes and adjacent habitats
- Economic and social values of saline lakes and impacts of resources (e.g. brine, Artemia, etc.) extraction
 - Management and restoration of saline lakes and related watersheds
 - Other topics

Discussion Panels

1st Panel: The role of NGO in the study, conservation, and management of saline lakes



Panel chairpersons:

Katia Hueso, IPAISAL Network/Comillas Pontifical University, Spain

Lynn de Freitas, Executive Director, FRIENDS of Great Salt Lake, USA

Short description:

This panel is aimed at NGOs that work on the conservation of the natural values and cultural heritage of saline lakes and surrounding landscapes, volunteerism, restoration of saltworks for environmental, cultural, and social purposes as well as activism against the environmental degradation of these sites. NGOs are essential stakeholders that act as a hinge between science, policy, and society. NGOs have the capacity to understand and apply research outcomes, collaborate with academia, and stimulate citizen science, helping translate scientific results to decision-makers and the public at large. Thanks to the close ties NGOs have with local communities, they can mobilize them for action and are perceived as free from political bias with respect to conservation issues. The goal of this panel is to exchange good practices, address environmental challenges faced by saline lakes, and establish ties between the NGO networks and ISSLR.

2nd Panel: Solutions for shrinking saline lakes



Panel chairpersons:

Bonnie Baxter, Director, Great Salt Lake Institute, Westminster University, USA

Massoud Tajrishy, Sharif University of Technology, Iran

Short description:

Saline lakes may report on the scarcity of water in a geographical region because their terminal nature balances input with evaporation. Consumptive overuse in the watersheds for development and agriculture has put stress on many of these lakes, and the warming temperatures of climate change are speeding the decline. In this, stakeholders representing different lakes and sectors (scientists, conservationists, policy-makers, industrialists, nature lovers) will brainstorm challenges that these ecosystems face and will suggest steps towards solutions. The expected outcomes of this are 1) A set of solutions that can improve sustainable management practices concerning saline lakes, 2) A research paper that reviews these challenges and solutions and suggests a path forward. The panel is open to all conference participants.

Conference Hotel**Paloma Foresta Resort Hotel**

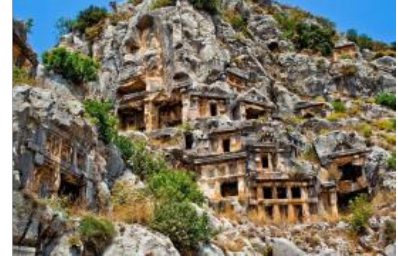
Paloma Foresta with Ultra Luxurious All-Inclusive concept and its 346 rooms within pine trees with its unmatched beach located where the Taurus Mountains embrace the Mediterranean and the texture offering serenity and calmness invites the guests to its relaxing and soothing world.



A number of rooms have been reserved as a run of the house (standard and garden rooms) for the symposium participants with the concept of "under one roof".

Excursions

1# Demre St. Nicholas, Myra, and Kekova Daily Excursion / Friday, 08 Nov.



Embark on a captivating full-day tour of Demre, St. Nicholas Church, Myra, and Kekova, starting from the Paloma Foresta Hotel.

2# Perge, Aspendos, and Antalya Sightseeing Daily Excursion / Friday, 08 Nov.



Embark on a full-day historical and cultural tour of Perge, Aspendos, and Antalya, starting from the Paloma Foresta Hotel.

3# Salda Lake, Pamukkale, and Ephesus Post Tour / 3 Days / Saturday, 09 Nov.



4# Konya, Salt Lake, and Cappadocia Post Tour / 3 Days / Saturday, 09 Nov.



Program

Monday - November 04, 2024	
10:00 14:00	Registration
14:00 15:30	Opening Session
14:00 14:10	Meryem Beklioğlu ICSLR'24, Welcome speech
14:10 14:20	Ahmet Yozgatigil Rector of METU, Welcome speech
14:20 14:40	Wayne Wurtsbaugh & Egor Zadereev ISSLR Welcome speech
14:40 15:30	Invited Talk: Erik Jeppesen Impact of water abstraction and global warming on water balance, salinity and lake ecosystems in arid and semi-arid regions with special focus on Türkiye lakes
15:30 16:00	Coffee Break
16:00 17:30	Session 2 Chair: Wayne Wurtsbaugh
16:00 16:45	Invited Talk: Masoud Tajrishy Urmia Lake Restoration: from Challenges to Solutions
16:45 17:00	Accuracy of Altimetry Data to Monitor Elevation and Storage Changes of Lake Urmia Somayeh Sima
17:00 17:15	Science Responds to Changes in The Salt Lake Zheng MianPing
17:15 17:30	Modeling Chlorophyll-a Concentrations In Great Salt Lake (USA) At High Temporal Frequency With MODIS Satellite Imagery Wayne A. Wurtsbaugh
17:30 18:30	Panel & Discussions Chairpersons: Bonnie Baxter, Director, Great Salt Lake Institute, Westminster University, USA Massoud Tajrishy, Sharif University of Technology, Iran Solutions for Shrinking Saline Lakes
18:45 19:45	Ice Breaking Party: Beach
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09:00 10:30	Session 3 Chair: Wayne Wurtsbaugh
09:00 09:45	Invited Talk: Lynn de Freitas Great Salt Lake's Future is Our Future. Sustainability of the Ecosystem is Imperative.
09:45 10:00	Proactive Strategic Planning for the Great Salt Lake Tim Davis
10:00 10:15	Evaluating Agricultural Management Practices in Mitigating Harmful Algal Blooms in a Semi-Arid Coastal Lagoon by Coupling SWAT+ and WET Models Juan Pablo Pacheco
10:15 10:30	Putting People Back at the Center of Saline Lake Stewardship Benjamin Abbott
10:30 11:00	Coffee Break
11:00 12:30	Session 4 Chair: Cihelio Amorim
11:00 11:15	Compensating for Water Deficit in the Hypersaline Lake Kuyalnik (Ukraine) From External Sources: History and Perspectives Oleksandr Goncharov
11:15 11:30	Tracking Dust Sources and Associated Human Health Impacts Around a Shrinking Inland Sea William C. Porter
11:30 11:45	"Toxic Dust Storms" or "Thriving Ecosystem": Examining Public Attitudes, Values, and Concerns of Great Salt Lake (Utah, USA) Anna McEntire
11:45 12:00	Multi-temperature Phase Equilibria of Calcium Sulfate-Based Salt-Forming Minerals and Its Application in the Leaching of Polyhalite Zeng Ying
12:00 12:15	Salt Lakes Need Freshwater Too Justin Brookes
12:15 12:30	Changes in Diversity of Wetland Birds Across Spatial Scales Following 20 Years of Wetland Loss and Salinization Ibrahim Kaan Özgencil
12:30 14:00	Lunch Break

14:00 15:30	Session 5 Chair: Katia Hueso-Kortekaas
14:00 14:15	Effects of Salinization on Zooplankton Community Composition and Diversity in a Gradient Mesocosm Experiment Irem Gamze Anık
14:15 14:30	Aquatic Coleopterans of the Sambhar Salt Lake, India: Current Status in Light of Natural and Anthropogenic Factors Seema Kulshreshtha
14:30 14:45	Water Level Fluctuations and Algal-Microbial Communities Response of the Aral Sea Remnant Lakes Natalie Barteneva
14:45 15:00	Characterizing Extremophilic Diversity: A Metabarcoding Survey of Five Salt Lakes Ayşegül Er Gökçe
15:00 15:15	A Salty Story: How Freshwater Lobose Testate Amoeba (Arcellinida, Amoebozoa) Conquered Athalassohaline Water Bodies, But Not the Sea Fernando Useros
15:15 15:30	Identifying Knowledge Gaps in Hypersaline Systems Driving Global Electrical Transition: Invertebrate Community Composition in Salares from the Lithium Triangle Gonzalo Salazar
15:30 16:00	Coffee Break
16:00 17:30	Session 6 Chair: Egor Zadereev
16:00 16:15	Past and Present Threats and Challenges to Saline Lakes in Northeast Spain: An Indicator-Based Diagnosis Katia Hueso-Kortekaas
16:15 16:30	Dramatic Declines in Breeding Shorebird Populations in Protected Coastal Wetlands in the Eastern Mediterranean Tamás Székely
16:30 16:45	Lost Aquatic Forests of the Coorong, South Australia Faith Coleman
16:45 17:00	Shoreline Soil Microbiomes and a Drying Great Salt Lake, Utah David Parrott
17:00 17:15	Microbiomes of Halophilic Algae Under Laboratory Cultivation Andrei Plotnikov
17:15 17:30	Microplastic Pollution in Saline Wetlands of the Ebro Basin: An Exploratory Study Noemi Delgado-Mellado
18:00 19:00	Panel & Discussions Chairpersons: Katia Hueso, IPAISAL Network/Comillas Pontifical University, Spain Lynn de Freitas, Executive Director, FRIENDS of Great Salt Lake, USA The Role of NGO in the Study, Conservation, and Management of Saline Lakes
Wednesday - November 06, 2024	
09:00 10:30	Session 7 Chair: Faith Coleman
09:00 09:30	Invited Talk: Jianrong Huang Microbial carbon fixation and its influencing factors in Qinghai-Tibet Plateau saline lakes
09:30 09:45	The Effects of Salinity and Heatwave on Zooplankton Community and Size Structures and Diversity: Synchronized Mesocosm Experiments, Türkiye Gül Canan Yavuz
09:45 10:00	Heatwave Effects on the GHG Dynamics of Shallow Saline Lakes: A Synchronized Mesocosm Study in Two Climate Zones Gültekin Yılmaz
10:00 10:15	Agricultural Runoff and Climate-Induced Drought Drive Biogeochemical Regime Shift in a Nutrient-Polluted Saline Lake Caroline Hung
10:15 10:30	Microbial Role in Carbon Cycle of Saline Lakes on the Tibetan Plateau Hongchen Jiang
10:30 11:00	Coffee Break
11:00 12:30	Session 8 Chair: Egor Zadereev
11:00 11:30	Invited Talk: Xiaoxi Sun Salinity change induces distinct climate feedbacks of nitrogen removal in saline lakes
11:30 11:45	How do Salinity and Warming Affect Shallow Lake Ecosystems? A Synchronized Mesocosm Experiment in Two Climates of Türkiye Cihelio Alves Amorim
11:45 12:00	Microbialites and Primary Productivity at a Shrinking Great Salt Lake Bonnie Baxter
12:00 12:15	Effects of Salinity and Climate on Phytoplankton Community Structure and Diversity: A Synchronized Mesocosm Experiment Zeynep Dilbe Uyar
12:15 12:30	Influence of Salinity and Climate on Organic Matter Decomposition and Stabilization in Synchronized Mesocosm Experiments Using the Teabag Index Method Gülce Yalçın
12:30 14:00	Lunch Break

14:00	Session 9
15:30	Chair: Tianlong Deng
14:00	Lithium Uptake from Brine of Salt Lake Ankara by Flexible and Freestanding Electrospun Composite Substrate
14:15	Mustafa Muammer Demir
14:15	Solid-Liquid Phase Equilibria of Potassium-Containing System: Effect of Temperature and Coexisting Ions
14:30	Yu Xudong
14:30	Preparation of High-Load Electrode and Study on Lithium Extraction Performance
14:45	Yuan Zhou
14:45	Effectively Extracting Li ⁺ from Low Concentration Sulfate Type Salt Lake Brines
15:00	Chunxi Hai
15:00	Efficient Electrochemical Degradation of Potassium Flotation Agents in High Salinity Environments Using Customized Composite Electrodes
15:15	Haining Liu
15:15	Sharing Saline Lake Stories Through Online Maps To Increase Awareness And Coordinated Conservation
15:30	Joseph Penrod
15:30	Coffee Break
16:00	Session 10
17:15	Chair: Mustafa Muammer Demir
16:00	Aquatic Ecosystem Response to Salinity Anomalies triggered by "El Niño Southern Oscillation" in Ponds of Isabela Island, Galápagos Archipelago
16:15	Daniela Rosero-Lopez
16:15	Experimental and Field Evidence Suggests Extreme Salinity Tolerances in Codiella Gastropods from Australian Salt Lakes.
16:30	Angus Lawrie
16:30	Lipid Biomarkers in Sediments of a Stratified Haloalkaline Lake Indicate Specific Production and Preservation of Phytoplankton Biosignatures
16:45	Mathias Pineau
16:45	The Underlying Digital Technology for the Intelligence of Salt Pans Processes in the Utilization of Salt Lake Resource
17:00	Huan Zhou
17:00	Phase Separation Strategy for the Resource Utilization of Solid Wastes
17:15	Fangqin Cheng
17:15	Climatic Controls on the Seasonal Variation of Oxygen Isotopes in Alpine Lake Water, Tibetan Plateau
17:30	Yongjie Lin
17:30	Poster Session
18:30	Chair: Nihan Tavşanoğlu
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10:30	Chair: Faith Coleman
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09:45	FizzingSoda: Spatio-Temporal Variation in the Gas Fluxes of Alkaline Lakes and the Underlying Microbial Processes
10:00	Attila Szabó
10:00	Organic Matter Accumulation Drives Methylophilic Methanogenesis and Microbial Ecology in a Hypersaline Coastal Lagoon
10:15	Christopher Keneally
10:15	The Yellow Substance Determines the Color of Phototrophs in the Chemocline of the White Sea Meromictic Lakes and Lagoons
10:30	Elena Krasnova
10:30	Coffee Break
11:00	Session 13
12:30	Chair: Erik Jeppesen
11:00	The Effect of Salinity on the Emergence of Zooplankton from the Bank of Resting Eggs
11:15	Egor Zadereev
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11:30	Julie Jung
11:30	Effects of Climate and Warming on Litter Decomposition in Oligohaline and Hypersaline Ecosystems: Insights from a Synchronized Mesocosm Experiment
11:45	Masum Billah
11:45	Salinity-Dependent Dynamics of Phototrophic Communities in a Southwestern Siberian Soda Lake During the Solar Activity Cycle
12:00	Ota Samylina
12:00	Bacterial Biofilm on Microplastics in Inland Saline Lakes
12:15	Kerem Gökdağ
12:15	Enrichment Patterns and Prediction Techniques of Neogene Brine Reservoirs in the Western Qaidam Basin, China
12:30	Qi Li
12:30	Lunch Break
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14:00	Session 14
15:30	Chair: MianPing Zheng
14:00	Minerogenetic series of deposits in the Qaidam Basin
14:15	Pan Tong
14:15	Sustainable Development of China's Salt Lake Industry and Enterprise ESG Performance and Suggestions
14:30	Yue Zheng
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15:00	Kaiyu Zhao
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15:15	Chak Ming Kung
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17:00	Xianhua Hou
17:00	Exploration and Advancement in the Discovery of Marine Potassium Salt Deposits in the Sichuan Basin, Southwest China
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17:15	Paleoclimatic Changes in Dalangtan Salt Lake in Qaidam Since 140K.A. According to Homogenization Temperatures of Fluid Inclusions in Halite
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Wayne Wurtsbaugh & Egor Zadereev	
- General ISSLR meeting (all conference participants)	
- Best presentation Awards Ceremony	
- Reports by the President, Secretary/Treasurer, Editor	
- Nominations of the ISSLR Board of Directors members	
- Discussion of the place for the next ISSLR conference	
17:45	
18:45	Closing Session
19:00	Meryem Beklioglu
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21:00	Closing Party
23:00	
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2# Perge, Aspendos, and Antalya Sightseeing Daily Tour	
Saturday - November 9, 2024	
Post Conference Tours	
3# Salda Lake, Pamukkale, and Ephesus Post Tour / 3 Days	
4# Konya, Salt Lake, and Cappadocia Post Tour / 3 Days	
07:30-	

"Just for a smooth presentation experience"

Oral Presentation:

- Please deliver your presentation to the technical staff of the meeting room at least 2 sessions prior to your scheduled time.
- Ensure that your presentation runs smoothly on the designated computer.
- Introduce yourself to the session chairperson before the start of your session.

Poster Presentation:

- Ensure your poster is securely placed on the assigned board at least 2 hours before your poster presentation slot.
- Please remove your poster promptly after your session ends to make space for the next presenter.



ICSLR'24 Community

WhatsApp group

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PLENARY SPEAKERS

ID: 87

Impact of Water Abstraction and Global Warming on Water Balance, Salinity, and Lake Ecosystems in Arid and Semi-Arid Regions with Special Focus on Türkiye Lakes

Erik Jeppesen*, Meryem Bekliođlu, Korhan Özkan, Zuhul Akyurek
METU Salt-Lake Team, Ankara, Türkiye

Globally, temperature and precipitation patterns are predicted to change markedly as a result of climate change. Particularly, the regions with a cold or hot semi-arid climate and the Mediterranean climate zone are expected to be strongly affected. Moreover, land in drought is expected to double from 2000 to 2100 to about 50% of the land worldwide. These projections do not consider the concurrent increases in water abstraction, particularly for irrigation purposes, that will increase markedly in the years to come due to a global increase in demand for food in a growing population, a shift from animal farming to crop farming in semi-arid and arid areas, and a decrease in net precipitation. Increasing irrigation will further accelerate salinization of lakes in the dry climate zones. In this talk, we will give a brief overview of ongoing changes in freshwater and saline lakes in semi-arid regions of the world, with special focus on Türkiye. We will further present highlights from the 4-year TÜBİTAK project CLIM-SALTLAKES studying the climate change effects on trophic structure and dynamics in saline and brackish lakes. In this project we have 1) established international unique well-equipped experimental facilities at METU in Ankara and Mersin campuses, allowing comprehensive studies of stressor effects on complex lake ecosystems at each place individually or synchronized between the two climate regions, 2) conducted three comprehensive highly synchronized experiments at these facilities (a saline gradient effect study and studies of the effects of short- and long-term heatwaves crossed with low and high salinities, 3) conducted a comprehensive snap-shot study of 50 inland and coastal saline lakes in Türkiye (63 sites), and 15 inland saline lakes (29 sites) in Kazakhstan, 4) done remote sensing and modelling studies of the changes in water balance and size taken place in the past 40 years and predicted for the future in lakes in the Konya and Burdur closed basins and 5) changes in ecosystem structure in these basins, the latter based on existing data from various sources.

Keyword: *Global warming*



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Great Salt Lake's Future is Our Future. Sustainability of the Ecosystem is Imperative**Lynn de Freitas***FRIENDS of Great Salt Lake, United States*

FRIENDS of Great Salt Lake is a nonprofit membership organization founded in 1994. Its mission is to preserve and protect the Great Salt Lake ecosystem and to raise public awareness about the Lake through education, research, advocacy, and the arts. FRIENDS focuses its work on the following major threats identified in a public survey that was conducted shortly after it was founded: 1) a growing population; 2) ignorance about the Lake; 3) water quantity and quality; 4) development on and around the Lake; and, 5) climate change. In November 2022, Great Salt Lake set a new historic record low elevation of 4,188.5' asl. The diminished ecological viability of the system, toxic dust from the exposed lakebed blowing over populated areas, and negative impacts to the Lake's resources prompted a significant, positive shift in public and political attitudes towards the Lake. That shift has translated into a willingness to dedicate considerable resources and actions to address its decline. This presentation will highlight these efforts and touch on what we all hope is a positive future outcome for the Lake.

Please see Friends of Great Salt Lake - 2024 Issues Forum (fogsl.org) for additional information regarding efforts to address the Lake's decline.

Keyword: *Sustainability*

Microbial Carbon Fixation and Its Influencing Factors in Qinghai-Tibet Plateau Saline Lakes**Jianrong Huang***China University of Geoscience, Wuhan, China*

Microbial carbon fixation in saline lakes constitutes an important part of the global lacustrine carbon budget. However, the microbial inorganic carbon uptake rates in saline lake water and its influencing factors are still not fully understood. Here, we studied in situ microbial carbon uptake rates under light-dependent and dark conditions in the saline water of Qinghai Lake using a carbon isotopic labeling (^{14}C -bicarbonate) technique, followed by geochemical and microbial analyses. The results showed that the light-dependent inorganic carbon uptake rates were 135.17–293.02 $\mu\text{g C L}^{-1} \text{ h}^{-1}$ during the summer cruise, while dark inorganic carbon uptake rates ranged from 4.27 to 14.10 $\mu\text{g C L}^{-1} \text{ h}^{-1}$. Photoautotrophic prokaryotes and algae (e.g. Oxyphotobacteria, Chlorophyta, Cryptophyta and Ochrophyta) may be the major contributors to light-dependent carbon fixation processes. Microbial inorganic carbon uptake rates were mainly influenced by the level of nutrients (e.g., ammonium, dissolved inorganic carbon, dissolved organic carbon, total nitrogen), with dissolved inorganic carbon content being predominant. Environmental and microbial factors jointly regulate the total, light-dependent and dark inorganic carbon uptake rates in the studied saline lake water. In summary, microbial light-dependent and dark carbon fixation processes are active and contribute significantly to carbon sequestration in saline lake water. Therefore, more attention should be given to microbial carbon fixation and its response to climate and environmental changes of the lake carbon cycle in the context of climate change.

Keyword: *Microbial carbon fixation rates, Dark carbon fixation, Saline lakes, Dissolved inorganic carbon, Microbial factors*

Salinity Change Induces Distinct Climate Feedbacks of Nitrogen Removal in Saline Lakes**Xiaoxi Sun***, Hongchen Jiang*China University of Geosciences, Wuhan, China*

Current estimations of nitrogen biogeochemical cycling and N₂O emissions in global lakes as well as predictions of their future changes are overrepresented by freshwater datasets, while less consideration is given to widespread saline lakes with different salinity (representing salinization or desalinization).

In this study, we show that N₂O production by denitrification is the main process of reactive nitrogen (Nr, the general abbreviations of NH₄⁺-N, NO₂⁻-N and NO₃⁻-N) removal in hypersaline lake sediments (e.g. Lake Chaka). Furthermore, denitrification-induced N₂ production exhibits higher salinity sensitivity than denitrification-induced N₂O production, suggesting that the contribution of N₂O to Nr removal decreases with decreasing salinity. This field-investigation-based salinity response model of Nr removal indicates that under global climate change, saline lakes in the process of salinization or desalination may have distinct Nr removal and climate feedback effects: salinized lakes tend to generate a positive climate feedback, while desalinated lakes show a negative feedback. Therefore, salinity change should be considered as an important factor in assessing future trend of N₂O emissions from lakes under climate change.

Our results systematically demonstrated that denitrification is the main process of reactive nitrogen in hypersaline lake sediments, and that the process of salinization or desalination may have distinct Nr removal and climate feedback effects. We believe that this work provides new insights for understanding the fate of N load in saline lakes and is of great significance for future N₂O emission assessment from global lakes under climate change.

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Keyword: *Saline lakes, Nr removal, N₂O production, Salinity change, Climate feedback*

Microbes of Soda Lakes - From Local Phenomena to Global Data**Tamas Felfoldi***Institute of Aquatic Ecology, HUN-REN Centre for Ecological Research; Budapest, Hungary*

Soda lakes are multiple extreme environments with special ion composition, alkaline pH, high turbidity, humic material and nutrient content, special underwater light-limited environment, and with rapid fluctuations of physicochemical conditions. As a result of global climate change, moderately saline habitats are expected to become more common (e.g. shallow water bodies more often become concentrated and desiccated because of increased evaporation), while shallow lakes are more sensitive to the consequences of changing weather patterns. The analogues of these global problems could be studied in soda lakes, which have moderately saline (i.e. 'brackish') water with changing salinity and could entirely dry out seasonally. Additionally, the growing human population creates environments with high concentration of nutrients (e.g. with the introduction of wastewaters to surface waters), an analogue of this phenomenon could be the high nutrient load provided by bird excrements in soda lakes. In this lecture, I will focus on the role of microorganisms (bacteria, algae and protists) in these habitats based on studies conducted with our research group in the recent years including both cultivation-based and environmental DNA-based results, mainly focusing on the soda lakes and pans of the Pannonian Basin in Central Europe. Local phenomena (such as algal blooms, effect of desiccation) and global microbiome data from saline lakes, furthermore several aspects of microbial ecology, such as adaptation and biological interactions will also be discussed.

ORAL PRESENTATIONS

ID: 71

Accuracy of Altimetry Data to Monitor Elevation and Storage Changes of Lake Urmia**Somayeh Sima^{*} ¹, Jean-Francois Cretaux²**¹ *Adjunct professor at Utah State University*² *deputy director of LEGOS, France*

Lake Urmia, Iran, has dried extensively during the past three decades and lost its ecosystem services. To revive the lake and its diverse functions, a thorough monitoring of the lake's level, area, and storage is essential. Satellite altimetry data creates a parallel opportunity to monitor lake status independently of the traditional gauge data. We've evaluated over two decades of altimetry data acquired from different satellites for monitoring Lake Urima's status since 1992. Our findings indicated a perfect agreement between the satellite-derived and in situ lake level data ($R^2=0.98$) and an RMSE=37 cm, which is higher than the acceptable range for large lakes. We attributed this error to the impact of evaporates and floating salt scales on the satellite tracks. Moreover, since the launch of new altimeters (e.g., Jason-3 and Sentinel-6), the accuracy of lake elevation data has been enhanced remarkably. However, Lake Urmia's hypsometric equations developed based on altimetry data and optical images are not reliable enough for practical applications, particularly at low levels. Consequently, while altimetric data are useful for lake elevation monitoring, altimetric-derived hypsometric relations should be used with caveats as they are subject to error propagation. Such validation efforts for other saline lakes can shed light on the accuracy of altimetric data to monitor the dynamic topography of these lakes.

Keyword: *elevation, hypsometry, evaporite*

Science Responds to Changes in The Salt Lake

Zheng MianPing

Director of Key Laboratory of Saline Lake and Environment, MNR; Institute of Mineral Resources, CAGS, Beijing, 100037, P.R. China

Salt lakes are not only living mineral resources but also breeding grounds for some salt-tolerant organisms. Their formation and evolution are closely related to the natural environment in which they exist. Unlike more stable metal and non-metal resources such as copper and iron, salt lakes are susceptible to changes in climate variables within the Earth system, such as temperature, humidity, and atmospheric pressure.

In recent years, different salt lake regions around the world have been experiencing various changes. Large salt lakes such as the Great Salt Lake and the Aral Sea are shrinking at an alarming rate, leading to a decrease in habitat for waterfowl and economic benefits. However, in some regions like the Qinghai-Tibet Plateau, salt lake water levels are rising significantly and becoming less saline, posing a threat to pastures, settlements, and salt production.

The causes of these changes are both natural variations on a global scale and human activities without proper scientific consideration of water balance. Therefore, it is necessary to strengthen the natural water balance of salt lakes and evaluate the trade-off between water use and ecological conservation. Different strategies should be adopted based on the dynamic water patterns of different salt lake regions. Firstly, for salt lake regions experiencing shrinkage due to excessive water consumption for industrial and agricultural purposes, efforts should be made to minimize water consumption. This strategy has successfully revitalized the green earth oases in the Guyan Lake and Shiyang River basins of the Heihe River Basin in northwest China. Secondly, for salt lake regions where water levels may rise and water quality may become less saline in the medium to long term, enhanced prediction and early warning systems, Flood control and drainage, and protection measures should be implemented.

Modeling Chlorophyll-a Concentrations In Great Salt Lake (USA) At High Temporal Frequency With MODIS Satellite Imagery

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The largest saline lake in the Western Hemisphere, Great Salt Lake, supports billion-dollar industries, recreation, and is an important ecological resource for migratory birds. However, little is known about the spatial and temporal dynamics of phytoplankton in the lake that support these resources. Reflectances provided by MODIS satellites correlated well ($r^2 = 0.66$) with field measurements of chlorophyll a in our principal study area of the lake, 1600 km² Gilbert Bay. The imagery indicated significant spatial differences in chlorophyll, with low winter concentration in littoral areas where temperatures approached 0°C, high concentrations in a plume emanating from a nutrient-polluted bay, and ~17% lower concentrations in the western side of the lake distant from nutrient inflows. There was high seasonality in chlorophyll, with concentrations averaging 37 mg m⁻³ in winter but decreasing to 3 mg m⁻³ in summer due to heavy grazing pressure from brine shrimp (*Artemia franciscana*).

Twenty years of imagery revealed a 68% increase in chlorophyll in the lake, likely resulting from a combination of: 1) increased wastewater nutrient inputs; 2) concentration of nutrients as the lake declined 2.6 m and lost 40% of its volume, and; 3) nearly complete loss of the deep-brine layer (monimolimnion) which sequestered nutrients away from the photic zone. The increased eutrophication likely has positive benefits on the *Artemia*, and subsequently on the aquacultural harvest of their cysts and on the birds dependent on *Artemia* for food. However, hyper-eutrophication in one of the hyposaline bays receiving secondary-treated wastewater from 2 million residents produces cyanotoxins far in excess of guidelines. MODIS imagery provides a useful and cost-effective means of monitoring the phytoplankton in Gilbert Bay, but 53% of the lake could not be effectively monitored due to shallow depths of its other bays, or Archaea and other plankton microbes with different pigments in the lake's salt-saturated northern bay.

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Proactive Strategic Planning for the Great Salt Lake

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Office of the Great Salt Lake Commissioner

In November of 2022, the Great Salt Lake, in the state of Utah - United States of America, fell to the lowest recorded level. As water levels dropped, salinity spiked, threatening an ecosystem that supports over 10 million migratory birds and a brine shrimp industry that helps feed tens of millions of people around the world. Subsequently, two above average water years have increased the level of the lake 1.98 meters above its lowest level. The lake is predicted to fall almost 1 meter this year as a result of high temperatures and below average precipitation. This will leave the lake at nearly 1.82 meters below its healthy, target range.

The Utah State Legislature and other stakeholders have responded with significant public investments and policy changes in response to these persistent and dramatic lake declines. One of which, HB 491, “Amendments Related to Great Salt Lake” (2023), established the Office of the Great Salt Lake Commissioner and required the Commissioner to, among other things, prepare a strategic plan applying “a holistic approach that balances the diverse interests related to the health of the Great Salt Lake...”

The Office of the Commissioner finalized the Great Salt Lake Strategic Plan in January, 2024. The strategic plan includes actions over the next thirty years to help get the lake to its healthy, target range and sustain it there.

Any proposed solution to sustaining the Great Salt Lake is most likely to be successful only if it is: • Ecologically sustainable, • Economically viable, • Politically possible, • Technically feasible, and • Legally sound.

The four objectives in the strategic plan include: • Better coordination of state, federal, and local agencies and stakeholders; • Basing decisions upon the best available science; • Getting more water to the lake; and, • Protecting air and water quality.

The Office of the Great Salt Lake Commissioner proposes to provide an overview of the strategic plan and lead a discussion about what effective, proactive actions will be most effective to save the lake and other saline lakes.

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<https://greatsaltlake.utah.gov/wp-content/uploads/Great-Salt-Lake-Strategic-Plan-1.pdf>

Keyword: *Great, Salt, Lake, Strategic, Plan*

Evaluating Agricultural Management Practices in Mitigating Harmful Algal Blooms in a Semi-Arid Coastal Lagoon by Coupling SWAT+ and WET Models

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Coastal lagoons are ecosystems particularly vulnerable to eutrophication and Harmful Algal Blooms (HABs) due to the convergence of various anthropogenic pressures from tourism to agricultural production. Proper management of watershed activities can help offset anthropogenic pressures driving HABs, e.g., by reducing nutrient runoff from agricultural activities. Here, we couple SWAT+ watershed models with a GOTM/WET lake model to evaluate how different agricultural Best Management Practices (BMPs) can minimize the prevalence of HABs in a semi-arid coastal lagoon with intense agricultural and tourism activity (Mar Menor, Spain). We evaluated the BMPs: Fertilizer Reduction, Vegetative Filter Strips, Contour Farming, Crop Rotation Management, and their combined effect, on mitigating HABs during 2002 – 2022. The major HABs were mainly associated with high nutrient runoff (particularly PO₄) in spring. The BMPs showed different performances in reducing the intensity and persistence of the HABs, which were mainly related to the reduction of the input of NO₃ and PO₄ that started or maintained the blooms. The combination of all BMP was the more efficient both in decreasing the intensity and the persistence of HABs, being the use of vegetative filter strips and crop rotation the most effective ones. The coupling of SWAT+ and WET models allowed us to test how agricultural BMPs scenarios can offset the intensity and persistence of HABs in a coastal lagoon. This coupled modelling approach helps in understanding the link between watershed to lake processes, thus contributing to decision-makers in developing knowledge-based strategies to mitigate eutrophication.

Keyword: *Phytoplankton, Eutrophication, Ecological modelling, Best Management Practices*

Putting People Back at the Center of Saline Lake Stewardship

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Many efforts to manage endorheic lake systems have focused on technical questions of water balance, hydrological infrastructure, and climate scenarios. While understanding sustainable water use thresholds is obviously critical to long-term protection of these ecosystems, so far, this approach has not led to consistent restoration of endorheic lakes around the world. Taking Great Salt Lake, USA, as a case study, we explore the hypothesis that focusing on the social dynamics of the ecosystem, including beliefs, values, awareness, and trust will create greater change and better long-term outcomes. To test this hypothesis, a group of scientists, lawyers, and community organizers have created a new coalition called Grow the Flow to catalyze an unprecedented flood of public support and policy innovation to increase water security in the Great Salt Lake watershed. Specifically, Grow the Flow consists of four key initiatives, all of which are primarily social: 1. creation of a public action network of engaged citizens, 2. supporting policy creation and vetting with a team of water policy specialists, 3. filling knowledge gaps with a research coordination network, and 4. growing the private and public funding base for Great Salt Lake conservation nationally. We believe that focusing on the human dimensions of the Great Salt Lake watershed creates new space for technical and technological innovation and implementation. Starting with values and social norms ensures that there is support for policy and technical interventions, which otherwise may remain theoretical. We discuss the types of data gathering, community outreach, and multi-level organizing that Grow the Flow has used to influence policy, behavior, and ultimately culture in this race to create an environment of long-term stewardship and human connection.

Keyword: *Great Salt Lake, Hydrosocial Cycle, Cultural Change, Socioecological, Community Organizing*

Compensating for Water Deficit in the Hypersaline Lake Kuyalnik (Ukraine) From External Sources: History and Perspectives

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The hypersaline water body Kuyalnik, located in southern Ukraine, is a sodium chloride lake. During years with stable hydrological conditions, it covered an area of up to 60 km² with a water volume of up to 90 million m³, and its mineralization ranged from 80-150 g/L. Over the last 20 years, the issues of lake desiccation and salt deposition have escalated to the point where it has become an ecological threat to the region. This prompted the development and implementation of a project for emergency replenishment of the lake with water from an external source. Sea water from the Black Sea with a salt content of 14-16 g/L was chosen as the source. The Kuyalnik, located 6 meters below sea level, receives water from the sea during the cold season. This project helped stabilize the hydrological and ecological conditions of this water body. However, the long-term use of seawater as a donor leads to the accumulation of excess salt in the lake. The mechanism behind this phenomenon is that the shallow (1-meter-deep) lake, having large surface area, works as a giant evaporator. Each year, the injection of seawater into the lake increases its salt pool. Over time, this will make it impossible for the Kuyalnik biocenosis to function in the same way it has for hundreds of years. Immediately after the project implementation, the search for sources of freshwater to compensate for the deficit began. Several main options were proposed: supply of river water through a pipeline; supply of river water through an irrigation system; supply of treated sewage water; supply of treated low-mineralized water from a neighboring overflowing water body.

Keyword: *saline lake desiccation, water deficit compensation*

Tracking Dust Sources and Associated Human Health Impacts Around a Shrinking Inland Sea

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Windblown dust has long been an air quality and public health concern among residents living around California's Salton Sea, a region characterized by serious socioeconomic and health outcome disparities. Dropping water levels and unique biogeochemistry within the Salton Sea water itself have raised concerns regarding the human health impacts of drying sediments exposed on shrinking shorelines, as well as potential lake spray emissions from the water surface. As particles emitted from different surface types can differ greatly in terms of composition, size distribution, and other properties, variability in the resulting health impacts of particulates reaching communities in the region may likewise be source dependent. Here we share analyses of surface-specific health outcomes associated with windblown coarse PM around the region using a novel back-trajectory surface apportionment and case crossover methodology. We further discuss attempts to better understand and mitigate the unique issues linked to these emissions across the basin. Finally, we explore similarities and differences connecting evaporating inland lakes and seas worldwide, as well as some of the opportunities for sharing knowledge and tools to address air quality changes in the increasingly dry, dusty future facing the Salton Sea basin and other analogous regions.

Keyword: *dust, lake spray aerosol, human health, salton sea*

“Toxic Dust Storms” or “Thriving Ecosystem”: Examining Public Attitudes, Values, and Concerns of Great Salt Lake (Utah, USA)

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Across the world, saline lakes are in decline, and significant human effort, political will, and public support will be required to save them. The Future of Great Salt Lake Survey was administered in 2022 in Utah, USA, during the lake’s lowest water levels to date. The survey was the most extensive and robust of its kind in determining current public attitudes about and support for Great Salt Lake conservation efforts, from local government, state government, and participants themselves. Respondents were asked to complete the sentence “The future of Great Salt Lake...,” and their interpretations and responses varied widely, providing rich insight into their attitudes, values, and concerns. Inductive and quantitative content analysis of open-response questions in the survey show how Great Salt Lake is a focusing point for broader discussions on water management in the western United States, highlighting significant differences in how citizens think about and talk about the lake. However, one key message—the threat of toxic dust blowing from a dry lake playa—stood out to respondents from among all other dangers resulting from the lake’s decline. The threat was such that many respondents indicated their intention to move out of state if air quality conditions near the lake were to deteriorate. This insight, along with others, demonstrate how the communication of risks can affect public attitudes and actions. A lack of shared understanding can stymie efforts to create beneficial policies, but identifying and speaking to people’s shared values can assist in creating a unified approach to salt lake management and policy.

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Keyword: *values, public opinion, water management, water policy, content analysis*

Multi-temperature Phase Equilibria of Calcium Sulfate-Based Salt-Forming Minerals and Its Application in the Leaching of Polyhalite

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Potassium plays an essential role in agriculture, being a key element in increasing the yield and quality of crops. Nearly 95% of global potash is used for the production of potassium fertilizers, with potassic minerals being an important raw material for fertilizer production. Potassic minerals can be divided into two types based on their water solubility: water-soluble (soluble) potassic minerals and non-water-soluble potassic minerals. Sylvite and carnallite are representative water-soluble potassic minerals, and in recent years, with the increasing demand for potash, resources of water-soluble potassic minerals have been gradually decreasing. Polyhalite is a potassium-magnesium sulfate mineral ($K_2SO_4 \cdot MgSO_4 \cdot 2CaSO_4 \cdot 2H_2O$), often considered an important indicator of potassium exploration due to its low solubility in water. As polyhalite is a double sulfate of potassium, magnesium, and calcium with a high theoretical potassium content (K 12.966%), it is also a slow-release, high-quality, chloride-free compound potassium-magnesium fertilizer, making the development, utilization, and genesis research of polyhalite increasingly a hot topic. Chemically, polyhalite is composed of K_2SO_4 , $MgSO_4$, and $CaSO_4$. In terms of solubility, $MgSO_4$ is more soluble than K_2SO_4 , which is significantly more soluble than $CaSO_4$. $CaSO_4$, due to its extremely low solubility, is one of the main factors affecting the formation of polyhalite or the potassium leaching rate in polyhalite. Based on this, our research group has conducted multi-temperature phase equilibria on the potassium-magnesium and potassium-calcium coexisting sulfate systems, obtaining various crystalline forms when potassium and calcium coexist, such as $K_2SO_4 \cdot 5CaSO_4 \cdot H_2O$, $K_2SO_4 \cdot CaSO_4 \cdot H_2O$, and $K_2SO_4 \cdot MgSO_4 \cdot 2CaSO_4 \cdot 2H_2O$, and various crystalline forms when potassium and magnesium coexist, such as $K_2SO_4 \cdot MgSO_4 \cdot 6H_2O$, $K_2SO_4 \cdot MgSO_4 \cdot 4H_2O$, and $K_2SO_4 \cdot 2MgSO_4$, which providing theoretical support for the salinization process of polyhalite. Meanwhile, the phase diagram was applied to the analysis of the potassium leaching process in polyhalite. Through comparative analysis, it was found that in addition to the formation of calcium sulfate enveloping polyhalite, leading to a “Citric solubility” effect in the leaching of potassium from polyhalite, the formation of potassium sulfate gypsum also affects the leaching of potassium from polyhalite. The research results are of great support for subsequent selection of leaching agents, further enhancement of the leaching process, and improvement of the potassium leaching rate in polyhalite.

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Salt Lakes Need Freshwater Too

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Coastal Lagoons are critical salt lake habitats. Freshwater flows to coastal lagoons and estuaries shape habitat, transport nutrients to drive productivity, and generate a salinity gradient that impacts water quality and provides spawning cues for fish. The aim of this study was to quantify how environmental flows improved outcomes for a coastal lagoon system (the Coorong, South Australia), considering the export, and prevention of ingress, of salt from the system, and the increased available habitat for key fish biota. A hydrodynamic model was used to determine the salt exchange between the Coorong and ocean and predict the salinity gradient in a coastal lagoon. Maintaining river flow arrests salt intrusion from the ocean into the Coorong. Without environmental water, the net import of salt into the Coorong would have been between 1.86 million tonnes in 2018-19 to approximately 2.33 million tonnes in 2019-20. The fresher conditions created by environmental water provision promote an expansion of suitable fish habitat area, derived from a simple habitat index based on salinity and water temperature. Without environmental water the habitat suitable for mullet would have contracted by 38% over the three year investigation period. A similar trend is evident for black bream, Tamar goby, greenback flounder, yelloweye mullet, congolli and smallmouth hardyhead. There are cumulative benefits from delivering environmental water over multiple years.

Changes in Diversity of Wetland Birds Across Spatial Scales Following 20 Years of Wetland Loss and Salinization

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Wetlands, despite their ecological value, have been extensively degraded worldwide. In this study, we investigated the impact of two decades of wetland loss and salinization, uncontrolled water use, and warming on the taxonomic and functional diversity of wetland bird communities in Konya Closed Basin, Türkiye. Using data from two breeding bird atlases (1998 and 2018) and historical satellite imagery, we assessed changes in breeding wetland bird diversity across various spatial scales and wetlands' seasonal shrinking patterns. We partitioned beta diversity into its turnover and nestedness components, and calculated individual contributions of extinctions and colonizations to the overall changes in beta diversity. We used mixed-effect models and Wilcoxon tests to assess the significance of diversity changes. We have also inspected the changes in mean values of various functional traits to find out the "winners" and "losers" after 20 years of wetland loss and degradation. Our findings revealed widespread diversity losses at the local scale. We also found that the communities became more dissimilar because of the local diversity losses. At the basin scale, functional diversity decline (66%) greatly exceeded taxonomic diversity decline (19%). The diversity changes we found indicate that a functional homogenization occurred at local and basin scales, and diversity losses at the local scale resulted in a subtractive heterogenization among the communities. Analyses of the individual functional traits showed that the winners were species with relatively larger brain size, smaller body mass, and early-breeders, while the losers were dive-foragers, grazers, reed-nesters, and open-water-foragers, all of which we attributed to the ecological changes that took place during the study period, such as shrinking and salinization of the lakes. Our satellite imagery analysis revealed an advancing wetland shrinking/drying over the study period. We suggest that advancing wetland shrinking/drying dates due to climate change and human actions may be contributing to the decline of the late-breeding endangered diving ducks. Taken together, our findings suggest that a large-scale conservation plan, considering these seasonal and spatial changes is needed to protect the remaining wetland bird diversity in the basin.

Keyword: Functional diversity, Beta diversity, Wetland birds, Functional traits, Wetland degradation

Effects of Salinization on Zooplankton Community Composition and Diversity in a Gradient Mesocosm Experiment

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Climate change, in addition to the anthropogenic impacts (i.e. water extraction), accelerates the salinization process in freshwater ecosystems, which can lead to impacts including changes in ecosystem structure, affecting ecosystem functioning, processes, and biodiversity. Understanding these effects is crucial for mitigation of freshwater salinization. Our research aims to address the impact of increasing salinity on zooplankton community structure. We conducted a salinization mesocosm experiment in Ankara from September 2021 to May 2022, at METU mesocosm System II, Turkey. We studied how freshwater ecosystems respond to a gradient of 16 different salinities, starting from 0.5 to 50 g/L. Mesocosms with a 5000 L capacity were filled with 30 cm of natural sediment mixed with washed sand and had a 120 cm water column. These mesocosms were inoculated with natural plankton communities, fish, and macrophytes sourced from both freshwater and brackish lakes with varying salinities. Salinity levels were controlled by adding sodium chloride and sodium sulfate. The experiment was divided into three periods: a month with gradual increase in salinity to different target levels, 5 months of stable salinities, and two months of desalinization. We focused on the salinization and stable periods and examined the response of zooplankton community structure and biodiversity to the varying salinity levels. The counting is ongoing and the results will be presented. We expect that the zooplankton biomass, diversity, and community composition to show significant non-linear responses to salinity. We anticipate that higher salinity levels decrease the zooplankton biomass and diversity with notable thresholds (absence of fish at salinities more than 17 g/L) observed at different salinity levels. These findings aim to underline the vulnerability of the zooplankton community to salinization, providing crucial insights for understanding the potential ecological impacts of climate change and water management practices on freshwater ecosystems.

Keyword: salinization, zooplankton, mesocosm, salinity gradient, community composition

Aquatic Coleopterans of the Sambhar Salt Lake, India: Current Status in Light of Natural and Anthropogenic Factors

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The Sambhar Lake is a Ramsar Site of western arid zone in India with immense economic, socio-cultural, and historical conservation values. A biodiversity survey of 22 peripheral villages of the lake in the year 2020-21 conducted by us indicated an irreversible loss of a few local species of fauna and flora. Much literature is available on avian and microbial communities, while no record is available on aquatic beetles of the Sambhar Lake since past 20 years. Therefore, present study was undertaken with an objective of exploring out the current status of aquatic Coleopteran diversity during April 2023-March 2024. Observations were taken across the year, thrice (early, mid and late) in every season, i.e., summer, rainfall and winter at six sites, chosen on the basis of aquatic avian populations, pollution, saltpans and satellite water spots. The beetles were identified by an entomologist on the basis of morphological taxonomic keys given in reference literature, and checked by Checklist of Fauna of India: Coleopterans (ZSI, 2024). Physico-chemical parameters like pH, temperature, salinity, TDS, sulphate and nitrate of water samples from all sites were measured. The aquatic beetles of the lake belong to two suborders: Adephaga having 73.33% genera and Polyphaga having 26.66% genera. Families Dytiscidae (60% species), and Elateridae (13% species) exhibit dominance over the rest. Comparison with last available past record (Kumar, 2005) shows a loss of seven species as for now. However, further long-term monitoring is required to be certain of their local extinction. Maximum Coleopteran diversity was observed during the rainy season (July-August) when physico-chemical values are low with regional differences at chosen sites. Another site with high sulphate level has minimum species diversity (single species) even in rainfall season. Late summer (Mid-June) witnessed a dry phase (temperature=42°-47.2°C) of observation sites except main lake having minimum beetle diversity (0). Rain-accumulated water at all observation sites, follows a gradual increase through the winter. Permanent change in lake size due to excessive salt-production and minimum inflow of connecting rivers is responsible for biodiversity loss. We, at institutional level focus on local communities through socio-economic literacy based on equitable sharing of benefit under Biological Diversity Act (BDA), 2002. The need to develop a conceptual framework on the line of the IUCN Species Strategic Plan (2021-25) involving stakeholders and its implementation is suggested.

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Keyword: *Aquatic Beetles of Sambhar, Biodiversity of Ramsar Site of arid zone*

Water Level Fluctuations and Algal-Microbial Communities Response of the Aral Sea Remnant Lakes

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The Aral Sea, once one of the largest terminal lakes in the world, is currently separated into a chain of partially connected water bodies. The salinity of some residual water bodies like Chernyshev Bay continued to increase, with further separation from the Large Aral Sea in 2022. In contrast, the North (Small) Aral part underwent ecological restoration. During field expeditions in 2018-2019, the sampling sites were located in the North Aral Sea (from Kokaral dam area to Shevchenko and Butakov Bay), Lake Tuscibas, Chernyshev Bay (connected with other parts by ephemeral channels and fully separated in 2022), and the South Aral Sea. During a field expedition in October 2022, Chernyshev Bay and the South Aral highly stratified water bodies were sampled using a bathometer and thermal sensor from the inflatable motor-equipped boats. The thermocline findings and analysis of algal-microbial communities provide an opportunity to discuss the biogeochemical and ecological responses of aquatic communities to fluctuating environmental parameters.

Keyword: residual Aral lakes, algal-microbial communities, imaging flow cytometry, next-generation sequencing, satellite data

Characterizing Extremophilic Diversity: A Metabarcoding Survey of Five Salt Lakes**Ayşegül Er Gökçe^{*1}, Esra Mine Ünal², Pelin Taş³, Emre Keskin³**¹ *Evolutionary Genetics Laboratory, Department of Fisheries and Aquaculture, Faculty of Agriculture, Ankara University, Ankara, Türkiye*² *AgriGenomics Hub: Animal and Plant Genomics Research Innovation Center, Ankara University, Ankara, Türkiye*³ *Evolutionary Genetics Laboratory, Department of Fisheries and Aquaculture, Faculty of Agriculture, Ankara University, Ankara, Türkiye,*

Environmental DNA (eDNA) metabarcoding represents a robust method for assessing biodiversity, particularly in unique and extreme environments such as salt lakes. By analyzing DNA fragments in environmental samples can identify a wide range of organisms, including those that are difficult to detect using traditional methods. Salt lakes are particularly important for such studies due to their unique ecological characteristics and the presence of extremophilic species, which thrive in high salinity and other extreme conditions.

In this study, eDNA metabarcoding was used to identify 5 different salt lakes (Tersakan Lake (38°35'58.10"K 33°04'43.92"D), Tuz Lake (38.50°K 35.20°D), Düden Lake (39.0834°K 33.144°D), Uyuz Lake (39°14'42.38"K, 32°55'33.93"D) and Gök Lake (39°00'45.7"N 32°50'18.6"E)) biodiversity at the species level of sampled habitats within the capacity of the reference database. Water samples were collected and filtered with a closed filtration system and DNA extractions were carried out from eDNA samples. According to the results, PCR amplifications were performed by selecting universal primers (eukaryotes (18SV4), invertebrates (COI), microbiota (16SV3-V4) and plants (p6loop)). The libraries of the samples were prepared with one-step PCR and adapters were added with the adapter ligation method. Analysis was performed with a high-throughput sequencing platform to obtain paired-end amplicons with a length of 600 base pairs. Approximately 1 million nucleotide sequence reads were obtained per samples. Reads were analyzed with various bioinformatics filtering steps. According to obtained salt lakes eDNA results, living organisms such as bacteria (more than 50 species), algae (more than 20 species), phytoplankton (more than 20 species), plant (5 species), invertebrate (10 species) and vertebrate (10 species) specific to the salt lakes were successfully detected at the species level. Notably, the results demonstrated significant differences in species composition and diversity between the lakes. Each lake exhibited a unique set of species, reflecting distinct ecological niches and environmental conditions. This study emphasizes the ecological significance of salt lakes as reservoirs of biodiversity and showcases the potential of metabarcoding and NGS as powerful tools for uncovering the hidden diversity of life in extreme environments.

Keyword: *eDNA metabarcoding, Salt lakes, Biodiversity, High-throughput sequencing, Extremophilic species*

A Salty Story: How Freshwater Lobose Testate Amoeba (Arcellinida, Amoebozoa) Conquered Athalassohaline Water Bodies, But Not the Sea

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The salinity barrier is considered as one of the most important frontiers dividing biodiversity and influencing the distribution of organisms. Crossing it requires profound physiological adaptations and is therefore supposed to happen rarely in evolutionary histories, but also opens the possibility for newcomer organisms to colonize new niches and diversify.

Most of these transitions have been studied between freshwater and marine environments. Here, we explored the biodiversity of Arcellinida, a group of protists that are common and diverse in freshwater sediments and soil but seem absent from the sea, in athalassohaline water bodies. These non-marine saline lakes usually exhibit strong salinity fluctuations, sometimes reaching extreme values, but their island-like nature could mean lower biotic pressures (competition and predation) for newcomer organisms.

We combined single-cell barcoding and environmental metabarcoding to explore the biodiversity of Arcellinida in different water bodies of Spain and Chile, with salinities ranging from freshwater to values higher than seawater. We also used culture approaches to explore the range of tolerance to salinity, coupled with transcriptomic analysis to determine which adaptations allow them to survive in different salinity conditions.

An extensive phylogeny of the group revealed multiple (recent and more ancient) colonizations of the saline environment by Arcellinida from freshwater ecosystems. Some species were halotolerant, living in a wide range of salinities, including freshwater. On the other hand, few species were found in coastal water bodies, and all of them at low salinities. In spite of the extreme conditions, Arcellinida diversity in athalassohaline water bodies was surprisingly high, novel and unique, highlighting the necessity to preserve these environments and further explore their biodiversity.

Keyword: *Salinity barrier, Ecological transitions, Protist, Testate amoeba, Metabarcoding*

Identifying Knowledge Gaps in Hypersaline Systems Driving Global Electrical Transition: Invertebrate Community Composition in Salares from the Lithium Triangle

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Like hypersaline ecosystems worldwide, South American salares are subject to growing threats driven by their location in the ‘Lithium Triangle’ of Argentina, Bolivia and Chile. This area represents >50% of total global lithium actual production. Extraction of lithium and other minerals in these closed catchments involves the extraction of water to support mining activities. As these wetlands become increasingly desiccated, their capacity to support ecological, cultural, economic, and scientific needs becomes reduced and threatened.

Given the ongoing threats to their conservation, there is a pressing need to deepen our understanding of how salares function. Most ecological studies conducted in the salares have focused on microbial community structure and function (e.g., role in greenhouse gas budgets). However, salares support other taxa, including aquatic invertebrates. These potentially play important roles in transmission of energy and nutrients to vertebrate consumers (migratory birds, reptiles) that rely on salares as key habitat. Although individual studies have been conducted, a broader view regarding salt lake aquatic invertebrates in the lithium triangle is lacking. Here we combine a literature review with our own field data, to characterize which taxa are present in these systems and whether different physicochemical characteristics influence community structure.

We collected information from 63 salares and lagoons located within the lithium triangle, where data were available on invertebrate taxa and geographical and physiochemical characteristics. Due to differences in the level of taxonomic resolution reported in these studies, analyses were conducted at family level. A total of 46 different taxa were reported. Although some taxa (e.g. Centropagidae) were particularly frequent across sites, multivariate analyses showed evidence of clustering between sample locations. Artemiidae were frequently reported, but only in salares with salinities >60 g/L. Most of the other families were present in the same catchments but were limited to lower salinities (e.g. Hyalellidae, Chironomidae, Cyprididae, Canthocamptidae).

Our results indicate that although several core invertebrate taxa are typical of salares in the Lithium Triangle, relative community structure varies between salares. One issue is that several studies included in our analysis were focused on particular taxa and did not provide full information on the wider invertebrate community, highlighting the need for renewed sampling using a standardized approach. Furthermore, our results highlight a pressing need to develop a deeper understanding of salar invertebrates, including the production of accurate taxonomic keys, and the use of molecular techniques to characterize community structure of salares at the species level.

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Keyword: *Hypersaline lakes, Salars, Invertebrates, Artemia*

Past and Present Threats and Challenges to Saline Lakes in Northeast Spain: An Indicator-Based Diagnosis

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Saline lakes are fragile and vulnerable ecosystems. Spain hosts the largest abundance of such wetlands in Europe, notably in the regions of La Mancha (south-central Spain) and Aragón (northeast Spain), the latter being the focus of this study. An indicator-based tool has been designed to provide a quantitative value to these wetlands' threats and challenges. The tool considers information gathered from a multitiered effort. On the one hand, semi-structured interviews were performed with stakeholders of different nature (public administrations, trade associations, entrepreneurs, and conservation NGOs). Also, a bibliographic survey including academic and grey literature allowed us to study the recent history of these wetlands. Finally, three field visits to the area were made to get a firsthand impression of the situation of the wetlands. Ten wetlands belonging to five distinct areas within the region Aragón have been visited: Gallocanta Lake, Salada de Chiprana, Sariñena Lake, Saladas de Alcañiz, and six playa-lakes in the south of Monegros. All of them are protected by the EU Birds and Habitats Directives and by regional laws, thanks to their rich bird fauna, among other natural values. Besides, Gallocanta, Chiprana, and the Monegros playa-lakes are Ramsar sites. Except for Chiprana, all these wetlands are shallow, and most are temporary or seasonal. Despite efforts from environmentalists and part of the scientific community to effectively protect the saline wetlands of the Monegros area, many of them are unprotected without a management plan. In the past, desiccation was planned for Gallocanta Lake to prevent the expansion of mosquito-borne illnesses. Besides, Sariñena Lake and Alcañiz Estanca have been transformed from playa-lakes (as observed in the 1927 flight photography) to permanent freshwater lakes fed with fresh water and irrigation return flows until their eutrophication and forced outflow of water. Among the most common current threats are agriculture intensification, land consolidation, and new infrastructures, large solar energy projects, intensive pig farming, and land occupation with industrial development subsidized by European funds. At the local scale, littering and vandalism are also found. Many informants seemed to approve of the irrigation agriculture projects, as some areas are one of the most arid regions in Europe, and traditional dry farming offers very limited yield. Identifying threats and challenges with an indicator-based tool may contribute to issuing recommendations to increase conservation awareness to improve conservation efforts and target specific problems with more precise knowledge.

Keyword: *saline lakes, conservation, Aragón, irrigation, solar farms*

Dramatic Declines in Breeding Shorebird Populations in Protected Coastal Wetlands in the Eastern Mediterranean**Korhan Ozkan^{*1}, András Kosztolányi², Tamás Székely³, Zuhail Akyürek⁴, Ádám Z. Lendvai³**¹ *Middle East Technical University Institute of Marine Sciences*² *Department of Zoology, University of Veterinary Medicine Budapest, Budapest, Hungary*³ *Department of Evolutionary Zoology and Human Biology, University of Debrecen, Debrecen, Hungary*⁴ *Department of Civil Engineering, Faculty of Engineering, Middle East Technical University, 06800 Ankara, Turkey*

Wetlands host significant biodiversity worldwide, although they are degraded at an unprecedented rate due to land reclamation, hydrological alteration and climate change. These changes can have detrimental consequences for waterbirds. Here we document dramatic declines in two large coastal wetland ecosystems hosting saline lakes and saltmarshes; namely, Çukurova and Göksu Deltas in Turkey in Eastern Mediterranean region. Çukurova Delta hosts a large population of a shorebird that used to be a common breeder in the Mediterranean Basin: the Kentish plover *Charadrius alexandrinus*. In the 1990's one of the largest breeding population of Kentish plovers in the Western Palearctic was at Lake Tuzla in Çukurova Delta. We conducted population surveys and collected demographic and life history data between 1996-1999 and replicated the population surveys in 2009-2010 and 2019-2020. Unexpectedly, the surveys showed that the Kentish plover population has declined by 70% in 25-years. Intensive agriculture already reclaimed the majority of the natural habitat by 1990's and analyses of high-resolution aerial photographs revealed an increase in pressures on the breeding habitat between 1990 and 2016. However, the dramatic population decline is unlikely to be explained by the habitat change alone. In contrast, our population viability analyses (PVA) using local demographic parameters showed that the Kentish Plover population was probably a sink population more than a decade earlier than the population collapse occurred. Similarly, Göksu Delta experienced dramatic decline in natural wetland cover and associated loss in breeding wetland birds. Lake Akgöl, the largest wetland habitat in Göksu Delta, lost 55 % surface cover in the last seven decades coincided with loss of Marbled Teal *Marmarionetta angustirostris* and dramatic declines in breeding populations of all wetland birds. Our results alert that the coastal birds may have limited resilience and intensifying anthropogenic pressures leading to poor reproductive performance can drive once-large breeding populations to a sudden drastic decline. Therefore, restoration of degrading coastal ecosystems is urgently needed to avoid significant biodiversity losses that can harm biodiversity hotspots like the Mediterranean Basin.

Keyword: *saline lakes, Coastal wetlands, Waterbirds, Habitat degradation, Breeding birds*

Lost Aquatic Forests of the Coorong, South Australia

Faith Coleman

Federation University / Coorong Environmental Trust

As the world's ecosystems shift and change, understanding aquatic ecosystem trajectories is critical to their conservation, restoration and management. This is particularly so in hypersaline coastal lagoons, due to their highly productive biochemically retentive natures. Unfortunately, human eyes can be rare visitors to the underwater worlds of saline lagoons. This means that shifting baselines in these systems are exceptionally common, with this lack of historic functional understanding obscuring long-term trends and the societal costs of lost productivity.

In an attempt to reestablish an ecological baseline for the South Lagoon of the Coorong, a vast trove of historic ecological data has been collated. Data relating to water quality, macrophytes and waterfowl has been analysed to provide an understanding of how the wetland once functioned and the drivers that hold it in its current state. The macrophyte data has provided evidence of an ecological shift in state from a lagoon full of macrophytes and predominantly clear water, to a macrophyte-fringed, highly turbid lagoon.

While restoring the South Lagoon to this pre-1978 state would be challenging, the documentation of this transition provides us with context, allowing us to determine site management with an understanding of trajectories, nutrient sources and shifts in ionic composition within the water body. In some cases, the drivers of these parameters have legacies spanning hundreds or thousands of years, providing significant inertia to restoration efforts.

These findings are also significant to other water bodies, demonstrating the importance of historic ecological understandings to modern saline wetland management. The findings also demonstrate the importance of ecological truth-telling, particularly when discussing the impact of colonisation on Traditional Owner rights.

Keyword: *Shifting baselines, feedback loops, Ecological drivers, Coastal lagoons, macrophytes*

Shoreline Soil Microbiomes and a Drying Great Salt Lake, Utah**David Parrott*, Felix Willenburg***Great Salt Lake Institute/Westminster University*

The saline soils comprising the shoreline of Great Salt Lake, Utah (GSL) provide a unique habitat for microorganisms and a select few halophytes (salt-tolerant plants). However, until recently, little has been known about the microbial diversity of these soils and how they are impacted by decreasing lake levels. Here we present our results characterizing the microbiome of both plant-free bare soil and that of the halophyte rhizosphere of *Salicornia utahensis* (Pickleweed) and *Suaeda erecta* (Seepweed) at two GSL locations; the more saline North Arm near the artwork, Robert Smithson's Spiral Jetty (SJ), and the less saline South Arm on Antelope Island (AI). Soil salinity was determined both in the rhizosphere and along a transect from the ancestral shoreline to the waters edge. Soil salinity measurements were taken from late spring at the maximum lake elevation (post winter runoff), through summer and into fall at the lowest lake elevation. Additionally, DNA was isolated from each soil sample to determine soil microbiome composition using bacterial tag-encoded FLX amplicon pyrosequencing (bTEFAP) 5k long read diversity assay for 16s rRNA genes was used for the identification of Archaea and bacteria, and bTEFAP long read 5k ITS1-4 diversity assay for the identification of fungi. Our data show differences in the composition of plant-free bare soil and rhizosphere microbiomes of *Salicornia* and *Sueda* depending on location. Decreased diversity of archaeal, bacterial, and fungal species was observed in both plant-free bare soil and both rhizospheres at SJ compared to AI. Interestingly, a corresponding increase in the representation of halophilic archaea at SJ was observed, possibly linked to the much higher salt concentration in the North Arm. Our data also suggests a correlation between lake level, soil salinity and microbiome composition seasonally from June to November (maximum to minimum seasonal lake level). Our results provide insight into the microbial diversity of GSL shoreline soils and their critical relationship with the waters of this endangered terminal saline lake.

Keyword: *soil microbiome, saline lake, Great Salt Lake*

Microbiomes of Halophilic Algae Under Laboratory Cultivation**Andrei Plotnikov*, Elena Selivanova, Vladimir Kataev, Yuriy Khlopko, Alexander Balkin***Institute for Cellular and Intracellular Symbiosis of the Ural Branch of the Russian Academy of Sciences,
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Halophilic microalgae inhabit environments with different salinities, from brackish to salt-saturated ones, and play a crucial role in microbial food webs as primary producers of organic matter used by heterotrophic bacteria determining and regulating their abundance and taxonomic composition. However, the influence of microalgae on the assembly of associated prokaryotes in the halophilic microbial community is underestimated. The aim of this study was to characterize microbial communities associated with halophilic microalgae upon transition to laboratory cultivation. Uniprotest cultures of halophilic microalgae belonged to four classes Chlorodendrophyceae, Bacillariophyceae, Trebouxiophyceae, Chlorophyceae were isolated from salt lakes and rivers in Europe. The cultures of microalgae were incubated under laboratory conditions. The sequencing of 16S rRNA gene amplicons using MiSeq (Illumina) was performed to reveal the prokaryotic communities associated with the microalgae. Our study demonstrates that laboratory cultivation of microalgae causes considerable changes in associated halophilic communities of prokaryotes including decrease of taxonomic richness, disappearance of some taxa, and significant increase in abundance of other taxa. In prokaryotic communities associated with halophilic microalgae, the classes Alphaproteobacteria, Gammaproteobacteria, phyla Balneolia и Bacteroidota dominated regardless the alga taxonomic affiliation and the source of isolation. Genera Marinobacter, Spiribacter, Methylophaga, Roseovarius, Rhodohalobacter and Gracilimonas were dominant in the associated communities. The distribution of most genera belonged to phylum Bacteroidota in associations with microalgae was random, except for unidentified Saprospirales found in association with a diatom *Navicula* sp., green algae *Picochlorum* sp. and *Asteromonas gracilis*. Among the associates, there were species-specific bacterial taxa associated with certain species of microalgae, e.g., *Coralimargarita* with the diatom *Navicula* sp., *Salinispirillum* sp. with *Asteromonas gracilis*. At thorough removal of all possible prokaryotic associates, alphaproteobacteria of the genus *Marivibrio* preserved in cultures of *Tetraselmis indica*.

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Keyword: *halophilic algae, microbiome, alga cultivation*

Microplastic Pollution in Saline Wetlands of the Ebro Basin: An Exploratory Study

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Microplastics are a pollutant of emerging concern. Recent research has shown that they are ubiquitous, as they have also been found in remote areas of the world, such as high alpine areas, polar caps, or deserts. This strongly suggests aeolian transport of microplastics. In this study, we investigated the presence of microplastics in saline lakes of a semiarid and sparsely populated area in northeast Spain. Many saline lakes of the Ebro Basin are fragile ecosystems that face numerous threats from intensive porcine farming, irrigation agriculture and climate change. Nine wetlands belonging to four distinct areas within the Ebro Basin have been visited, Gallocanta Lake, Salada de Chiprana, Sariñena Lake in the northern Monegros area and six playa-lakes in the south of Monegros. All of them are protected by EU Birds and Habitats Directives and by regional laws, thanks to their rich bird fauna, among other natural values. Additionally, Gallocanta, Chiprana and the Monegros playa-lakes are Ramsar sites. Except Chiprana, all wetlands sampled are shallow and most, temporary, or ephemeral. Despite efforts from environmentalists and part of the scientific community to effectively protect the saline wetlands of the Monegros area, they are unprotected, without a management plan and more vulnerable to anthropogenic activity, such as agricultural intensification, replacing crops with photovoltaic panels with effects for bird populations, littering and vandalism. Samples from these wetlands have been collected and studied in the lab. After processing for the removal of organic matter and filtration, the filters were studied with optical microscopy and Fourier Transformed Infra-Red microscopy (microFTIR) for the quantification and identification of microplastics, respectively. So far, microplastics have been found in all samples and most appear to be fiber-like, suggesting long-distance aeolian transport. Little is known about the possibility of bird-induced transport, which could be the case in Gallocanta Lake, a wetland visited yearly by thousands of cranes (*Grus grus*) and other migratory species. With the ongoing study with microFTIR, we hope to determine the origin of the pollution and provide recommendations for the management and conservation of these wetlands. This study stems from a collaboration between the R+D studies “ISABEL”, funded by the Spanish Ministry of Science and “Microplastics in salt”, funded by Comillas Pontifical University.

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Keyword: Saline lakes, Microplastic pollution, Conservation, Ebro Basin, Wind dispersal

The Effects of Salinity and Heatwave on Zooplankton Community and Size Structures and Diversity: Synchronized Mesocosm Experiments, Türkiye

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Zooplankton are vital components of aquatic ecosystems, integral to nutrient cycling, energy transfer, and ecosystem health. Their sensitivity to environmental stressors (e.g. salinity, heatwaves) makes them effective indicators of ecosystem disturbances. Among these stressors, salinization and heatwaves are significant, with their combined effects intensifying due to land and water use through irrigation and climate change. This study, conducted as synchronized mesocosm experiments in Ankara and Mersin, which represent two different climates of Türkiye, examines the combined impacts of heatwaves and two different salinity levels on zooplankton community, size structures and biodiversity. Sixteen mesocosms in each site were utilized with salinity levels of 4 ppt and 40 ppt, and heatwaves simulated with 6°C temperature above the ambient in half of the mesocosms. Zooplankton samples were collected for species identification, abundance, richness, and biomass calculations. The study aims to clarify the individual and combined impacts of salinity and heatwaves. High salinity mesocosms were predominantly inhabited by rotifer species by the experiment's end, while cladoceran and copepod species persisted in low salinity mesocosms. Thus biodiversity was lower in high salinity and heatwave treatments. Additionally, species average sizes decreased owing to the treatment effects. Further analysis and discussions of the results will take place to better understand the complex interactions between salinity, heatwaves, and zooplankton dynamics. Overall, this research underlines the critical need for understanding multifaceted environmental stressors to better predict and mitigate their impacts on aquatic ecosystems.

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Keyword: zooplankton, mesocosm, salinization, heatwave

Heatwave Effects on the GHG Dynamics of Shallow Saline Lakes: A Synchronized Mesocosm Study in Two Climate Zones

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Shallow lakes are significantly influenced by climate warming, salinization, and eutrophication, which in turn affect carbon cycling and greenhouse gas (GHG) dynamics. Climate change is not only increasing average temperatures but also intensifying and more frequently causing extreme weather events. These events can profoundly impact lake chemistry, biogeochemical processes and in turn ecosystem functioning. To understand how GHG emissions from these ecosystems respond to such events under varying salinity conditions, we conducted a three-month factorial design mesocosm experiment. The experiment exposed two salinity levels (4 and 40 ppt) to a 15-day simulated heatwave (+6 °C compared to control), which divided the experiment into pre-heatwave, heatwave, and recovery periods. Our experiment employed two sites representing contrasting climate zones: Mediterranean (Mersin) and semiarid cold (Ankara). At each site, we established 16 5000 L mesocosms, each containing 120 cm water and 30 cm of sediment and sand. These mesocosms were inoculated with natural plankton communities, fish, and macrophytes sourced from freshwater and brackish lakes. To investigate the effects of heatwave and salinity, we crossed these two treatments to four replicate mesocosms at each site. Salinity and heatwave conditions were controlled, where simulated heatwave was achieved via programmable electrical heaters. The experiment ran concurrently in Mersin and Ankara from August 29 to November 20, 2022. We measured GHG fluxes (CH₄, CO₂ and N₂O) weekly using the headspace and floating chamber techniques and gas chromatography. Diffusional fluxes of CH₄ were minimal and close to baseline values and did not differ significantly across treatments (salinity, temperature and climate zones), however low salinity mesocosms exhibited significantly higher ebullitive fluxes, reflecting the inhibitory role of salinity on CH₄ emissions in both climate zones. Remarkably, high salinity mesocosms in Mersin, which exhibited negative CO₂ fluxes (uptake in the water) prior to heating, become net emitters during heating event, while the effect was less pronounced in the relatively cooler Ankara mesocosms but not observed in the low salinity mesocosms, where the lack of change was likely attributable to the high submerged macrophyte abundance. Our findings indicate that short term extreme events can induce significant alterations in the biogeochemical processes of saline ecosystems, particularly in the systems without submerged macrophytes.

Keyword: Greenhouse gas, Heatwaves, Climate change, Shallow lakes, Mesocosms

Agricultural Runoff and Climate-Induced Drought Drive Biogeochemical Regime Shift in a Nutrient-Polluted Saline Lake**Caroline Hung*, Charles Diamond, Timothy Lyons***Department of Earth and Planetary Sciences, University of California, Riverside*

The Salton Sea, California's largest lake, serves as a critical case study for understanding the impacts of climate change and land use on saline lake ecosystems. Over the past two decades, this ecosystem has undergone a significant biogeochemical regime shift, characterized by rapid shallowing, breakdown of thermal stratification, and alterations in sulfur cycling. Our study examines these changes using a combination of in-situ measurements, historical data, and satellite observations, demonstrating how anthropogenic factors such as agricultural runoff and eutrophication, climate-induced drought, and water diversions have accelerated this shift. Key findings include a transition from a stratified system with distinct oxic and anoxic zones to a more frequently mixed water column with expanded suboxic to anoxic conditions. This has led to a shift in sulfur cycling from pulsed, high-intensity sulfide releases to more frequent, lower-intensity events beginning as early as spring and persisting throughout the summer into the fall. We also observed the emergence of new ecological indicators, such as changes in gypsum bloom and sulfide emission patterns, signaling fundamental alterations in the lake's biogeochemical processes. These findings have significant implications for the management of saline lakes worldwide, particularly in arid regions facing similar pressures. Our research contributes to understanding how climate change and land use practices can trigger tipping points and persistent state changes in saline lake ecosystems, providing valuable insights for proactively managing similar transitions in other vulnerable water bodies globally. We emphasize the need for integrated approaches that consider complex interactions between physical, chemical, and biological factors in these dynamic ecosystems, including the important consequences of high nutrient inputs and changing lake level. The Salton Sea case underscores the urgency of implementing effective policies addressing both water quantity and quality to mitigate impacts on ecosystem health and surrounding communities.

Keyword: *shallow lake, stratification, sulfur, sulfide, regime shift*

Microbial Role in Carbon Cycle of Saline Lakes on the Tibetan Plateau

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Investigating the microbial mechanisms of the carbon cycling and its response to salinity in saline lakes is of great importance for a holistic understanding of the global carbon cycle and its impact on climate and environmental changes. We systematically investigate microbial degradation and transformation of dissolved organic matter, microbial carbon fixation and organic matter storage in the sediments of typical Qinghai-Tibetan lakes with a salinity range from freshwater to salt-saturation. We found that 1) the effect of microbial action on the carbon budget of salt lakes in the Qinghai-Tibetan Plateau: the negative carbon emission of lakes in the Qinghai-Tibetan Plateau (QTP) caused by microbial action is up to 60 million tons of carbon/year; As salinity increased, the carbon fixation pathway changed from the Wood-Lungdahl pathway to the Calvin-Benson-Basham cycle; 2) The input of terrestrial organic matter leads to a positive priming effect of lake sediments in the QTP; Regarding the positive priming effect, the input of terrestrial organic matter is higher than the production of endogenous organic matter; Microorganisms in high-salinity lakes tend to degrade and utilize organic molecules with high carbon numbers and high complexity; In the high-salinity environment, some microbial groups (e.g. Sumerlaeota) can degrade and transform organic components such as cellulose and chitin with high complexity, producing low-molecular-weight substrates such as acetic acid and hydrogen, which can be easily utilized by heterotrophic microorganisms. Sumerlaeota has a facultative mode of survival to adapt to environmental stresses such as high salinity; Microbial action is an important regulator of significant differences in the formation of molecular components of organic matter in lakes with different salinity; and 3) the microbe-mineral interaction affects the stability of organic carbon in lake sediments. The reduced NAu-2 surface can adsorb a significant amount of organic carbon. These results will provide a theoretical framework for a holistic understanding of carbon budget, microbial processes involved in carbon cycling, and their response to environmental change in saline and hypersaline lakes.

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Keyword: *Microbial carbon cycling, Saline lakes, Environmental change*

How do Salinity and Warming Affect Shallow Lake Ecosystems? A Synchronized Mesocosm Experiment in Two Climates of Türkiye

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Freshwater salinization and climate change are major threats to freshwater biodiversity, significantly impacting ecosystem functioning and services. To investigate how aquatic ecosystems with varying salinities respond to global warming, we conducted a three-month factorial experiment examining the effects of two salinities (4 and 40 g/L) and two temperature scenarios (ambient and +4.5°C warming) in different climates. This experiment was simultaneously performed at two mesocosm facilities in Türkiye: Ankara (cold-dry semiarid climate) and Mersin (warm Mediterranean climate). Each mesocosm had a capacity of 5000 L, filled with 30 cm of natural sediment and washed sand, and a 120 cm water column. The mesocosms were inoculated with natural plankton communities, fish, and macrophytes sourced from freshwater and brackish lakes with varying salinities. Salinity levels were maintained by adding sodium chloride and sodium sulfate, while continuous warming was achieved using aquarium heaters. The experiment commenced on August 31, 2023, and concluded on November 30, 2023, with weekly sampling of physicochemical parameters, chlorophyll-a, and suspended solids. Salinity influenced the alternative states of the mesocosms. At 4 g/L, the mesocosms exhibited clear water and nearly 100% coverage of the submerged macrophyte *Stuckenia pectinata*. In contrast, at 40 g/L, the mesocosms shifted to a turbid state with a high biomass of phytoplankton. Higher levels of chlorophyll-a and suspended solids were observed in warmer Mersin at both salinities and at 40 g/L in both locations. A significant interaction between salinity and warming was found for chlorophyll-a concentrations: in Ankara, higher concentrations were recorded at 40 g/L under warming conditions, whereas in Mersin, higher concentrations were observed at ambient temperatures. At 4 g/L salinity, warming negatively impacted chlorophyll-a in Ankara, resulting in higher concentrations at ambient temperatures. Warming influenced suspended solids only in warmer Mersin at 40 g/L, with lower values in heated mesocosms, leading to increased water transparency. In contrast, heated mesocosms in Ankara exhibited reduced water transparency towards the end of the experiment due to higher chlorophyll-a concentrations. Oxygen saturation was unaffected by warming treatments at both facilities at 4 g/L but decreased under warming at 40 g/L salinity in both Ankara and Mersin. Notably, warming reduced pH and alkalinity at 40 g/L in Mersin, with smaller effects at 4 g/L and in Ankara. Our findings indicate that warming induces significant changes in saline ecosystems, particularly at higher salinities. In contrast, at lower salinity levels, the high abundance of submerged macrophytes mitigates ecosystem responses to warming.

Keyword: *Freshwater salinization, Global warming, Ecosystem response, Alternative states, Metabolism*

Microbialites and Primary Productivity at a Shrinking Great Salt Lake**Bonnie Baxter*, Alivia Preston***Great Salt Lake Institute, Westminster University*

Interactions between microbial communities and their environments can result in the formation of organo-sedimentary structures, termed “microbialites.” In fact, the oldest identifiable fossils from Earth’s early biosphere (3.430 Ga) are putative microbialites, carbonate rocks formed by biogenic processes. Great Salt Lake (GSL), Utah, USA provides a modern microbialite habitat where the structures are extensive due to the hypersaline conditions, as well as the shallow nature of the lake. At GSL, the microbialite mats provide a critical benthic habitat for brine fly larvae and pupae, which feed millions of migratory birds. Our studies suggests that the hypersaline north arm microbialites are remnant features and indicate communities associated with them are no longer actively precipitating carbonate minerals. Whereas the moderately saline south arm structures support thick mats containing cyanobacteria and diatoms (and other bacteria, archaea, and fungi) that do photosynthesis. We have explored the microbial diversity and primary productivity of the south arm microbialites in comparison to water column phytoplankton in direct measurements of carbon fixation and chlorophyll over a seasonal samplings. Our data demonstrate that the phototrophs associated with microbialites are a major source or carbon to support the lake’s simple food chains. Since our studies began, the elevation of GSL has reached a historic low, and this poses two dangers to microbialites: 1) increasing salinity beyond the restrictive maximum, and 2) desiccation. We are currently turning our studies towards understanding the resiliency of the microbialite structures in a time where the lake faces the consequences of water diversions combined with climate change. This involves the cultivation of phototrophs to test their response to hypersalinity and desiccation.

Keyword: *Great Salt Lake, Microbialites, Primary Productivity, Desiccation*

Effects of Salinity and Climate on Phytoplankton Community Structure and Diversity: A Synchronized Mesocosm Experiment

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Freshwater ecosystems face complex interactions between salinization, eutrophication, and climate change, impacting phytoplankton structure and diversity. To investigate the impacts of those interactions on phytoplankton communities of shallow lakes, we performed a synchronized mesocosm experiment across two climates (dry-cold Steppe in Ankara and hot Mediterranean in Mersin) with a gradient of freshwater salinization (0.5-50 g/L). The nine-month experiment was divided into three phases: salinization (daily additions of sodium chloride and sodium sulfate), stable, and desalinization (twice-a-week additions of fresh water). For this presentation, we used samples from the beginning, middle, and end of the salinization period (after 1 month). We hypothesized that (H1) salinization enhances phytoplankton biomass; (H2) salinization decreases phytoplankton diversity; and (H3) cyanobacteria are predominantly favored. Using Random Forest, Generalized Additive Models, and Redundancy Analysis, we identified key environmental variables affecting phytoplankton diversity and structure. Our findings indicate that phytoplankton biomass was positively influenced by alkalinity, followed by total phosphorus and salinity, mostly in Ankara. Temperature and total nitrogen appeared to be the most important factors impacting species richness, with a positive influence in Ankara and a negative in Mersin. Species richness was also enhanced by total phosphorus in Mersin, and negatively affected by alkalinity in Ankara. Shannon's diversity and Pielou's evenness were positively associated with temperature and total nitrogen but decreased with rising total phosphorus, alkalinity, and salinity in Ankara. Overall, phytoplankton diversity showed a negative correlation with total biomass, highlighting the dominance of a few taxa. Regarding phytoplankton groups, cyanobacteria, followed by green algae and diatoms, were favored by increased salinity, alkalinity, and total phosphorus. In contrast, these groups were negatively associated with total nitrogen. The warmer temperatures in Mersin, along with higher coverage and metabolism of submerged macrophytes, mitigated the responses of phytoplankton and the ecosystem to salinization. Our mesocosm experiment shows that freshwater salinization significantly affects phytoplankton communities, increasing biomass but reducing diversity, with cyanobacteria being predominantly favored. Responses varied between climates, with temperature and nutrient levels being crucial factors.

Influence of Salinity and Climate on Organic Matter Decomposition and Stabilization in Synchronized Mesocosm Experiments Using the Teabag Index Method

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Litter decomposition is vital to the carbon cycle in freshwater ecosystems. This process, influenced by temperature, nutrient levels, water chemistry, hydrology and microbial and macroinvertebrate communities, is increasingly affected by global climate change. Additionally, freshwater salinization is one of the emerging grand challenges which might further complicate decomposition and stabilization. This study investigates the effects of salinization on decomposition rate and stabilization factor using synchronized mesocosm experiments conducted in two different climatic regions. We used the Teabag Index (TBI), an approach that utilizes standardized green and rooibos tea bags as indicators of decomposition rates and litter stabilization, respectively. Gradient design mesocosm experiments were carried out simultaneously both in Ankara (cold semi-arid climate) and Mersin (hot-summer Mediterranean climate) in Türkiye, utilizing 16 salinities with a range of 0.5-50 g/L. Tea bags were incubated for 63-65 days in both water column and sediment to capture the decomposition dynamics in different habitats. Initial results suggest that the effects of salinity on organic matter decomposition and stabilization varied among both the climate regions and inoculation habitats (water column vs. sediment). Decomposition rate in the cold semi-arid climate was less sensitive to changes in salinity. However, in the hot-summer Mediterranean climate, it significantly decreased with increasing salinity, particularly in the sediment habitat. Regarding stabilization, salinity had a significant positive effect in both habitats in the cold semi-arid climate while in the hot-summer Mediterranean climate, this effect was observed only in the sediment habitat, indicating that the sediment in the hot-summer Mediterranean climate was more responsive to salinity changes compared to its water column. Our findings highlight the significant role of salinity affecting decomposition and stabilization, with pronounced variability due to different climates and habitats.

Keyword: *salinization, decomposition, stabilization, climate, habitat*

Lithium Uptake from Brine of Salt Lake Ankara by Flexible and Freestanding Electrospun Composite Substrate

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Electrospinning has been established as a fiber formation technique for continuous fabrication of nanometer diameter polymeric fibers.¹ Fibrous structure obtained by electrospinning has been successfully employed as substrate for various applications.² In this study, polyurethane fiber mats electrospun from dimethyl formamide solution were associated with λ -MnO₂ particles, which are known for promising sorbent material for lithium recovery.³ The particles were deposited on the fiber mat by vacuum deposition. Thus, electrospinning and vacuum deposition were readily merged to synthesize the composite substrate. The composite film was subjected to lithium uptake experiments using both synthetic and natural brine. Salt lake of Ankara has brine that contains nearly 200 mg/L concentration of Li⁺ along with 110 g/L of Na⁺, 10 g/L of Ca²⁺, and 18 g/L of Mg²⁺. The composite film fabricated in this research uptakes 14% of Li⁺ from natural lake brine when 200 mg λ -MnO₂ is applied on the surface of electrospun PU mat. This performance increased to 76% by applying serial application of five fresh layers of composite films for synthetic brine. The experiments are in progress to increase percent uptake for the natural brine. Initial results of this study was published in ACS Appl. Polym. Mater. 2024, 6, 321-329. This project is supported by European Commission Horizon Europe Framework Programme entitled with CRM-geothermal: Raw materials from geothermal fluids: occurrence, enrichment, extraction (Project number: 101058163).

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Keyword: *electrospinning, critical raw materials, ion sieve*

Solid-Liquid Phase Equilibria of Potassium-Containing System: Effect of Temperature and Coexisting Ions**Yu Xudong***, Zhuge Fuyu, Feng Shan, Zeng Ying, Wu Changhao, Li Qi, Li Jing, Zhang Nan, Yang Yousheng*College of Materials and Chemistry & Chemical Engineering, Chengdu University of Technology, China*

China is a major agricultural country in the world, with a potassium salt dependency of up to 50%. The development of potassium salts in China mainly relies on the production of potash from salt lakes. As development continues, unconventional potash resources with vast reserves, such as deep brine with high content of potassium and polyhalite, have gradually come into view. According to the classification by hydrochemical types, salt lakes can be divided into chloride type, sulfate type, carbonate type, borate type, and nitrate type. Deep brines are mostly of the calcium chloride type, and polyhalite belongs to the sulfate mineral. Different types of brines have different interaction relationships between potassium and coexisting ions, resulting in different types of potassium salts formed. Meanwhile, due to the large temperature difference between seasons and day and night in the salt lake area, the deep brine is buried deep and the temperature is much higher than the temperature of the salt lake brine. Moreover, the calcium content in the deep brine is higher than that in the salt lake, and some deep brines also contain ammonium. This makes the crystallization form of potassium show various changes under the influence of multiple temperatures and multiple ions. There are not only single salts such as KCl, K₂SO₄, but also double salts such as Na₂SO₄·3K₂SO₄, K₂SO₄·MgSO₄·6H₂O, K₂SO₄·MgSO₄·4H₂O, KCl·MgCl₂·6H₂O, etc. Sometimes, the solid solutions (KCl)_x(NH₄Cl)_{1-x} and (NH₄Cl)_x(KCl)_{1-x} formed, and more complex conditions can also lead to the formation of solid solution type double salt (NH₄)K₂Mg₃Cl₉·18H₂O. Therefore, this work compares and analyzes the crystallization forms of potassium in the phase equilibria of potassium-containing systems under the influence of temperature and coexisting ions, with the aim of providing guidance for the efficient development and utilization of potassium in brines.

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Preparation of High-Load Electrode and Study on Lithium Extraction Performance

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Constructing high-loading electrodes with high Li⁺ adsorption capacity and excellent kinetic performance is crucial for addressing the low lithium extraction efficiency from salt lake brine. However, developing such electrodes poses significant electrochemical and engineering challenges. Increasing the active material content can hinder Li⁺ mass transfer within the electrode, leading to increased polarization and reduced kinetic performance, ultimately affecting extraction efficiency. Additionally, the commonly used adhesive, PVDF, is highly hydrophobic, limiting effective contact between the brine and the electrode. This issue is especially pronounced in high-loading electrodes, where the active material utilization inside the current collector is low, further decreasing lithium extraction efficiency. In this study, we constructed a high-loading electrode (20 mg·cm⁻²) using rGO, MF, biochar, and LFP, forming a three-dimensional conductive network. These materials demonstrated excellent lithium extraction efficiency in salt lake brine, achieving an embedding capacity of approximately 30 mg·g⁻¹ in pure lithium solution within 10 minutes. Even in actual brine, the electrodes exhibited a high lithium extraction capacity of around 25 mg·g⁻¹ or more. Furthermore, we employed a sulfonation strategy to enhance the hydrophilicity of the high-loading electrodes (45 mg·cm⁻²). Both experimental and theoretical results indicate that improving electrode hydrophilicity significantly enhances lithium extraction capacity in thick electrodes. At 0.8 V, the S-PVDF electrode achieved a lithium extraction capacity of 41.72 mg·g⁻¹ in simulated brine, markedly higher than the 35.72 mg·g⁻¹ capacity of the PVDF electrode, and also performed well in real brine with a capacity of 28.8 mg·g⁻¹. Moreover, the Mg²⁺/Li⁺ ratio in the actual brine was reduced from 65 to 0.37, effectively achieving Mg-Li separation. These strategies offer a novel approach to developing high-efficiency lithium extraction electrodes.

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Keyword: *restoration*

Effectively Extracting Li⁺ from Low Concentration Sulfate Type Salt Lake Brines**Chunxi Hai^{*}, Yuan Zhou, Yanle Li, Junjie Huo, Yanxia Sun, Shengde Dong, Luxiang Ma, Qi Xu, Xin He***College of Materials and Chemistry & Chemical Engineering, Chengdu University of Technology, China*

Due to its eco-friendliness, low cost, and excellent cycling stability, the aluminum-based adsorbent H-LDHs, ($H_yLi_{1-y}Cl \cdot 2Al(OH)_3 \cdot xH_2O$, where y means the H^+ amount exchanged with crystal Li^+] during the eluting process), prepared by eluting the lithium-aluminum double layered hydroxides precursor with deionized water, is the only large-scale utilized adsorbent for selectively separating Li^+ from salt lake brines. It is believed that the adsorbent H-LDHs could be used for selectively recovering Li^+ from high salinity brines including chloride, sulfate and carbonate type brines. However, to date, most reports focus on its practical application to chloride type brines, and little information is available on its efficiency for sulfate type brines, owing to its relatively poor application performance. Therefore, taking the role of lattice and surface Li^+ sites on performance into consideration, we systematically investigated the use of doping technology to improve the adsorbing capacity and stability of aluminum-based adsorbents prepared by the precipitation method. We here discuss the relationship between the adsorbent structure and its properties in detail, characterized the sorption performance of lithium-aluminum double layered hydroxides, studied their mode of action, optimized doping modulating conditions. During the eluting stage, up to 20 mg/g Li^+ could be quickly removed from the precursor prepared under optimized condition in 20 minutes without remarkable topotactic phase transformation of adsorbents to $\alpha-Al(OH)_3$. As-prepared adsorbent has high adsorption capacity (up to 10.2 mg/g in 400 ppm $LiCl$ solution), but also possesses unique self-healing ability during the next delithiation/lithiation cycles, thus promising excellent adsorption cycling stability. This study experimentally and theoretically proves the importance of controlling the chemical structure for preparing high performance lithium adsorbents by the coprecipitation method, which is important for high-efficiently extraction of lithium resources from low-grade multi-component liquid minerals.

This study was financially supported by the National Natural Science Foundation of China (NSFC, Grant Number: U20A20337), Qinghai Natural Science Foundation (Grant Number: 2021-ZJ-903).

Keyword: *Lithium Adsorbent, Formation Mechanism, Impact factor optimization, Li-Al Double Layer Hydroxides*

Efficient Electrochemical Degradation of Potassium Flotation Agents in High Salinity Environments Using Customized Composite Electrodes

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The effective elimination of stubborn organic compounds in high-salinity environments, such as brine, presents a formidable obstacle for electrochemically advanced oxidation processes, challenging both their efficacy and durability. In this study, a composite electrode, comprised of CNT/Nafion-functionalized Ti/SnO₂-Sb/b-PbO₂-CNT/Nafion, was devised and tailored for the proficient and enduring removal of octadecylamine (ODA) and 4-dodecylmorpholine (DMP) within authentic high-salinity settings.

Remarkably, the composite electrode achieved complete degradation of ODA and DMP within just 60 minutes, with degradation efficiencies reaching 100% for both contaminants. Moreover, the composite electrode exhibited a substantial improvement in the removal of total organic carbon (TOC), with removal efficiencies of 78% for ODA and 66% for DMP, coupled with remarkably low energy consumption (0.414 and 1.402 kWh/g TOC), respectively.

Electrochemical analyses revealed enhancements in the composite electrode's electrochemical activity, evidenced by lowered oxygen evolution potentials (1.791 V) and increased electrode surface area (ECSA = 20 cm²), alongside reduced charge transfer resistance ($R_{ct} = 18.21 \text{ W/cm}^2$) and augmented corrosion-resistant capacity (corrosion potential = 1.115 V). Notably, the composite electrode demonstrated exceptional stability and recyclability, validated through recycling and accelerated lifespan testing, with insights into the associated stability mechanism.

Further elucidation of the electrocatalytic degradation mechanism revealed a sequential process involving the removal of amino and morpholine rings, followed by the decomposition of carbon chains. Gas chromatography-mass spectrometry (GC-MS) and theoretical calculations were employed to identify intermediate products generated during the degradation of ODA and DMP, offering insights into potential degradation pathways in high-salinity systems.

In summary, this study provides a novel perspective on electrocatalytic oxidation in real high-salinity environments, showcasing enhanced efficiency and stability.

Keyword: *Electrocatalytic degradation, High-salinity, Flotation agents, Degradation mechanism*

Sharing Saline Lake Stories Through Online Maps To Increase Awareness And Coordinated Conservation

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Saline lakes worldwide are experiencing rapid declines due to unsustainable water use and climate change. These shrinking water bodies pose significant threats to biodiversity, human health, and regional economies. While the collapse of each lake creates acute local environmental problems, the public is largely unaware of this global crisis. To better understand and communicate the severity of this issue, we employed remote sensing and geographic information systems (GIS) to analyze 35 years of Landsat data for multiple saline lakes around the world. By extracting annual shoreline changes, we developed interactive maps that visualize the dramatic transformations these lakes have undergone. We have integrated these maps into a publicly accessible website that tells the unique story of each lake, raising awareness about the challenges they face. Our goal is now to engage researchers, managers, and educators to share their "saline lake stories" from lakes around the world. We invite you to participate in this effort to highlight the challenges and progress for your endorheic lake to increase awareness and inspire collaborative action to restore and protect the Earth's terminal lakes.

Keyword: *Saline Lakes, GIS, Landsat*

Aquatic Ecosystem Response to Salinity Anomalies triggered by “El Niño Southern Oscillation” in Ponds of Isabela Island, Galápagos Archipelago**Daniela Rosero-Lopez^{*1}, Marcelo Ardon², Alonso Ramirez², Karla Barragan³, Andrea C. Encalada³**¹ *Instituto Biosfera, Universidad San Francisco de Quito, Ecuador.*² *North Carolina State University, United States of America*³ *Instituto Biosfera, Universidad San Francisco de Quito, Ecuador*

Oceanic islands like the Galápagos Archipelago harbor a variety of fresh and brackish water ecosystems. The specific type of ecosystem depends on factors such as the island's size, age, geology, climate, and altitude. Of the approximately 127 islands (18 large) that compose the Galapagos Archipelago, only a few harbor freshwater and brackish ecosystems. San Cristóbal, Santa Cruz, Isabela, Floreana, and Santiago are the main islands that contain ecosystems such as crater lakes, ponds, streams, waterfalls, wetlands and marshes, groundwater springs, and cave systems with temporary and permanent running waters. The lowlands of Isabela Island, Galápagos, are home to several brackish ponds with varying salinity levels, declared a Ramsar Site. Extreme weather events such as the El Niño Southern Oscillation (ENSO) can disrupt water levels, temperature, and salinity, creating conditions that impact the aquatic community. Between September 2023 and April 2024, we continuously monitored the conductivity, water level, water temperature, solar radiation, and ambient temperature in four ponds while sampling aquatic invertebrates and benthic algae in eight ponds from Isabela Island. Our preliminary results depict a particular behavior of salinity and water level with extreme dissolved oxygen concentrations during radiation and water temperature peaks. Additionally, we observed high invertebrate and benthic algae biomass in months when weather has shown the presence of ENSO. Changes in salinity can provide a clearer picture of the magnitude and duration of the ENSO signal and the lasting effects on macroinvertebrates, benthic algae, and cyanobacteria present in brackish ecosystems, varying with their proximity to the ocean.

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Keyword: *Galapagos, Salinity, ponds, El Nino Southern Oscillation*

Experimental and Field Evidence Suggests Extreme Salinity Tolerances in *Coxiella* Gastropods from Australian Salt Lakes.**Angus Lawrie^{*1}, Jennifer Chaplin¹, Mahabubur Rahman¹, Aminul Islam¹, Adrian Pinder²**¹ *Murdoch University, Centre for Sustainable Aquatic Ecosystems, Environmental and Conservation Sciences, 90 South Street, Murdoch, WA 6150, Australia*² *Department of Biodiversity, Conservation, and Attractions, Kensington, WA 6151, Australia*

Understanding the salinity tolerances of halophiles is becoming important from a conservation perspective because the salinity of salt lakes is increasing due to the increased rates of evaporation and regionalised reductions in rainfall associated with climate change. Globally very few gastropods inhabit salt lakes and few salt lakes contain gastropods. However, two of the three Tomichiidae genera, *Tomichia* and *Coxiella* occur in salt lakes in southern African and Australia, respectively. Current field data suggest that collectively *Coxiella* species occur over a wide salinity range (0.3 – 130 g/L). However, there is little reliable published information about the salinity distributions of different *Coxiella* species, in part due to confusion in species identifications. This study aimed to determine salinity tolerances in *Coxiella* gastropods from Australian salt lakes and whether different species exhibit characteristically different tolerances. Controlled gradual accumulation experiments were conducted to estimate both the maximum and minimum salinity levels at which 50% of individuals (IC50) remained active for 25 populations representing six species. All studied species showed remarkable euryhalinity with high survival in all species between 10 mS/cm - 75 mS/cm though some species were more tolerate of high salinities than others (e.g. median IC50 values for *C. glabra* = 94.1 mS/cm and *C. n. sp. 2* = 146.4 mS/cm), while minimum salinity tolerance varied little among populations and species. The experimental trends in salinity tolerances were consistent with the salinity distributions of species in the field, although the former were typically broader than the latter. The findings suggest that *Coxiella* comprises some of the most salt-tolerant gastropods globally.

Keyword: *Halophilic, IC50, dose-response, experiment, Australia*

Lipid Biomarkers in Sediments of a Stratified Haloalkaline Lake Indicate Specific Production and Preservation of Phytoplankton Biosignatures

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Anthropogenic activities and global warming threaten coastal and continental environments by driving aquatic ecosystems to anoxia and euxinia through eutrophication. Such extreme conditions are harsh on aerobic organisms, including phytoplankton, forcing them to adapt and develop survival strategies. Salt lakes, especially when stratified, are ideal model ecosystems for studying phytoplankton adaptation to (poly)extremophilic conditions.

Dziani Dzaha (Mayotte, Indian Ocean) is a thalassohaline, alkaline volcanic crater lake where cyanobacteria-dominated primary production induces aphotic and anoxic waters below 1 meter depth (Leboulanger et al., 2017; Sala et al., 2021). The two dominant phytoplanktonic organisms, *Limnospira fusiformis* (Cyanobacteria) and *Picocystis salinarum* (Chlorophyta), were observed viable at all depths of the water column despite the absence of light and oxygen and the presence of high concentrations of reduced chemical species, including sulfides, ammonium and methane below 1 meter depth (Bernard et al., 2019; Sarazin et al., 2020).

Investigation of lipid biomarkers from the water column and lake sediments revealed the presence of previously undescribed partially reduced carotenoid pigments derived from b-carotene, which appear in the euxinic part of the water column and accumulate in the underlying sediments. The occurrence of numerous reduced carotenoids has already been observed in Lake Cadagno, an euxinic lake, where they were shown to be formed by abiotic reductive sulfurization/desulfurization processes operating on biosynthetic pigments from anoxygenic phototrophic bacteria (Hebting et al., 2006). However, in the present case, the lack of structural diversity of reduced carotenoids and the specific chemical structure of the dominant b-carotene derivative, characterized by mass spectrometry and NMR analysis, suggest instead a biosynthetic production in response to unfavorable environmental conditions.

Quantification of carotenoid derivatives in lake sediments, along with other lipid biomarkers specific to archaea, bacteria and phytoplankton, was used to identify potential biological producers. High concentrations of reduced carotenoids and the strong correlation with phytoplankton biomarkers over the last 900 years of sediment record, when modern environmental conditions became permanent, indicate biological synthesis by dominant primary producers and subsequent preservation in sediments. The production of partially reduced pigments may thus be an adaptive strategy of some phytoplanktonic organisms to survive when confronted with anoxia/euxinia and/or highly reducing conditions.

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Keyword: *Thalassohaline lake, Anoxia/euxinia, Phytoplankton, Lipid Biomarkers, Reduced carotenoid derivatives*

The Underlying Digital Technology for the Intelligence of Salt Pans Processes in the Utilization of Salt Lake Resource

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Salt pans is a widely adopted for the utilization of salt lake brine resources. It relies on solar energy to evaporate and crystallize, and is a green, low-carbon, and environmentally friendly industrial process. Due to the huge operational units and the dependence on meteorological factors, it is difficult to achieve precise process management. In order to improve the efficiency and the potash deposit quality of salt pans for complex salt lake brine (such as chloride type and magnesium sulfate subtype), the reasonable process planning and intelligent management should be carried out depending on meteorological characteristics. The digital twin system of salt pans processes can provide management means such as visual, controllable and predictable state, which need the underlying digital technology, such as the models of brine physical properties and phase equilibrium, quantitative expression of salt precipitation behaviors in evaporation and temperature change process, influence of meteorological conditions on natural evaporation and salt precipitation of brine.

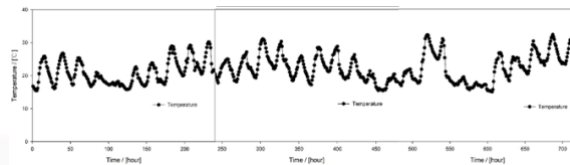


Fig.1 Temperature hourly changes in May 2024 (°C) (meteorological information)

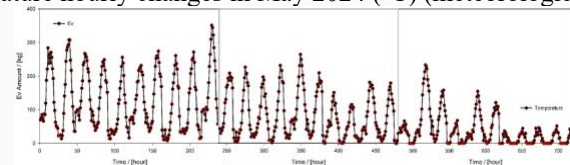


Fig. 2 Calculation results of evaporation rate (kg/hour) of experimental brine

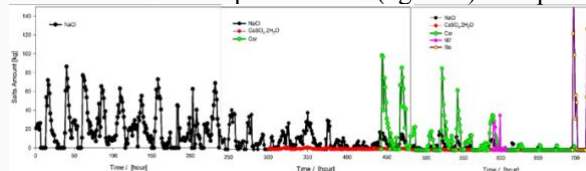


Fig.3 The hourly salt precipitation state (salt species and amount) of experimental brine in May

For this purpose, the comprehensive thermodynamic models are established in the last decade, which basing on the improved eNRTL for the complex brine containing ions of Li^+ , Na^+ , K^+ , Mg^{2+} , Ca^{2+} , Cl^- , SO_4^{2-} and B species at multi temperature; the new methods are also established for identifying the salt species and calculating the quality of salt precipitation or dissolution in dynamic and continuous processes; the models of natural evaporation behaviors of brine in salt pans are developed. Using salt pans systemtric models, and weather hourly information, the state of brine liquid and salt precipitated in each salt pan can be predicted, as well as the annual meteorological information can also be used to plan annual production.

One example, 100 m³ brine of Cha'erhan Salt Lake are natural evaporated in a 1000 m² salt pan with 720 hours until Bischofite saturated and precipitated. The real-time process state of digital twin are shown in Fig 1-3. The meteorological data are of May- 2024 including temperature, humidity, air pressure, wind speed, and solar radiation intensity.

The day night variation of meteorology, e.g., temperature as shown in figure 1, result in the changes of brine evaporation, figure 2, as well as the changes of salt species and quantities of salt precipitation figure 3. Fig.3 denote (1) salts precipitation sequence is of NaCl, CaSO₄·2H₂O, Carnallite, Magnesium sulfate hydrate and Bischofite; (2) before and after carnallite significantly precipitated, the amount of precipitated salts are very small. This is the optimal period for brine scheduling.

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Keyword: Salt-lake Brine, Digital twin, Salt pans, Underlying Digital Technology

Phase Separation Strategy for the Resource Utilization of Solid Wastes
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It is well known that the industrial solid wastes such as high-mud tailing salt, mixed waste salt, low-grade salt and coal waste, etc., are rich in potassium, aluminum, sodium, lithium, silica and so on. For decades, however, the comprehensive utilization of these resource has confronted severe challenges due to their type diversity, complexity and lack of breakthrough technologies. Based on the principle of phase separation in salt-water systems, recently we have developed several efficient separation and conversion technologies for the comprehensive utilization of the valuable elements in the above-mentioned solid wastes.

In respect of high-mud content low-grade salt mine, we revealed the law of phase equilibrium and designed an unstable dissolution pathway, achieving precise regulation of the solid-liquid conversion of tailing-salt and the desliming through coagulation-sedimentation. Guided by the phase diagram of Na^+ , K^+ , $\text{Mg}^{2+}/\text{Cl}^-$ - H_2O system, the desliming efficiency can be significantly increased via a reinforced tailing-salt flotation, producing high-purity products such as KCl , Na_2SO_4 , MgSO_4 , etc. Based on the dry base diagram of Na^+ , $\text{Mg}^{2+}/\text{Cl}^-$, SO_4^{2-} - H_2O system, we illustrated the mechanism for the metastable transformation of the mixed tail salt of sodium and magnesium. Meanwhile, we promoted the engineering implementation of the converting technology of sodium-magnesium mixed tail salt and produced high-quality crystalline $\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$ (99.5%) and KCl (99.7%). Moreover, by blending of tail salts and temperature-controlled evaporation, high-magnesium content carnallite with NaCl content less than 5% can be produced, and subsequent hydrolysis process will obtain high-purity potassium-magnesium sulfate fertilizer product (99.47%). With the aid of the phase diagram of Na^+ , K^+/Cl^- , SO_4^{2-} - H_2O at different temperatures, we explored a value-added conversion technology for fabricating K_2SO_4 from the low-value mixed salt $\text{NaCl}/\text{Na}_2\text{SO}_4$. In addition, based on the principle of phase separation in ternary water-salt system Al^{3+} , $\text{Fe}^{3+}/\text{Cl}^-$ - H_2O (- HCl), we developed a wet separation and conversion technology for high-valued utilization of the solid wastes from coal mining, metallurgy, and chemical industries. For instance, we developed the technology of leaching-desliming-crystallization-product regulation and achieved efficient separation of valuable elements in coal-based wastes, producing high-value products such as MgCO_3 , AlCl_3 , and Li_2CO_3 , etc.

In conclusion, after years of efforts, we have broken through the limitation in the disposal of industrial waste salts, waste water and coal-based solid wastes, promoting the regional ecological and environmental protection in Shanxi and Qinghai provinces in China.

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Keyword: *Principle of phase separation, Phase equilibrium, Industrial solid waste*

Climatic Controls on the Seasonal Variation of Oxygen Isotopes in Alpine Lake Water, Tibetan Plateau**Yongjie Lin***Institute of Mineral Resources, Chinese of Academy of Geological Sciences*

Alpine lakes on the Tibetan Plateau (TP) can potentially preserve multiple aspects of water isotopic composition in their sediments, which has emerged as a valuable proxy for palaeoclimate reconstruction. However, the underlying factors that influence the isotopic composition of alpine lake water have not yet been fully elucidated. Here, we present a comprehensive dataset comprising monthly hydrological and meteorological measurements, as well as δD and $\delta^{18}O$ values of both lake water and river inflow, collected over the course of a calendar year from an alpine lake on the TP. To simulate and quantitatively interpret seasonal variations in the $\delta^{18}O$ values of surface water and identify the drivers behind these variations, we employ both a mass balance model and a random forest model. Our modeling results reveal that the seasonal fluctuations observed in the $\delta^{18}O$ values of lakes within this high-elevation zone are primarily driven by local hydrological processes, which were induced by seasonal climate variations. Our study underscores the importance of comprehending the distinct seasonality patterns of lake hydrology before utilizing lake sediment archives of $\delta^{18}O$ for palaeoclimate reconstructions.

Keyword: *Alpine lake, Oxygen isotopes, Climatic controls, Seasonal variation*

FizzingSoda: Spatio-Temporal Variation in the Gas Fluxes of Alkaline Lakes and the Underlying Microbial Processes

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Inland saline lakes are biogeochemically distinctive from freshwater habitats; they are usually alkaline (pH > 8) and characterized by specific amounts of dissolved ions. Despite their total global water volume being comparable to the volume of freshwater lakes, estimations on their contribution to terrestrial carbon cycling are inaccurate due to the lack of comprehensive gas flux data. Under high alkaline pH, dissolved atmospheric CO₂ is directly converted to bicarbonate (HCO₃⁻) and carbonate (CO₃²⁻) that can either precipitate or directly fuel primary production. Thus, in alkaline lakes, physico-chemical and biological processes can lead to the removal of CO₂ from the atmosphere. However, it has been shown that certain alkaline-saline lakes, especially soda lakes, are also hotspots for terrestrial and macrophyte derived organic carbon processing which is expected to lead to C-gas emissions. As the metabolic processes of the resident microbial community are key to the gas fluxes, the drivers of the tipping points between carbon sink and source status of these systems can only be deciphered by coupling onsite flux measurements with state-of-the-art molecular biology techniques.

The FizzingSoda project aimed to gather seasonal C-gas flux data from alkaline lakes by conducting direct diurnal flux measurements on 12 distinct sites in Central and Eastern Europe, alongside water chemical characterization and meta-omic investigations. The results of the seasonal measurements showed that saline-alkaline lakes can substantially differ in their daily C-gas flux trends. CO₂ fluxes ranged from sinks to substantial emitters (-181 to 3883 mg CO₂-C m⁻² d⁻¹), while CH₄ fluxes were surprisingly high for soda lakes (> 23 mg CH₄-C m⁻² d⁻¹). Distinctive deviations in the relative gene frequencies linked to metabolic processes potentially impacting C-gas fluxes were identified by metagenomic and metatranscriptomic approaches, including the reconstruction of individual genomes from metagenomic data. Soda lake microbial communities exhibited a higher relative abundance of genes associated with methane turnover and other one-carbon compounds, highlighting the environment's role as a carbon-processing hotspot. The project findings underscore the significance of saline-alkaline lakes to terrestrial greenhouse gas fluxes.

Keyword: *soda lake, greenhouse gas fluxes, microbial activity, metagenomics*

Organic Matter Accumulation Drives Methylo-trophic Methanogenesis and Microbial Ecology in a Hypersaline Coastal Lagoon**Christopher Keneally**^{* 1}, **Matilda Southgate**², **Daniel Chilton**¹, **Virginie Gaget**³, **David T. Welsh**⁴, **Luke Mosley**¹, **Dirk V. Erler**⁵, **Stephen P. Kidd**¹, **Justin Brookes**¹¹ *School of Biological Sciences, The University of Adelaide*² *Murray-Darling Basin Authority*³ *Discipline of Surgery, The University of Adelaide*⁴ *School of Environment and Science, Griffith University*⁵ *Faculty of Science and Engineering, Southern Cross University*

Hypersalinity is common in coastal wetlands throughout warm, tropical, and arid regions. Climate-induced changes in rainfall, sea level, and anthropogenic modification to basins and coastlines are likely to further increase salinization in these ecosystems. Yet, carbon cycling in hypersaline coastal wetlands is not well understood, and poorly constrained in climate models. In the Coorong, a eutrophic, hypersaline coastal lagoon, recognized as internationally important under the Ramsar convention, organic matter rapidly accumulates in deeper areas of the lagoon, through the settling of fine detrital particles, phytoplankton and suspended sediments. During initial surveys, elevated surface water methane (CH₄) concentrations were observed above these fine depositional sediments. To identify the drivers of CH₄ production, organic matter and sediment characteristics were assessed in surface sediments. Genetic markers (i.e., 16rDNA and the *mcrA* functional gene) were used to characterize microbial communities. With multiple lines of evidence, this study identifies organic matter, methanogen abundance, and salinity as important drivers of CH₄ production, which is concentrated in depositional zones. Archaea were also more abundant in depositional zones, including methylo-trophic methanogens: Methanofastidiosales, Methanomassiliicoccales, Methermicocceae, and Methanococoides. These methanogens were highly correlated to CH₄ in porewater, suggesting an influence of methylo-trophic methanogenesis. To investigate further, metabolic genes were predicted from 16S rRNA with PICRUSt2. This represents the first effort to analyze CH₄ dynamics in the Coorong, underscoring the need to integrate these unique ecosystems into global climate models to enhance our understanding of greenhouse gas dynamics and emissions in a changing climate.

Keyword: *Coorong, methane, Archaea, methylated compounds, organic matter*

The Yellow Substance Determines the Color of Phototrophs in the Chemocline of the White Sea Meromictic Lakes and Lagoons

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In coastal stratified lakes and lagoons gradually separating from the White Sea because of the post-glacial uplift, in the chemocline (gradient zone between the aerobic and sulfide zones) there is usually a layer of colored water with the massive development of phototrophic microorganisms. At the beginning of hydrological evolution, when all the water in it is still salty, the colored layer is red; in reservoirs with a fresh mixolimnion (the upper layer to which convection is limited) the colored layer is green, and in intermediate stage it is brown. Light transmission spectra were measured at different horizons in a few partially separated reservoirs, in the sea, and in fresh lakes with "Ocean Optics USB 4000" spectrometer. The data show the decisive role of humic substances dissolved in water ("yellow substance") in the formation of light niches with different spectral ranges. Their concentration increases as the isolation from the sea increases, causing narrowing of the photic zone, the chemocline appears closer to the surface, and a shift in the spectral composition of transmitted light to longer wavelengths is detected. In a stratified marine bay, light reaching the chemocline is mainly in the yellow-green portion of the spectrum (520–600 nm); in sea lagoons, yellow (510–670 nm) predominates; in reservoirs with a fresh surface layer of water, yellow-orange-red (520–720 nm) predominates. Niches with similar spectral composition in different bodies of water are occupied by organisms whose antennas are adapted to absorb quanta from the same wavelength range. In marine stratified bays and salty lagoons, the yellow-green light range favors microorganisms with red pigments; in reservoirs with a fresh mixolimnion, which allows only the yellow-orange-red part of the spectrum to reach the chemocline, microorganisms with green and blue pigments benefit.

Keyword: *coastal meromictic lakes, humic substances, spectral ecological niches, isolation from the sea, photosynthetic pigments*

The Effect of Salinity on the Emergence of Zooplankton from the Bank of Resting Eggs**Egor Zadereev**^{* 1}, **Tatiana Lopatina**¹, **Ksenia Khoroshko**²¹ *Krasnoyarsk Scientific Center, Institute of Biophysics, Krasnoyarsk, Russia*² *Siberian Federal University, Krasnoyarsk, Russia*

To preserve biodiversity under the global trend of freshwater salinization, it is necessary to understand the limits of resistance of populations and communities to changes in the salinity (Cunillera-Montcusí et al., 2022). Planktonic crustaceans play a key role in the functioning of aquatic ecosystems. In their life cycle, they form resting eggs, which are important for the stability and functioning of ecosystems. After salinization, resting eggs allow populations to survive unfavourable conditions (Santangelo et al., 2014). Landscapes dominated by small lakes with varying salinities are typical for many arid regions of the world. The concentrations of dissolved salts in these lakes vary both during the year and between years. In such ecosystems with high geographic connectivity, each of the nearby lakes develops its own zooplankton community. However, with changes in salinity, rapid colonization of the lake by zooplankton adapted to the changed salinity occurs. Resting eggs of species adapted to different salinities accumulate in the resting egg bank, which different zooplankton communities form in different years. One of such systems of lakes is located in the South of Siberia (Republic of Khakassia). Previously, we assessed the species composition of zooplankton and changes in the food web of these lakes associated with salinity (Zadereev et al., 2022). For the presented study, we selected 4 lakes with a salinity range from 0.8 to 4 g/L. We assessed the species composition of active pelagic zooplankton in these lakes (sampled once a month from June to September 2023). We also sampled bottom sediments (surface 20 cm layer) from these lakes in order to subsequently test the ability of the zooplankton community to recover from the resting egg bank. During the experiments, the following hypotheses were tested: 1) the species composition of zooplankton observed during the season in the water column is lower than the species composition of zooplankton hatched under favorable conditions from a bank of resting eggs; 2) at different salinities, different zooplankton communities will form from the bank of resting eggs of the same lake; 3) zooplankton communities formed from banks of resting eggs from different lakes at the same salinity will be similar. The results obtained are necessary for understanding the effect of salinity on biodiversity and the functioning of lake ecosystems and developing the concept of metacommunities in nearby lakes. The study was funded by Russian Science Foundation and Krasnoyarsk Regional Fund of Science and Technology Support (Project No. 23-24-10044).

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Keyword: *saline lakes, resting eggs, zooplankton, metacommunity*

Halophilic Nematodes Live in America's Dead Sea

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Extreme environments enable the study of simplified food-webs and serve as models for evolutionary bottlenecks and early Earth ecology. We investigated the biodiversity of invertebrate meiofauna in the benthic zone of the Great Salt Lake (GSL), UT, one of the most hypersaline lake systems in the world. The hypersaline bays within the GSL are currently thought to support only two multicellular animals: brine fly larvae and brine shrimp. Here, we report the presence, habitat, and microbial interactions of novel free-living nematodes. Nematode diversity drops dramatically along a salinity gradient from a freshwater river into the south arm of the lake. In Gilbert Bay, nematodes primarily inhabit reef-like organosedimentary structures built by bacteria called microbialites. These structures likely provide a protective barrier to UV and aridity, and bacterial associations within them may support life in hypersaline environments. Notably, sampling from Owens Lake, another terminal lake in the Great Basin that lacks microbialites, did not recover nematodes from similar salinities. Phylogenetic divergence suggests that GSL nematodes represent previously undescribed members of the family Monhysteridae – one of the dominant fauna of the abyssal zone and deep-sea hydrothermal vents. These findings update our understanding of halophile ecosystems and the habitable limit of animals.

Keyword: *Extremophile, hypersaline, phylogenetics, lacustrine sediment, meiobenthic macrotaxa*

Effects of Climate and Warming on Litter Decomposition in Oligohaline and Hypersaline Ecosystems: Insights from a Synchronized Mesocosm Experiment**Masum Billah^{*1}, Gultekin Yilmaz¹, Cihelio Amorim¹, Meltem Koru¹, Archana Manjunath¹, Meryem Beklioğlu¹, Erik Jeppesen², Korhan Özkan¹**¹ Middle East Technical University² 5Department of Ecoscience and WATEC, Aarhus University, 8000 Aarhus, Denmark

Decomposition is a key determinant of aquatic ecosystem functioning, controlling nutrient and carbon cycling. Salinity and water temperature are known to be two important drivers of litter decompositions in aquatic ecosystems. However, only little is known on their effect on litter decompositions in these ecosystems. Thus, this investigation provided insight of simulated climate warming (4.5°C) into macrophyte litter (*Ruppia cirrhosa*) decomposition in oligohaline (4 ppt) and hypersaline (40 ppt) ecosystems from mesocosm in the two contrasting climate regions (colder Ankara Vs warmer Mersin, Turkey). We hypothesized that H1) The litter degradation rate will be lower in the oligohaline mesocosms compared to the hypersaline mesocosms and H2) degradation rate were positively related to the increasing temperatures. We incubated known amounts of litter in litter bags for 85 days in mesocosms to understand the decay rates. We found that litter degradation rates were similar between temperature treatments, with the control at $7.7 \pm 0.2 \text{ mg g}^{-1} \text{ day}^{-1}$ and the warming treatment at $8.0 \pm 0.2 \text{ mg g}^{-1} \text{ day}^{-1}$. Climate region had a significant impact on degradation rates, Mersin, showed a higher degradation rate ($8.4 \pm 2.4 \text{ mg g}^{-1} \text{ day}^{-1}$) compared to the Ankara ($7.3 \pm 1.7 \text{ mg g}^{-1} \text{ day}^{-1}$). Additionally, degradation rates were significantly higher in oligohaline mesocosms ($8.4 \pm 0.2 \text{ mg g}^{-1} \text{ day}^{-1}$) compared to hypersaline mesocosms ($7.4 \pm 0.2 \text{ mg g}^{-1} \text{ day}^{-1}$). However, in Mersin, degradation rate was markedly higher in the hypersaline mesocosm compared with the oligohaline mesocosm, defying our initial expectations. Overall, our results indicated decay rates were influenced by salinity, warming, and eutrophication.

Keyword: *Litter decomposition, Organic matter, Nutrient cycling*

Salinity-Dependent Dynamics of Phototrophic Communities in a Southwestern Siberian Soda Lake During the Solar Activity Cycle

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The endorheic saline lakes of southwestern Siberia are subject to pronounced intra-century climate cycles of varying duration (within 20–47 years), which manifest themselves in alternating wet and dry periods. Additionally, for the Kulunda steppe and the Baraba lowland, relatively short-term cyclical climate changes are shown, clearly expressed within the Schwabe-Wolf solar activity cycles (actually 9–14 years). As a result, the salinity and water levels of lakes change significantly, and these changes certainly have an essential impact on the diversity and functioning of the resident halophilic and/or natronophilic microbial communities. Few microbiological studies, though, have examined the dynamics of this process.

In this work, we consider the small shallow soda lake Tanatar VI, located in the Kulunda steppe (Altai Region, Russia), as a model object for studying climate-induced succession of phototrophic microbial communities. The purpose of this work was to analyze the relationship between changes in solar activity, lake surface area, and lake salinity and to analyze the impact of these changes on the succession of phototrophic microbial communities. The approach used in this study was the retrospective comparison of hydrochemical and microscopic data obtained during annual summer field work with satellite and solar activity data for the 12-year observation period (2011–2022).

During this period, the lake surface changed threefold and the salinity changed by more than an order of magnitude, which strongly correlated with the phases of the 24th and 25th solar activity cycles. Based on the analysis of satellite and hydrochemical data, as well as the field observations, we distinguished high (100–250 g/L; 2011–2014), medium (60 g/L; 2015–2016), extremely low (13–16 g/L; 2017–2020), and low (23–34 g/L; 2021–2022) salinity periods. The occurrence of 33 morphotypes of cyanobacteria, two key morphotypes of chlorophytes, and four morphotypes of anoxygenic phototrophic bacteria was analyzed. It was shown that each salinity period was characterized by a unique composition of phototrophic communities. The sequence "solar activity → hydrology → salinity → morphotype composition → functioning of microbial communities" is discussed in the context of possible cause-and-effect relationships.

Our data indicate that the ecosystem of the southwestern Siberian soda lake is characterized by dynamic stability, i.e., the alternation of different alternative (structural and/or functional) stable states of an ecosystem, naturally repeated over time, driven by climate cycles.

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Keyword: *soda lakes, salinity, phototrophic microorganisms, dynamic stability, solar activity*

Bacterial Biofilm on Microplastics in Inland Saline Lakes

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Microplastics (MPs) can disrupt the biological, physiological, and ecological processes within lakes, causing significant harm to these delicate ecosystems. Microplastics raise serious concerns about their potential to adversely affect environmental health due to their ability to act as vectors for pathogenic bacteria. Despite existing research on bacterial biofilms linked to microplastics, our understanding of the role of salinity on these bacterial assemblages on microplastic is limited. This study aims to explore cultivable viable bacterial biofilm communities associated with MPs across a salinity gradient (range from 0.25‰ to 197.7‰) in 11 lakes located in the two closed basins -Konya Closed Basin (KCB) and Burdur Closed Basin (BCB)- in Türkiye. The concentration of MPs in the lakes varied from 0.25 to 1.75 items/L, predominantly consisting of fibers and fragments within the size range of 50 µm to 5 mm. The diverse MP concentrations were not related to salinity and likely reflects variation in human activities in the proximity of the lakes. The most abundant cultivable bacterial phyla in both MP-associated biofilms and lake water were Pseudomonadota (83.1-98.4%) and Bacillota (1.6-16.9%), respectively. The counts of bacterial strains were similar between surrounding water and MP surfaces. However, discernible differences emerged among surrounding water of lakes, particularly in the presence of potentially pathogens exhibiting high salinity tolerance, such as *Vibrio* spp. PCA analysis revealed that halotolerant *Proteus* spp. strains on MP surfaces were particularly associated with Lake Bolluk (95.7 ‰), while *Alcaligenes* spp. was linked to the highest saline Lake Tuz. The high-count bacterial unit of *Shewanella putrefaciens*, recognized as halophilic bacterium, was associated with Lake Salda, being highly alkaline. These findings hold significant implications for understanding the ecological impact of MPs and their fate in diverse aquatic ecosystems.

Keyword: *Plastisphere, Freshwater salinization, Vector role, Bacterial Biofilm*

Enrichment Patterns and Prediction Techniques of Neogene Brine Reservoirs in the Western Qaidam Basin, China

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Potassium salt has always been a scarce mineral in various countries, and China's self-sufficiency rate of potassium salt is currently only 30%, mainly from the eastern Qaidam Basin. The Dalangtan area in the western Qaidam Basin is a relatively large continuous sedimentary center in the early to mid Cenozoic era, and also an important salt sedimentary center in the Neogene of the Qaidam Basin. The ancient salt lakes in the Qaidam Basin, from the Middle Miocene to the Late Pleistocene, were first formed in the northwest, forming the "underground Qaidam potassium rich brine" and the Dalangtan potassium salt lake. It can be seen that the western Qaidam Basin has favorable conditions for salt and potassium formation since the Neogene period. At the same time, according to petroleum drilling data, there is abundant deep brine in the deep part of the region. However, due to relatively weak basic research, low degree of implementation of structural traps, unclear understanding of the distribution and evolution characteristics of faults and the distribution pattern of underground brine reservoirs, various factors are restricting the evaluation and development of brine resources in the region. Conducting research on the enrichment patterns and prediction techniques of underground brine resources can help reveal the storage and migration characteristics of underground brine in saline basins, which has important theoretical and practical significance for the development of potassium salt resources. This study combines the actual exploration of oil fields, guided by the structure lithology exploration concept, integrates oil well interpretation and potassium salt drilling data, and applies structural interpretation, seismic inversion and other technologies to carry out research on isochronous stratigraphic sequence framework, seismic data interpretation and brine reservoir prediction. The focus is on using two-dimensional seismic data combined with some three-dimensional seismic data to carry out continuous structural interpretation, accurately implement geological structures, clarify the spatiotemporal distribution characteristics of brine reservoirs, clarify the enrichment law of brine, and provide strong technical support for ensuring the sustainable development of potassium salt bases in the Qaidam Basin and expanding reserve resources of potassium salt.

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Keyword: *enrichment patterns prediction techniques Qaidam Basin*

Minerogenetic series of deposits in the Qaidam Basin**Pan Tong^{*1,3}, Li Dongsheng^{2,3}, Han Guang^{2,3}, Jia Jiantuan^{2,3}**¹ Bureau of Geological and Mineral Resource Prospecting & Development of Qinghai Province,,Xining 810029, Qinghai, China² Qinghai Qaidam Integrated Institute of Geology and Mineral Resource Exploration, Golmud, Qinghai 816000, China³ Key Laboratory of Salt Lake Resource Exploration and Research in Qaidam Basin of Qinghai Province; Golmud, 816000, China

The Qaidam Basin (QB) on the Qinghai-Tibet Plateau is rich in mineral resources. We summarize the mineralization and metallogenic series of the basin by studying the characteristics of tectonic-sedimentary evolution since the Cenozoic and the temporal and spatial distribution of sedimentary minerals, such as salt, oil, and gas. The mineralization of the basin includes biological sedimentation, chemical sedimentation, mechanical sedimentation, rock salt dissolution-sedimentation, and evaporative sedimentation. Petroleum and natural gas minerals are the geneses of biochemical sedimentation, and salt minerals are mainly due to evaporative deposition. Taking into account basin evolution, geological structural unit, mineralization mechanism, and its origin connection, we classify deposits in the QB into two minerogenetic series: related to Paleogene-Quaternary plateau collision uplift sedimentation and metallogenic series connected to Quaternary fluid action. Based on the analysis of the mineralization series of different minerals in the QB, we can deepen the understanding of mineralization, and provide theoretical basis for ore exploration in Qinghai. We also suggest the development of fine exploration methods and technologies in the QB to serve as a breakthrough in ore exploration.

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Keyword: *Qaidam Basin, basin evolution, mineral deposit*

Sustainable Development of China's Salt Lake Industry and Enterprise ESG Performance and Suggestions

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This article provides a brief disclosure of relevant policy information from the United Nations and developed countries to overview global sustainable development (ESG) goals and processes, including ESG requirements in the development of the Extraction and Utilization of Saline lakes Resources, such as policies and tools. It also introduces how China fulfills sustainable development goals at the national level (a national plan for China's sustainable development in 2030). Focusing on the advancement of ESG along the timeline, it sorts out the relevant requirements and policies introduced by the Chinese government in the past two years. The specific work done is as follows:

First, from the perspective of related standards and evaluation tools, a review is conducted regarding the capacity improvement and ESG performance of sustainable development. Drawing on the Green Paper, within the relevant tools and introductions, the focus is on some evaluation standards that China is currently attempting to introduce.

Second, a path is sorted out for the capacity improvement and performance of ESG promotion by saline lakes development enterprises. For leading enterprises that have already carried out ESG, summaries are made from the aspects of strategy, identification of key issues, challenges or obstacles, and strategy implementation. Select 2-3 enterprise cases to conduct a path review on the capacity improvement and performance of ESG promotion by saline lakes production enterprises, saline lakes mining enterprises, etc. Specifically, different dimensions are emphasized (from the three dimensions of ESG), highlighting the outstanding aspects. Different cases are selected for interpretation from the perspectives of E (Economic), S (Social), and GI (Government).

Third, from the three dimensions of ESG, it examines how enterprises identify and analyze strategic and key issues and how they implement them. The domestic case of Qinghai is selected to introduce how remote areas drive the overall local economic development and maintain social balance. Additionally, an international case is selected to introduce relevant measures and performances of Chinese enterprises in integrating with local policies and communities during their entry into the international market.

Finally, for these enterprises practicing ESG, some suggestions are given from our perspective based on the overall situation of the area.

Extraction and High-Value Utilization of Rare Elements Lithium, Rubidium, and Cesium from Salt Lake Brines

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Salt Lake brines and other liquid minerals around the world are rich in rare elements. However, there are technical bottlenecks such as poor adsorbent stability, poor selectivity, and weak dynamic adsorption. Therefore, the effective extraction and utilization of the valuable rare elements in the brines of salt lakes is crucial.

Among the many separation and extraction methods, adsorption is the best choice for extracting lithium-rubidium-cesium and other rare elements from the brine of salt lake because of its simple operation, greenness, and high efficiency. Based on this, this report aims to study lithium, rubidium, cesium, and other rare elements in the brine of the salt lake. Firstly, lithium resources are separated and extracted from salt lake brine. The team used excessive metal doping to construct a series of adsorbents accurately and, combined with an in situ calorimeter, innovative traditional wet spinning, and other advanced technological means, successfully prepared a series of micron-sized spun fiber lithium ion sieve composite adsorbent materials. Series of adsorbents on Li⁺ adsorption/desorption performance increased significantly, adsorption capacity increased substantially (25 mg/g to 60 mg/g), the adsorption and desorption cycle from 24 h to 1 h, the preparation cost reduced by nearly 40%, a breakthrough in the traditional coating granulation powder adsorbent capacity and stability of the double performance of the decline in the technical bottleneck. Next is the separation and extraction of rubidium resources from salt lake brine. Our team also developed a W-doped tin sulfide KWTS composite magnetic microspheres to efficiently extract rubidium resources from the brine of salt lakes. The adsorption amount of KWTS on Rb⁺ can reach 184.68 mg/g, much higher than that of traditional adsorbents, with excellent selectivity and ultra-fast adsorption rate. In addition, the magnetic microsphere composite metal tungsten doped tin sulfide Fe₃O₄@KWTS was designed, and static adsorption and desorption experiments were carried out to investigate the Rb⁺. Finally, it separates and extracts rubidium resources in salt lake brine. Our team developed a series of green and efficient layered cesium ion adsorbents (KMS, M=Bi, Zr, etc.) based on the quantitative design of DFT-based meta-adsorbents. The adsorption capacity of the Cs⁺ series of metal layered adsorbents for Cs⁺ is as high as 400 mg/g, with excellent selectivity and cyclic stability.

Salt Lake brine is a treasure trove of rich resources, however, the efficient separation and extraction of low-grade rare elements in high-salt systems is still a challenging topic. Combined with the characteristics of salt lake brine, the design and development of new separation, extraction, and purification technology is a challenging research direction in the future. Accelerating the comprehensive and synergistic development of Salt Lake brine resources is imperative.

Acknowledgment

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Green and Efficient Lithium Extraction from Salt Lake Brines

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With the rapid development of new energy vehicles and the lithium battery industry, the demand for lithium salt sharply increased in recent years^[1]. However, with the depletion of solid lithium resources, salt lake brines containing abundant lithium attracted more and more attention, especially salt lake brines with high Mg/Li ratios around the world. However, the similar properties between Li and Mg cause difficulties in separating lithium; therefore, it is urgent to develop environmentally friendly technology for efficient recovery of lithium from salt lake brines. Green and efficient adsorption methods and electrochemical methods are suitable for the recovery of lithium from salt lake brine. Our group studied adsorption technology, based on advanced techniques including metal doping, in-situ calorimetry, and wet spinning. A new type of micrometer scale lithium-ion sieve spinning fiber composite adsorbent was prepared, and the adsorption capacity and kinetics selectivity were improved compared to the traditional granular adsorbents^[2,3]. An electrochemical method was used to analyze the reasons for the degradation of the cycling performance of the LiFePO₄ the host material for extraction of lithium from salt lake brine. Na_{2/3}FePO₄ impurities formed in the electrode were the main cause affecting the electrode cycling. Accordingly, a stepped charging and discharging strategy and an in-situ electrode regeneration process was proposed, which resulted in drastic enhancement of electrode cycling capability and great cost savings^[4]. The two methods enable green and efficient recovery of lithium from high Mg/Li salt lake brine. Meanwhile, the matched intelligent equipment was also designed and processed.

Finally, how to control the cost of lithium extraction from salt lake brine, improve the comprehensive utilization rate of lithium resources, and produce high-value lithium salt products will be the developed trends for green and efficient extraction of lithium in the future.

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Keyword: *lithium, salt lake, brines*

Develop Lithium Resources in Salt Lakes to Support Green Energy Goals

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1. Green energy is an energy development goal that mankind must and will achieve in the future.
2. Lithium is an essential element for green energy, but currently, the main method in the world is still to extract lithium from ore, which faces serious environmental damage.
3. 70% of the world's lithium resources are distributed in salt lakes. How to develop salt lakes through scientific, innovative, and environmentally friendly means is crucial to the development of green energy for mankind.
4. Juneng Yongtuo has accumulated more than 30 years of experience in salt lake lithium extraction technology and is the world's pioneer in lithium-magnesium separation. It currently has a strong comprehensive ability to develop salt lakes in the most environmentally friendly way.
5. Juneng Yongtuo is willing to share technology and resources with participants in Salt Lake development and make joint contributions to the early realization of green energy goals for mankind.

Uncovering the Mystery of the Disappeared Lake Lop Nur with spaceborne Synthetic Aperture Radar

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Lake Lop Nur was a vast ancient playa located at the east end of Tarim Basin, northwest of China. It is of great significance to the research of global climate change. The geomorphological characteristics of its lake basin and drying process have not been fully understood. The time and cause of Lop Nur's disappearance and its impact on the exchange of Chinese and Western Civilization along the Central Route of ancient Silk Road stimulated intensive controversy. Due to the harsh environment, vast area, and flat terrain of the Lop Nur, reliable topographic data has always been lacking in the study of the ancient environment. Based on regional network adjustment methods, a Digital Elevation Model (DEM) with a 10-m spatial resolution and a relative precision of 0.42 m was derived from TanDEM-X/TerraSAR-X satellite image pairs using the interferometry method, which was verified using ICESat-GLAS laser footprints and a local DEM acquired by a drone. With the DEM results, we have confirmed the objective existence of the Loulan Depression. This depression was discovered and named by Sven Hedin in 1900 during his leveling measurements from the ancient city of Loulan to the northern shore of Lake Kara-Koshun. Using DEM and the Japanese Advanced Land Observing Satellite Phased Array type L-band Synthetic Aperture Radar (ALOS/PALSAR) data, supplemented by field surveys and contemporary scientific research, we estimate that Lop Nur, at its highest lake level, covered an area of 11,602 km², which is consistent with historical writings of the Han Dynasty (202 B.C.E.–220 C.E.). The radar penetration characteristics through the dry salt crust of Lop Nur have been verified. We utilized Synthetic Aperture Radar (SAR) data to infer the shallow water table depth of the basin in Lop Nur. The dating of aeolian and lacustrine sediments with Optically stimulated luminescence (OSL) dating method indicates that Lop Nur had completely vanished 360 – 470 C.E. Following the Lake's desiccation, several minor episodes of lake level fluctuation occurred, but never reached the upper-most shorelines. From 77 B.C.E. to 500 C.E., the Loulan Kingdom was a prosperous and important transshipment point connecting China to Europe and Central Asia. The results also show the Lop Nur climate change event coincided with the collapse of the Loulan Civilization. The influence and effects of the climate change event may have extended beyond this region to Eastern China, Western Asia and as well as the Mediterranean area.

Keyword: *Lop Nur, SAR remote sensing, lake basin topography, drainage evolution*

Long-Chain Alkenones in Lake Sediments of the North-Minusinsk Valley (Southern Siberia) as a Potential Biomarker for Paleoclimate Reconstructions

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Patterns of climate variability in the higher latitudes of Asia, such as Siberia, are not entirely clear (Novenko et al., 2022). This is why the Minusinsk Hollow, which is located in this region, is of particular interest for palaeoclimatic research. The area is characterized by arid and semiarid conditions. Reconstructed chronologies of salinity variations from lake sediments provide valuable insight into past regional climatic changes, including humidity and environmental shifts. This study presents the first evidence of a correlation between alkenone characteristics and the status of water bodies in the previously unstudied area of southern Siberia. This is an important contribution to the global knowledge base of paleolimnological biomarkers. Our findings indicate a notable increase in total concentration of alkenones in the upper layers of bottom sediments of saline lakes exhibits a notable increase at a salinity level of approximately 20 g l⁻¹. Additionally, it was determined that the average chain length of alkenones in surface sediments increases with rising salinity, thus indicating that this parameter can be applied as an indicator of salinity. Furthermore, the ratio of alkenones C₃₇/C₃₈ varies considerably, indicating that this index can be employed as a paleo-indicator of salinity. The high correlation between Uk₄₀, Uk'₄₀ and Uk'₃₇₃₈ indices with salinity suggests their potential for use in paleosalinity reconstructions (Bulkhin et al., 2023). The obtained functional dependences were additionally verified in the core of bottom sediments of Lake Utichie-3 thereby substantiating the potential of alkenones as a paleo-indicator of climatically induced salinity fluctuations in endorheic lakes (Bulkhin et al., 2024). The taxonomic diversity of haptophytic algae and alkenone content in the studied lakes was similar to that found in prairie areas of North America. This is likely due to the similarity in climatic conditions and the ionic composition of lake waters in these two regions.

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Keyword: *long-chain alkenones, salinity indicator, lake sediments, South Siberia, paleoclimatology*

A case for Large-scale Utilization of Waste Magnesium Resources in Salt Lake: Magnesium-based Cement Sound Absorbing Materials

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The Salt Lakes of Qinghai province have accounted for more than 90% of China's potassium fertilizer production, which is of great significance to ensure national food security. However, 8~10 tons of bischofite ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) would be generated for extracting 1 ton of potash from brine, directly leading to a sharp increase of bischofite amount by ~60 million tons per year. The mass abandonment of magnesium resources has not only caused serious environmental and ecological problems, but also restricted the sustainable utilization of both potassium and lithium in the Salt Lakes. Recently, fabrication of magnesium-based cements and the related functional materials has been considered as a promising way for efficient large-scale utilization of waste magnesium resources in the Salt Lakes.

In response to the challenges posed by the intrinsic drawbacks of basic magnesium sulfate cement (BMSC) such as slow early hydration, poor water resistance, and high costs, we investigated the early hydration mechanism and the mechanical properties of BMSC with addition of citric acid, crystal seed emulsion (SE) and fly ash (FA, 50%). The addition of SE induced a faster structure rearrangement of the formed intermediates, $3\text{Mg}(\text{OH})_2 \cdot \text{MgSO}_4 \cdot 8\text{H}_2\text{O}$ (318 phase) and active $\text{Mg}(\text{OH})_2$, promoting the formation of $5\text{Mg}(\text{OH})_2 \cdot \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (517 phase) and thus accelerating early hydration. The 12 h-strength of BMSC reached to 33 MPa with a sharply shortened initial setting time of 48 min when adding 6% SE. Moreover, the mechanical properties of FA-BMSC with addition of SE were improved by 30% since FA particles can be tightly encapsulated in the reticulated whisker structures of 517 phase. Combined with physical foaming, we prepared porous FA-BMSC materials with excellent sound absorbing performance. The noise reduction coefficient and mechanical strength of the foam board product with a density of $280 \text{ kg} \cdot \text{m}^{-3}$ reached 0.7 and 1.8 MPa, respectively. The abundant connected and open pores and fuzzy micro-nano rough surface of pore walls (needle-like 517 phase) facilitated the rapid attenuation of sound waves. By cooperation with Shanxi Transportation Holdings Group, CO., LTD., we built a pilot line for production of FA-BMSC based-noise barrier board with an annual output of 100,000 m^2 in Shanxi Transportation Science and Technology Park for Solid Waste Resource Utilization. This work provided an environmentally friendly, cost-effective, and easy-to-install material for efficient prevention of road traffic pollution, paving a novel way for high-value and large-scale utilization of magnesium resource in Salt Lake in western China.

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Keyword: *Waste magnesium resources, Basic magnesium sulfate cement, Fly ash, Seed emulsion, Sound absorbing materials*

POSTER PRESENTATIONS

ID: 31

Paleoclimatic Changes in Dalangtan Salt Lake in Qaidam Since 140K.A. According to Homogenization Temperatures of Fluid Inclusions in Halite**Fan Fu^{*} 1, Meng Fanwei², Hou Xianhua¹**¹ *Institute of Mineral Resources, Chinese Academy of Geological Sciences, Beijing, 100037, China*² *School of Resources and GeoSciences, China University of Mining and Technology, 221116, Xuzhou, China*

Dalangtan salt lake is a Quaternary salt lake sedimentary area in the Qaidam Basin of the Qinghai Tibet Plateau, where salt deposits are developed. Among them, CORE LiangZK02 hole has preserved a good paleoclimate record since the last interglacial period at 140 k.a., and halite is widely distributed. We selected the halite samples from the 0-90m depth section of the well since the late Pleistocene (140 k.a.). The homogenization temperature measurement methods of fluid inclusion and hydrogen, oxygen isotope analysis were used to study the late Pleistocene paleoclimate change in Dalangtan area. The homogenization temperature results are very consistent with the deep-sea oxygen isotope and the Guliya ice core in Tibet. The fluid inclusions, hydrogen and oxygen isotopes in halite of the drill core from bottom to top can be divided into three stages, which correspond to the MIS5 (Marine Isotope Stage 5), MIS4 (Marine Isotope Stage 4) and MIS3 (Marine Isotope Stage 3) stages of the Guliya ice core respectively, indicating that it is significantly affected by global climate change. The characteristics of oxygen isotope changes of fluid inclusions reflect that the Dalangtan area was supplemented by abundant marine air mass precipitation during the MIS5 and MIS3 periods, which has a good response to the high lake level events in the Tibetan Plateau and its surrounding MIS3 and MIS5 periods. The Guliya ice core of Tibet can be subdivided into three stages (MIS3c, MIS3b and MIS3a) from bottom to top in the MIS3 period. The MIS3c (early stage) and MIS3a (late stage) are 3 and 4 °C higher than today respectively. The third stage of LiangZK02 hole corresponds to the MIS3 stage, and two high temperature events (MIS3c, early stage) and (MIS3a, late stage) were also found, which were recorded by the maximum homogenization temperature of fluid inclusions in halite (58.2 °C, 38.17 m and 58.8 °C, 20.41 m in depth). The extreme maximum temperature in the warmest MIS3 stage, indicating that the Qaidam Basin is extremely sensitive to global change and fluctuates violently.

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Keyword: *Qaidam, Dalangtan, MIS3, fluid inclusions, homogenization temperature*

Hydrological Reorganization Controls the Formation of B Deposits in the Bangor Co Salt Lake on the Qinghai-Xizang Plateau

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Boron is a critical and technologically important element applied in glass, ceramics, fertilizers, and high-tech industries. Boron deposits in salt lakes on the Qinghai-Xizang Plateau (QXP) are famous through the ancient and modern world. Studies on the formation of B deposits in salt lakes are blooming, and key scientific issues focus on the B sources (geothermal waters, supergene rock weathering, deep brines, etc.) and enrichment mechanism (cold/hot arid climate, evaporation, time, basin subsidence, etc.). However, hydrological conditions and the crucial role in the formation of boron deposits in salt lakes are less concerned. In this study, we carried out a detailed fieldwork in the Bangor Co Salt Lake (BCSL), and a total of 22 water samples (lake waters, springs, rivers) were collected and analyzed for elemental and Sr isotopic compositions. Combined with the regional hydrologic information and previously reported data, the following conclusions are reached: (1) the source waters in the BCSL can be classified into three types, cold springs in the eastern part of the lake, Galisangqu River, other rivers and cold springs in the western part of the lake, which are characterized by different water chemistry and Sr isotopes; the current supply system is unable to form the B deposits and salt volumes in the BCSL; (2) boron in the BCSL mainly sourced from the inherited Selin Co paleolakewater and the occasionally connection between the two lakes since about 2 ka BP; (3) it can be calculated that more than 900×10^3 t B_2O_3 were supplied by Selin Co to the BCSL through one connection; and it takes only 14 times connection to supply enough boron to the BCSL; (3) once the two lakes separated, the area of BCSL shrink rapidly and water salinization process accelerate, assisting the boron enrichment in waters and the formation of boron deposits. In recent years, under the warmer and humid climate of the QXP, the Selin Co Lake expand significantly, and the lakewater accompanying abundant boron overflowed into the Bangor Co Salt Lake since 2022, causing the soaring expand of lake area and water volume of the BGSL. This phenomenon strongly supports our conclusions. There are several large lake systems in the QXP, which may experience similar hydrological reorganization process, and facilitate the formation of numerous boron deposits on the QXP.

Keyword: *Boron, Hydrological reorganization, Bangor Co Salt Lake*

Distribution Characteristics and Possible Sources of Bromine in Salt Lakes on the Qinghai-Xizang Plateau

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Bromine is a key essential element in a complete industrial system. Salt lake is an important source of bromine. There are numerous salt lakes in the Qinghai-Xizang Plateau, which rich in resource elements such as potassium, lithium, and boron, with enormous development potential. However, research on the bromine content, distribution characteristics, and sources of salt lakes in the Qinghai-Xizang Plateau is still limit. This study collected 26 surface brine samples from salt lakes on the Qinghai-Xizang Plateau and analyzed their bromine contents. It further summarized data from 64 other reported salt lakes, systematically analyzed the distribution characteristics of bromine content in salt lakes on the Plateau, and further explored potential sources of bromine. The results showed that the distribution of Br in the surface brine of salt lakes on the Qinghai-Xizang Plateau ranged from 0.5 to 246.8 mg/L, with an average of 41.1 mg/L. High bromine salt lakes were concentrated in the southern part of the plateau, showing a decreasing trend from south to north. At the same time, the average bromine content of carbonate type salt lakes was the highest, while the average bromine content of chloride type salt lakes was the lowest; Evaporation concentration was not the main controlling factor for the enrichment of bromine in salt lakes. There are multiple sources of bromine in salt lakes, and the sources of bromine in bromine rich salt lakes in the southern plateau might be mainly related to the supply of hot springs, while the high bromine sources in salt lakes in the Qaidam Basin were mainly related to the supply of deep formation water.

Keyword: *Bromine, Salt lake, Qinghai-Xizang Plateau*

Hydrology and Sediment Supply Insights from Surface Sediment Grain Size in the Largest Lake System of Qaidam Basin, NE Qinghai-Tibet Plateau

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The warming and increased precipitation trends over the Qinghai-Tibet Plateau (QTP) have led to lake expansion, posing risks to regional infrastructure and ecological balance. Understanding modern grain size distribution in lake sediments is crucial for interpreting hydrological variations in these lakes. Hurlig and Toson Lakes, the largest lake system in the Qaidam Basin, northeastern QTP, offer an ideal setting for this research. We collected 94 surface sediment samples from these lakes to analyze spatial grain size distribution and its hydrological implications. Our findings indicate that fine silt is the dominant grain size in both lakes, followed by medium to coarse silt and clay, with sand being the least abundant. Using the End Member Modeling Algorithm (EMMA), we identified three end members in Hurlig Lake (HEM1–HEM3) and four in Toson Lake (TEM1–TEM4). In Hurlig Lake, these end members, primarily transported by the Bayin River, reflect variations in the hydrodynamic conditions of low-energy rivers in the northeastern QTP. In Toson Lake, TEM1 and TEM2 are sensitive to changes in lake levels, TEM3 is largely influenced by terrestrial and aeolian deposits, and TEM4 records extreme precipitation events. Cluster analysis further segmented the sedimentary environments into three areas in Hurlig Lake (HSA1–HSA3) and Toson Lake (TSA1–TSA3). In Hurlig Lake, HSA1 and HSA2 contain fine river-borne sediments, while coarser materials from runoff and Bayin River transport characterize HSA3. In Toson Lake, TSA1 represents typical lake sediments, TSA2 is a transitional zone between TSA1 and TSA3, and TSA3 is influenced by gully runoff. This study offers valuable insights into hydroclimate reconstruction and provides a theoretical framework for interpreting grain-size records in the northeastern QTP.

Keyword: *Northeastern Qinghai-Tibet Plateau, Grain size, Lacustrine surface sediments, Hydrodynamics*

Spatial Distribution Characteristics and Genesis of the Potash Deposit and Its Impact on the Abnormal Enrichment of Potassium Salts in the Khorat Plateau

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The Khorat plateau potash deposit is a world-class giant deposit. The spatial distribution characteristics and the enrichment mechanisms of potassium salt are still unclear, which is a key scientific issue of the potassium salt mineralization system. Based on the 447 boreholes data in the deposit, the study systematically divided the salt and clastic layers of three sedimentary cycles and reconstructed the sediment thickness and burial depth of different rock layers. The main findings are as follows: the spatial distribution ranges of the three sedimentary cycles are different, showing a trend of increasing thickness from east to west. Potassium-magnesium salts are mainly concentrated in the western part of the plateau, with localized enrichment of potassium salts, and their thickness is significantly greater than that of the underlying rock salt. The coupling of basin morphology, intercrystalline brine migration, regional tectonic compression, gravity differential loading, and salt rock buoyancy maybe the main controlling factors leading to the local thickening of potassium salt anomalies. The local enrichment of potassium salt, rather than an absolute increase in the volume of potassium salt, is one of the significant features of the "anomaly" in the deposit. This study has important guiding significance for a deeper understanding of the mineralization mechanisms of the deposit, as well as for subsequent exploration and resource assessment.

Keyword: *Potash Deposit, Spatial Distribution, Abnormal Enrichment, Khorat Plateau*

Efficient Selective Adsorption of Rubidium and Cesium in Practical Brine by a Metal-Organic Framework Magnetic Adsorbent

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As key strategic elements, rubidium (Rb) and cesium (Cs) have important applications in many high-tech fields. Salt lakes contain a large amount of resources with industrial significance, and the extraction of Rb and Cs from salt lakes is part of the comprehensive utilization of resources. In this work, a composite magnetic adsorbent ($\text{Fe}_3\text{O}_4@\text{ZIF-8}@\text{AMP}$) was prepared and its adsorption properties for Rb^+ and Cs^+ were studied in simulated and salt lake brine. The structure of the adsorbent was characterized by SEM, XRD, N_2 adsorption - desorption, FT-IR and VSM. The adsorption test shows that the adsorbent has good adsorption affinity for Rb^+ and Cs^+ . The Langmuir model and pseud-second-order dynamics can well describe the adsorbing isotherm and kinetic dates, respectively. Compared with powdered crystal AMP, the adsorption capacity and adsorption rate of $\text{Fe}_3\text{O}_4@\text{ZIF-8}@\text{AMP}$ are significantly increased by about 1.86 and 2.5 times, which is attributed to the large specific surface area and high dispersibility of the adsorbent in the solution. Based on the good magnetic properties, the adsorbent can be quickly separated from the solution within 17 s under the action of an applied magnetic field. In addition, the adsorption differences of Rb^+ and Cs^+ in different brines were investigated, and the results showed that the adsorbent still had a good selective adsorption of Rb^+ and Cs^+ in the salt lake brine with a large number of coexisting ions. Therefore, this promising adsorbent can be used to extract Rb^+ and Cs^+ from aqueous solutions.

Keyword: *Rubidium, Cesium, Metal-organic framework magnetic adsorbent, Brine*

Ecological Effects and Masking of a Shift in Aragonite Saturation State in a Coastal Lagoon**Faith Coleman***Federation University / Coorong Environmental Trust*

The sources of water inputs and the nature of those water inputs into the South Lagoon of the Coorong have shifted over time, resulting in a change in Aragonite Saturation State (ASS). The shift in ASS was masked due to increased production of dissolved organic carbon by cyanobacteria and picoplanktonic green algae, along with a dependence on Total Alkalinity testing as a means of estimating dissolved inorganic carbon.

Direct testing of dissolved inorganic carbon in 2008 and 2023 has demonstrated a decrease in ASS, to the point that some areas that were historically 3 or more, now have an ASS of less than 1. This is likely to have altered the phosphorous cycling within the coastal lagoon, as well as the resilience of charophytes to hypersalinity, desiccation, sulphates and water column turbidity.

Keyword: *Aragonite Saturation State, Water Chemistry, Phosphorous, Charophytes*

Seasonal Dynamics of Visible Light Composition in the Redox Zone of Stratified Basins**Elena Labunskaya** *¹, **Valentin Lobyshev**², **Dmitry Voronov**³, **Elena Krasnova**¹¹ *Moscow State University, Faculty of Biology, Moscow, Russia*² *Moscow State University, Faculty of Physics, Moscow, Russia*³ *Kharkevich Institute for Information Transmission Problems, Russia*

Sunlight supplies energy to the water ecosystem. The process of converting solar energy into chemical energy for organic molecules requires pigments with a porphyrin structure –chlorophylls and bacteriochlorophylls, absorbing in the blue, red or far red parts of the visible light spectrum. Terrestrial organisms receive sufficient amounts of such light, but in water the spectral composition of light changes due to physical (light absorption during resonant oscillations of water molecules), chemical (due to substances dissolved in water that absorb in the visible part of the spectrum) and biological (pigments of phototrophs) factors. The effect of the latter factor can be detected only in communities with high population density, for example, in chemocline (redox zone) of stratified basins with the biofilm of phototrophic microorganisms. The work examines the penetration of light through the water column in the coastal stratified lakes and lagoons at different stages of isolation from the Kandalaksha Gulf of the White Sea. Measurements were carried out in winter and summer to analyze the effect of the phototrophic layer in the chemocline. The study demonstrated spectral composition alterations associated with overtones of water molecule oscillations, absorption by CDOM (Coloured Dissolved Organic Matter), and absorption by photosynthetic antenna pigments in the chemocline. No changes associated with the absorption of pigments by phototrophs were identified outside the chemocline zone due to insufficient concentration of phytoplankton. The pigment composition of phototrophs in the chemocline corresponds to the spectral range of light that has reached this zone and ensures almost complete light absorption in a thin (10–20-centimeter) layer. In more extended chemoclines, 50–70 cm thick, a layered arrangement of phototrophs with different antenna pigments capable of capturing photons from the remaining part of the spectral range is observed. This allows for complete absorption of residual light that reaches the chemocline zone.

The work was supported by the Russian Science Foundation, grant no. 24-24-00008.

Keyword: *Meromictic lakes, stratified reservoirs, chemocline, spectral composition of visible light, photosynthetic pigments*

Secret Life of a Layer Cake: On Phytoplankton of Coastal Stratified Lakes Separated from the White Sea

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On the Karelian coastline, as a result of post-glacial land uplift, bays are being gradually separated from the White Sea and turning into freshwater basins, passing a meromictic phase. Lake Kislo-Sladkoe and lake Elovoe under the investigation are at different stages of isolation. While stratified, they possess a five-layered hydrological structure where the desalinated surface layer, halocline, aerobic saline zone, chemocline, and hydrogen sulfide zone can be distinguished. Such conditions lead to the thriving of unique microalgal biota. The purpose of this study is to compare the dynamics of phytoplankton structure in both lakes in order to reveal any trends.

To examine phytoplankton, water samples were taken from several horizons up to the hydrogen sulphide zone using a submersible pump, and concentrated by the reverse filtration method. Algal cells were identified, measured, and counted in a Najotte chamber under a light microscope. To calculate carbon biomass, biovolumes were determined by mathematical equations based on the geometric shapes of cells, and converted into carbon content. Similarity analysis of phytoplankton structure was performed via statistical nMDS, one-way ANOSIM, and SIMPER procedures.

As a part of the study, 64 phytoplankton species were registered in Kislo-Sladkoe, while 70 species were catalogued in Elovoe, all belonging to Bacillariophyta, Myzozoa, Cyanobacteria, Ochrophyta, Chlorophyta, Charophyta, Cercozoa, Cryptophyta, and Euglenozoa. The phytoplankton structure in the lakes varied both in species composition and seasonal dynamics. The maximum biomass value for the growing season in Kislo-Sladkoe was significantly higher than that corresponding in Elovoe (149.8 mg C/m² and 57.4 mg C/m², respectively). Statistical analysis showed that most samples reliably clustered into four groups that were dissimilar by $\geq 91\%$. Group I includes samples of under-ice phytoplankton from Kislo-Sladkoe with *Microcystis ichthyoblabe*, *Amphora* sp. and cryptomonads as characteristic species. Group II consists of samples from mainly upper horizons of Kislo-Sladkoe in May-August where the determinative species are *Cyclotella choctawhatcheeana* and *Microcystis ichthyoblabe*. Group III comprises most samples from Elovoe where *Gyrosigma obscurum*, *Melosira nummuloides* and *Desmodesmus armatus* define similarity within the community. Group IV includes samples from chemocline of both lakes with *Oxyrrhis marina* acting as a characteristic species.

Thus, at the beginning of the season the lakes differed in phytoplankton communities. However, later, due to the more intensive growth of organisms associated with chemocline as the most productive layer, *Oxyrrhis marina* formed a community typical for both lakes.

The study is supported by the Russian Science Foundation (project No. 24-24-00008).

Keyword: *phytoplankton, the White Sea, chemocline, coastal stratified lakes, Oxyrrhis marina*

Effect of Sulfide on Photosynthesis and Nitrogen Fixation in Non-heterocystous Cyanobacterium from a Soda Lake

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Sulfide is a well-known inhibitor of oxygenic photosynthesis in most cyanobacteria. However, some of them are capable of using it in sulfide-dependent anoxygenic photosynthesis. The effect of sulfide on nitrogen fixation (NF) is poorly investigated. All previous studies were carried out at pH levels below 10 and mostly at low salinities (Belkin et al., 1982; Villbrandt and Stal, 1996; Miller and Bebout, 2004). On the other side, high sulfide concentrations are often observed in soda lakes with pH 10 – 10.5 where sulfide is supposed to be much less toxic. However, there is no published data about the influence of sulfide on cyanobacteria from these habitats.

The object of our study was the natronophilic non-heterocystous diazotrophic cyanobacterium *Sodalinema* sp. P-1104, isolated from the soda lake Petukhovskoe (Kulunda Steppe, Russia). Cyanobacteria of this genus are widely distributed in soda and saline alkaline lakes up to 200 g/l of total salinity (Samylina et al., 2019).

We investigated the capability of performing anoxygenic photosynthesis by CO₂ photoassimilation and NF by acetylene reduction assay. In our experiments, we used the inhibitor of oxygenic photosynthesis 3-(3,4-Dichlorophenyl)-1,1-dimethylurea (DCMU) and a wide range of high sulfide concentrations (2–20 mM). Photosynthesis and NF were not inhibited with additions of sulfide up to 20 mM. Moreover, sulfide addition stimulated NF up to three times. There was a strong positive correlation between rising NF activity and sulfide consumption. The addition of DCMU without sulfide totally inhibited NF and CO₂ photoassimilation, although treatment of inhibited cultures with sulfide initiated it. In the presence of DCMU and sulfide the labeled carbon was almost completely incorporated into the dissolved organic matter rather than the biomass. The observed effects of sulfide addition can be explained by several mechanisms: 1) Sulfide is chemically expended to remove oxygen and decrease Eh, optimizing the conditions for nitrogenase; 2) Sulfide is metabolically oxidized by sulfide-quinone reductase. In the light, electrons from sulfide oxidation initiate anoxygenic photosynthesis; in the dark, these electrons may be sent into the respiratory chain. In both cases, nitrogenase receives more reducing equivalents. Also, both of these mechanisms can take place at the same time.

Thus, we obtained the first data on the ability of natronophilic cyanobacterium to perform sulfide-dependent anoxygenic photosynthesis. Our findings expand the knowledge about cyanobacterial anoxygenic photosynthesis and its connection with nitrogen fixation to sodic conditions.

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Keyword: *natronophilic cyanobacteria, anoxygenic photosynthesis, nitrogen fixation, soda lake, sulfide*

Structure of Protist Communities in Two Stratified Water Bodies Separated from the White Sea Revealed with Metabarcoding

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There are many saline bays and lagoons on the Arctic coast of Russia. During the process of separation from the sea, these water bodies go through a stage where stable stratification occurs. These stratified water bodies are known as meromictic lakes. In many of them, the salinity in certain layers can exceed that of seawater, and anoxic conditions with a high concentration of hydrogen sulfide develop in the bottom layers. The meromictic lakes are very attractive for studying communities of microorganisms as they form vertically stratified multilayer biocenoses. We analyzed the vertical structure and diversity of protist communities in two stratified water bodies sampled using high-throughput 18S rDNA amplicon sequencing. We selected two water bodies at different stages of separation from the sea (Kandalaksha Bay, White Sea) in order to compare protist communities. One is a saline lagoon, Cape Zeleny (66°31'49"N, 33°05'55"E), on the Kislaya Bay. The salinity in some layers of the lagoon exceeds that of seawater. Water from the sea enters the lagoon with the tides. The second is Lake Trekhtzvetnoye (66°35'53"N, 32°59'97"E). It is not connected to the sea and has a surface layer of fresh water that is 2 m deep. Sampling and measurement of hydrological characteristics were done on 6 and 12 September 2021.

Water samples were taken from the surface to the bottom from various depths including an area with sharp physico-chemical gradients. Sequencing was performed using the Illumina MiSeq platform (Illumina, San Diego, CA, USA).

We revealed significant differences in the taxonomic structure of protist communities depending on stages of separation from the sea. In addition, differences were identified in the taxonomic composition of various horizons in each studied reservoir. A total of 8 eukaryotic supergroups, 20 divisions, 66 classes, 111 orders, 146 families and 246 genera have been identified. The largest number of ASVs (amplicon sequence variant) belonged to such supergroups as TSAR (the largest groups of eukaryotes, comprising Telonemia, Stramenopiles, Alveolata and Rhizaria), Archaeplastida, Cryptista, and Obazoa. Alveolata, Stramenopiles, Chlorophyta and Cryptophyta were dominant in the studied water bodies. Ciliophora dominated among Alveolata in Lake Trekhtzvetnoye and were especially abundant in the depths in the chemocline area, whereas in the saline lagoon, Dinoflagellata were predominant in the horizons near the chemocline. The obtained results provide insight into the taxonomy and diversity of protists in two meromictic water bodies.

The study was supported by the Russian Science Foundation (project No.24-24-00008).

Keyword: *saline bay, stratification, meromictic lakes, metabarcoding, taxonomy and diversity of protists*

H₂S and Physico-Chemical Microprofiles in an Organic-Rich Sediment

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In saline aquatic ecosystems, especially in organic-rich sediments, sulphur influences the dynamics of biogeochemical cycles as well as nutrient availability (Canfield et al., 1993). Oxidised and reduced forms of sulphur can act in many bacterial metabolic processes under oxic and anoxic conditions. In saline sediments, hydrogen sulphide is the main compound generated by the anaerobic decomposition of organic matter by microorganisms (Jørgensen, 1982). This gas can facilitate the mineralisation of organic compounds, contributing to sediment fertility and the support of benthic communities (Rysgaard et al., 1999). However, in high concentrations, H₂S becomes a toxic agent that can negatively affect biodiversity and ecosystem health (Diaz, 2001).

As a step towards understanding the functioning of biogeochemical processes and dynamics of the natural saline lake environment (saline lake ecosystems), an organic-rich sediment from the Pétrola saline lake (SE Spain) was exposed to polluted water. The aim of this study under lab conditions is to get more insight into the processes governing the fate of atrazine, the interferences of nitrate in atrazine behaviour and the evolution of physico-chemical and S-compound in the water-sediment interface. Three treatments were studied in triplicate, in aerobic and light-darkness conditions (T1, control; T2, atrazine addition; T3, atrazine and nitrate addition). Oxygen, temperature, pH, redox and sulphide microprofiles were measured from 1 mm above water-sediment interface up to 1,5 cm below interface.

This study showed high retention of the atrazine by the organic-rich sediments and an immediately atrazine biodegradation after adsorption into the sediment. Oxygen microsensor reported a well-mixed water column until reaching the interface, where the diffusion boundary layer is located and there is no net production or consumption, just a diffusive transport. Once the interface was exceeded, anoxia was reached in the first millimetre of depth in all treatments. Temperature was stable through the different microprofiles. The pH microsensors monitored alkaline values, with a slight decrease as the depth increased. Oxidising conditions were preserved in all water columns. As the water-sediment interface was exceeded, maximum reducing conditions appeared at 0.3 mm in T1, 2.7 mm in T2 and 1.5 mm in T3. H₂S microprofiling showed the zones of production and consumption of the compound. H₂S production started once anoxia conditions were well established (2 mm). In T1, accumulative production zone extended until the end (no consumption zone), while in T2 and T3 the consumption zone was reached at 9 and 9.5 mm, respectively.

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Keyword: *hydrogen sulphide, anoxic sediment, biogeochemistry processes*

Diurnal Changes in Three Extremely Shallow Soda Lakes in the Pannonian Basin (Hungary)**Anita Békésy**^{* 1,3}, **Attila Szabó**^{2,4}, **András Hidas**², **Xiao Yi Chen**^{1,2}, **Péter Dobosy**², **Tamás Felföldi**^{1,2}¹ *Department of Microbiology, Institute of Biology, ELTE Eötvös Loránd University, Pázmány Péter stny. 1/c., H-1117 Budapest, Hungary*² *Institute of Aquatic Ecology, HUN-REN Centre for Ecological Research, Karolina út 29., H-1113 Budapest, Hungary*³ *Institute of Genetics and Biotechnology, Hungarian University of Agriculture and Life Science, Szent-Györgyi Albert u. 4., H-2100 Gödöllő, Hungary*⁴ *Department of Aquatic Sciences and Assessment, Swedish University of Agricultural Sciences, Lennart Hjelm s v`ag 9, SE-75007 Uppsala, Sweden*

Soda lakes and pans are unique, multiple extreme environments. These shallow, moderately saline, permanently alkaline aquatic habitats have a great biodiversity and they are important feeding, resting and nesting places for water birds. Many of these habitats are extremely shallow with no characteristic shoreline vegetation, therefore they are named soda pans. Due to their shallowness and rapidly changing environmental conditions, soda pans could serve as a simplified model system to study the effect of environmental changes on aquatic life.

The aim of our study was to reveal the short-term changes of physico-chemical (temperature, pH, conductivity, dissolved oxygen, dissolved and total organic carbon) and biological parameters (ATP and chlorophyll-a content, microbial cell counts, carbon dioxide flux) in three adjacent shallow soda pans, located in the Pannonian Basin in Hungary. Sample collection and on-site measurements were carried out three times a day (at sunrise, early afternoon, after sunrise) at two parallel sites of each pan.

The water pH was relatively stable (around pH 9) due to the buffering effect of the high amount of dissolved carbonates, while the water temperature showed remarkable daily fluctuations (up to 15°C) comparing morning and early afternoon values. During the studied period the pans were continuous carbon dioxide emitters. Large differences were also observed in the planktonic microbiological activity (based on ATP content) among the samples and study sites. All these indicated that changing environmental conditions have fundamental effects on these shallow aquatic habitats even within a day.

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Keyword: *Soda lakes, short-term changes, Pannonian Basin, physico-chemical and biological parameters, Soda pans*

Unraveling the Sulfur Mass Balance in the Rapidly Evolving Salton Sea Evaporitic System**Caroline Hung**^{* 1}, **Charles Diamond**¹, **William Gilhooly III**², **Christopher Tino**¹, **Timothy Lyons**¹¹ *Department of Earth and Planetary Sciences, University of California, Riverside*² *Earth Sciences, Indiana University Purdue University Indianapolis*

The Salton Sea, California's largest lake, is a unique hypereutrophic, evaporitic system with a sulfate concentration eight times that of the average ocean (approximately 200 mM vs. 28 mM). Over recent decades, massive fish-kills due to upwelling of anoxic and euxinic (sulfidic) waters, coupled with sulfide volatilization, have led to local extinctions of aquatic species and odor nuisances reaching as far as the Greater Los Angeles Metropolitan area. Despite the sulfur cycle's significant role in environmental degradation and quality of life issues, management strategies have largely overlooked this crucial aspect. This study investigates the sources and sinks of sulfate in the Salton Sea, focusing on the changing sulfur cycle and its ecological impacts as the lake undergoes rapid shallowing and consequent redox shifts. We employed a comprehensive approach to track the sulfur mass balance across various compartments of the Salton Sea system, including in-situ measurements and isotopic analyses of lake water, sediments, porewater, tributaries, gypsum crystals during greentide (water column precipitation) events, and marginal crusts. Our methods incorporated analyses of sulfur species concentrations (sulfate and sulfide), $\delta^{34}\text{S}$ for sulfides and sulfates, and $\delta^{18}\text{O}$ for sulfates. Results indicate that sulfate in the Salton Sea water column ($\delta^{34}\text{S}_{\text{sulfate}}=4\text{‰}$, $\delta^{18}\text{O}_{\text{sulfate}}=14\text{‰}$) is influenced by groundwater inputs and dissolution of gypsum from the past lake bed as seen through porewater values ($\delta^{34}\text{S}_{\text{sulfate}}=9\text{‰}$). Tributary inputs ($\delta^{34}\text{S}_{\text{sulfate}}=-0.2\text{‰}$) also play a significant role, potentially carrying agricultural fertilizer signatures ($\delta^{34}\text{S}_{\text{sulfate}}=0$ to 4.5‰), as evidenced by sulfate $\delta^{34}\text{S}$ values slightly heavier than those of the Colorado River ($\delta^{34}\text{S}_{\text{sulfate}}=-18$ to -2‰), the ultimate natural source of sulfate into the system. Isotopic data reveal that sulfide diffusion from sediments is an important process, highlighting the critical role of microbially mediated sulfur cycling in this ecosystem and their contributions to marginal crusts ($\delta^{34}\text{S}_{\text{sulfate}}=6\text{‰}$, $\delta^{18}\text{O}_{\text{sulfate}}=16\text{‰}$) and gypsum crystals (10-20 microns in diameter; $\delta^{34}\text{S}_{\text{sulfate}}=7\text{‰}$, $\delta^{18}\text{O}_{\text{sulfate}}=16\text{‰}$) that precipitate across the lake surface in late summers. These findings provide crucial insights into the structure and functioning of the Salton Sea's sulfur cycle, demonstrating how it may respond to rapid climate change and anthropogenic water reduction pressures. Our research explores the intricate relationships between physical structure (lake shallowing), biogeochemical functioning (sulfur cycling), and ecosystem responses (redox shifts) in this dynamic salt lake environment. Moreover, our findings offer valuable insights into the sulfur cycle in evaporitic drying environments with dynamic redox states, potentially informing our understanding of similar biogeochemical processes at different points in Earth's history.

Keyword: *Isotope geochemistry, Sulfur mass balance, Evaporitic system, Gypsum, Redox*

Salinization Induces Biodiversity Loss and Cyanobacteria Dominance in Periphyton: A Salinity Gradient Experiment in Shallow Lake Mesocosms in Contrasting Climates

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Freshwater salinisation is a main threat to inland waters worldwide. Yet, its interactive effects with climatic variability are still not well understood, particularly so for key primary producers such as periphyton. Here we analysed the responses of periphyton biomass, composition and morpho-functional traits along a gradient of 16 salinities (0.5 to 50 ppt) mesocosm experiments in two climatic regions: cold semi-arid and warm Mediterranean. Salinisation induced drastic changes in periphyton biomass and composition, even within short salinity ranges, with similar responses in both climates. These changes included loss of taxonomic richness, with compositional replacement towards cyanobacteria dominance and an increased proportion of species with a higher surface-to-volume ratio (S:V). While species of green algae with low S:V were more sensitive to salinity and restricted to the lowest salinity levels, cyanobacteria species with high S:V better tolerated extreme osmotic stress and were dominant at higher salinities. These drastic effects of salinisation can lead to the oversimplification of the periphytic matrix, with potential impacts to higher trophic levels and primary production. Furthermore, the increased proportion of cyanobacteria can exacerbate the environmental threats driven by salinisation on the functions and services of inland aquatic ecosystems.

Keyword: *Freshwater salinisation syndrome, Global change, Benthic algae, morpho-functional traits*

**Effect of Heatwave on Water Clarity of Shallow Lakes under Different Salinities and Climatic Zones:
A Synchronized Mesocosm Experiment**

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Climate change induced salinization may have pronounced effects on the ecosystem structure and water quality of shallow lakes. Climate change is expected to intensify extreme heatwave events, which may further exacerbate pressures on shallow lake ecosystems, but little is known about heatwave effects in saline lakes. We carried out a factorial-designed mesocosm experiment to examine the effect of a heatwave (+6°C increase compared to the control at ambient temperatures for two weeks) crossed with two salinity levels (4 g/L and 40 g/L) in two climate zones: Ankara (cold-dry semiarid climate) and Mersin (warm Mediterranean climate). Each treatment was replicated four times, i.e. totally 16 mesocosms at each site. Each mesocosm (5 m³) consisted of 30 cm of natural sediment and a 120 cm water column. The mesocosms were inoculated with sediment, lake water, plankton, fish, and macrophyte communities collected from a set of freshwater and saline lakes with a corresponding range of salinities. The experiment was conducted from August 29 to November 3, 2022, consisting of (i) three weeks of ambient temperatures (pre-heatwave), (ii) two weeks of a +6°C heatwave (heatwave), and (iii) three weeks of ambient temperatures after the heatwave (post-heatwave). The control treatments were kept at ambient temperature during the entire experiment. Relevant physicochemical parameters (conductivity, temperature, salinity, Secchi disc depth, chlorophyll-a, and suspended matter) were measured twice a week. Water quality parameters (chlorophyll-a and suspended matter) were significantly higher at high salinity and in the warmer climate. The average chlorophyll-a concentrations during the pre-heatwave, heatwave, and post-heatwave phases were approximately ten times higher at 40 g/L salinity compared to 4 g/L salinity. Furthermore, chlorophyll-a concentrations were 90% and 40% higher in warmer Mersin than in colder Ankara for 40 g/L and 4 g/L, respectively. The average suspended matter concentrations during these phases were approximately twenty and ten times higher at 40 g/L salinities compared to 4 g/L salinities in Mersin and Ankara, respectively. Suspended matter concentrations at 40 g/L salinity in the warmer Mersin site were c. 2 times higher than that of the colder Ankara site. However, no difference in suspended matter concentrations at 4 g/L salinity was observed between sites. Overall, the heatwave treatment did not significantly impact the water quality parameters during the experiment. The experiment demonstrated a significant and potentially synergistic detrimental role of salinity and climate on lake water quality but without a pronounced effect of a heatwave.

Microbial Diversity in Oligo - and Polysaline Soda Lakes: An Emphasis on Microorganisms Involved in The Methane Cycle.

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Compared to hypersaline soda lakes of Kulunda Steppe (Russia), microbial communities of oligo- and polysaline soda lakes of this region have received very little attention to date. We look into the microbial diversity in the near-bottom water and upper sediments of lakes Tanatar IV with salinity of 3.75 g/L and pH of 9.9 and Tanatar V with salinity of 18.5 g/L and pH of 9.7. In both lakes, the majority of the bacteria were members of the phyla Pseudomonadota, Bacteroidota, Verrucomicrobiota, Mycoplasmatota, Actinomycetota, and Cyanobacteriota. Representatives of the phyla "Ca. Woesearchaeota" and Euryarchaeota prevailed among the archaea. Sequences affiliated with uncultivated members of different candidate phyla were discovered. The high abundance of cell-wallless mycoplasmas belonging to the orders Acholeplasmatales and "Ca. Izemoplasmatales" suggested that these bacteria reside inside the larvae of *Microchironomus* and *Ephydra* dominated in the sediments of Tanatar IV and Tanatar V, respectively. Mycoplasmas, however, were absent in microbiomes of both larvae. In *Microchironomus*, up to 50% sequences belonged to anaerobic organotrophs *Paraclostridium ghonii*, and up to 12% to cyanobacteria of the genus *Synechococcus*. In *Ephydra*, 30% sequences belonged to uncultivable filamentous sulfur-oxidizing bacteria *Thiothrix* sp., 24% to alkaliphilic purple nonsulfur bacterium *Rhodobaca* sp., 18.5% to facultative anaerobic haloalkaliphilic fermenters *Vagococcus fluvialis*, and cyanobacteria of the genus *Cyanobacterium* reached 7%. Microorganisms involved in the methane cycle have received our particular attention. Sediments of Tanatar IV were dominated by hydrogenotrophic (*Methanocalculus* and *Methanoculleus*) and acetoclastic (*Methanotrix*) methanogens. Methylophilic and methyl-reducing methanogens were also detected there. Lake Tanatar V was dominated by *Methanocalculus*-related hydrogenotrophic methanogens. Simultaneously, the overall diversity of methanogens was lower compared to Tanatar IV, and acetoclastic representatives were absent. Tanatar V had a larger abundance of methyl-reducing methanogens than the other lake, but both lakes had a similar proportion of methylophilic methanogens. In lake Tanatar IV, *Methylocystis*- (Alphaproteobacteria) and *Methylotheobacterium* (Gammaproteobacteria)-related aerobic methanotrophs predominated in the near-bottom water and sediments, respectively. In the Lake Tanatar V, only gammaproteobacterial methanotrophs were identified. The results of 16S rRNA profiling were consistent with the potential activities of methanogenesis and aerobic methane oxidation determined in incubation experiments. Therefore, an increase in salinity of 15 g/L resulted in an increase in methanogenesis on methylated compounds, a suppression of acetoclastic methanogenesis and aerobic methane oxidation, but had no effect on hydrogenotrophic methanogenesis. The work was supported by RNF (grant No 22-14-00038).

Keyword: *soda lakes, microbial diversity, methanogenesis, methane oxidation*

Environmental DNA as a Tool to Unveil Metazoan Diversity of Chilean Precordillera Hypersaline Lakes

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Saline and hypersaline wetlands are biodiversity hotspots for metazoan species such as aquatic invertebrates and wading birds. However, a combination of pressures from climate change and extractive processes is increasingly endangering this biota and the long-term ecological functioning of these ecosystems. With the goal of improving conservation efforts through state-of-the-art survey techniques in hypersaline ecosystems, this study tests the use of environmental DNA (eDNA) for metazoan biomonitoring. We employed a novel multi-assay approach (12S, 18S and COI) and also targeted two substrates – sediment and water – from three hypersaline lakes located in the Chilean Precordillera: Salar de Atacama (Laguna Puilar), Salar de Pujsa and Salar de Tara. We also compared eDNA outputs from water samples with conventional kick-net data to assess the potential for complementary approaches. Our eDNA analysis revealed a total of 21 and 22 taxa across the three Salars in sediment and water, respectively. Within both substrates, the highest diversity was found in Salar de Tara (15 taxa - sediment and 13 taxa - water). Our multi-assay design was able to detect a range of resident hypersaline taxa with different conservation status, spanning from rotifers (*Ecnemur*) to endangered snails (*Heleobia atacamensis*), to amphipods (*Hyalella*) and flamingos (*Phoenicopterus*). Macroinvertebrate presence/absence data derived from conventional kick-net surveys also indicated that Salar de Tara was the richest system. Compared to net-based assessments, eDNA analysis allowed more refined taxonomic assignments for copepods and ostracods, while certain taxa such as Ephydriidae or Hirudinea were not detected through molecular tests, likely due to poor performance of universal assays with these groups. Overall, this study provides evidence that eDNA is an effective tool to improve the accuracy of biomonitoring, and therefore able to refine conservation efforts, in hypersaline lakes. Given the high pace of research developments in the field of molecular ecology, eDNA has great potential to become a central actor in hypersaline bioassessments in the near future.

Keyword: *eDNA, molecular ecology, bioindicators*

First Record of Aquatic Invertebrate Diversity in Salt Flats Threatened by Lithium Mining in the Atacama Region, Chile

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In the Atacama region, a significant number of salars are concentrated in the north of Chile, lacking protection, which today is putting them at potential risk of disappearing. Most of these salt flats from the perspective of aquatic invertebrates are largely unknown, with few studies mentioning that the salt flats and lagoons of the Atacama region do not have *Artemia*, but there is no published information on the invertebrate community structure in the different salt flats of the region.

In the 1990s, François Risacher surveyed all the salt flats present in this region, focusing mainly on the geological and hydrogeological aspects, leaving a fairly complete list of the salt flats present in Atacama. However, more than 20 years have passed in which these sites have not been sampled again to monitor the state of these salars. In this way, the need arises to gather information on such an ignored group as the aquatic invertebrates present in these unique ecosystems. Faced with this problem, this study generated the first survey of information on the diversity of invertebrates present in five salt flats in this region.

A qualitative and semi-quantitative sampling of zoobenthos and zooplankton was carried out by taking water samples and surface sediment samples, respectively, for subsequent laboratory identification with a binocular stereomicroscope. Zoobenthos results indicated that copepods of the family Canthocamptidae were the predominant invertebrates at most sites. On the other hand, zooplankton showed the predominance of Ephyridae larvae for most of the sites and the presence of *Artemia* is reported for the Pedernales salt flat, previously considered without *Artemia*, and *Boeckella* for the La Laguna and Maricunga salt flats. The sites generally showed low diversity indices ($H' = 0.2 - 1.6$), as species richness in these environments tends to be low compared to other ecosystems globally. Salinity showed a negative correlation with species richness ($r = -0.63485$, $p < 0.05$), so it can be seen that at higher salinities the number of taxa tends to decrease, reaching 1 in some salars, which has been reported for other hypersaline environments.

Although this work marks a beginning in the study of invertebrates in the Atacama salt flats, a more detailed study is needed for each of the salt flats, using molecular tools to know in detail the species that make up these systems and to be able to make better decisions when protecting these ecosystems. In this way, samples will be obtained for sequencing invertebrate taxa in future sampling.

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Keyword: *Atacama region, Salar de Pedernales, Salar de Maricunga, Artemia, Ephyridae*

Environmental Drivers of Zooplankton Community Composition in Turkish Coastal Lakes

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Coastal or brackish lakes are understudied as compared to their freshwater counterparts. While salinity is an important driver of zooplankton biodiversity in these systems, with the removal of large cladoceran grazers such as *Daphnia* at salinities higher than 8 permille, the interactive effects of salinity with other environmental variables on zooplankton communities in these unique ecosystems are poorly understood. In this study, we examined associations between environmental variables and zooplankton community structure across 29 coastal lakes in the Turkish Mediterranean and Aegean region using multivariate methods. Our preliminary results show that differences in zooplankton species diversity and biomass between lakes were driven by differences in salinity, water temperature, maximum depth, nitrate concentrations, and lake maximum depth. *Artemia* and smaller cladoceran species were associated with higher salinities, while copepod nauplii were associated with higher water temperatures and dissolved oxygen. Our results suggest that these five variables and their interactive effect are important drivers of zooplankton community structure across Turkish coastal lakes.

Keyword: *Saline lakes, Coastal wetlands, Community composition, Zooplankton*

Diversity and Distribution of Bacterioplankton Community across the Depth and Thermal Gradients in Chernyshev Bay, former Aral Sea basin

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The Aral Sea, once the fourth largest inland body of water, has undergone dramatic shrinkage due to excessive water diversion for agriculture. This hypersaline lake represents a unique ecological scene to study the biogeography of extremophilic microorganisms and their response to the hitherto changing environment. This study aims to investigate the diversity and distribution of bacterioplankton across the depth and thermal gradients of the highly stratified northern extremity of Large Aral known as Chernyshev Bay. Water samples were collected in October 2022 at various depths – from 0 to 10 meters – within the Chernyshev Bay part that was fully separated lake at this time. Bacterioplankton community composition was assessed using high-throughput nanopore-based sequencing of the full-length 16S rRNA gene coupled with Emu, the expectation–maximization algorithm, to perform taxonomical classification of obtained reads. Furthermore, functional diversity of the microbial community was predicted using the PICRUSt2 software. Preliminary results indicate a positive relationship between alpha-diversity and sampling depth, coupled with distinct distribution patterns of haloanaerobic species, including sulfate-reducing, acetate-oxidizing, and chitin-utilizing microorganisms. Additionally, we have observed changes in the microbial communities that align with the thermal stratification in the deeper water levels, where an increase in temperature occurs at approximately 7 meters under the water surface. This research provides valuable insights into the biogeochemistry and functional diversity of bacterioplankton in the hypersaline environment of the former Aral Sea.

Keyword: *aral sea, bacterioplankton, archaea, biodiversity, 16S rRNA*

The Great Salt Lake Collaborative: How Journalists Moved the Needle on Public Awareness and Action

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In 2022, as Great Salt Lake (Utah, USA) reached its lowest levels in recorded history, a group of 19 news, education, and civic organizations came together to better inform and engage the public about the crisis. Since then, news competitors have become collaborators in their shared mission of solutions-driven journalism on Great Salt Lake issues, and they have received national recognition for their coverage and partnerships. In two years, the collaborative published more than 500 stories in statewide media, hosted community outreach events, and shared information through social and digital media. The collaborative's efforts have resulted in unprecedented visibility of Great Salt Lake issues and comprehensive coverage of actions taken to manage the crisis. Since the collaborative formed, significant efforts have been made in the state to address Great Salt Lake's water levels, and the collaborative has expanded to provide additional coverage on another key Western water crisis, the Colorado River.

Keyword: *solutions journalism, public opinion, great salt lake, case study*

Disappearing Ecosystem Services and Livelihoods of the Sambhar Salt Lake: A Swan Song of Vanishing Ramsar Site of India

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During last 50 yrs, the water-spread of the Sambhar Salt Lake, India has remained 47% of its original present in 1970s. If this 'unwise' overexploitation of the ecosystem services(ES) continues with the same pace, the lake may vanish in next 50 years from now. The population depending on the lake ES in last 30 years was definitely lesser which is clear by lesser number of private salt-producing operators. The population depending on ES is certainly, not only going to increase from current 34.38%, but also seems unstoppable. 30% of agricultural land will also become saline and barren rocky areas will increase by 5-7%. Human population growth rate in Ajmer and Nagour district is 18-21% in 10 years while in Jaipur district it is 27%. Hence, population will be almost double. Ground water level will almost be more than >80m after 50 years. Biodiversity will also be depleted along with serious imbalance of ecosystem. Resultant poverty in local communities, without any infrastructural facilities and alternative livelihood opportunity will lead to temporary/permanent migration to nearby cities. It is high time to take a sustainable immediate action to save it with long-term poverty reduction goal. In the year 2016, National green Tribunal of India has directed state government to take action on the over-exploitation of Ecosystem Services of Sambhar Lake which could well be defined as the 'environmental justice', based on the NEERI(2016) Technical Report but, lack of effective communication with policy-makers and practitioners and a gap in approach for supporting decision-makers has diluted the effective implementation of such an important decision. Though, local communities have won the case, they donot have a 'voice' in land-use decisions, or gaining effectiveness in identity and practices. However, it is important to note that supporting knowledge of socio-economic status, livelihoods, social difference, cultural values, more knowledge systems and impacts of change on people's lives is a necessary foundation for policy-making about Sambhar Lake. Deeper consideration of socio-economic aspects, land-rights and local perspectives of vulnerable communities by decision-makers is required. Suggestions like, 'trade-offs' in pro-poor and equitable ways by the governance with support of research tools suited for local contexts and need for decision on ecosystem services to include governance and politicians right from local to higher levels at various scales might work. Economic evaluation of ecosystem services and exploring the possibility of best suitable method like trades-off are need of the time.

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Keyword: Sambhar lake declining ES, Socio-economic survey of Salt lake

Estimating The Rate of Evaporation on Lake Urmia

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Lake Urmia, which is one of the six large super-saline lakes, is subject to drying conditions due to human activities and climate change. Evaporation is the cause of most water losses in closed lakes, and its proper estimation plays an important role in understanding the water balance of saline lakes.

In this study, a framework was applied to estimate the amount of evaporation from the water surface of Lake Urmia using ground and satellite data. The modified Penman equation was used to estimate the evaporation rate. The ERA5-Land reanalysis dataset was used as a meteorological input in the Penman equation. In order to derive a time series of lake surface water temperature, Moderate Resolution Imaging Spectroradiometer (MODIS) 8-day land surface temperature products (i.e., MYD11A2 and MOD11A2) were used. Also, a time series of lake area was produced using an image enhancement process and MODIS images.

The water activity coefficient was calculated using the field data of the concentration of the main ions in the lake water as the input of the PHREEQC software (using the Pitzer database), and its values were between 0.52 and 0.89. The evaporation rate was calculated with and without consideration of heat storage change by a one-dimensional simulation of the water temperature profile ($R^2 = 0.97$, $RMSE = 1.07$ °C) from 09/04/2016 to 12/31/2017. The results indicated that the amount of thermal energy stored in the estimation of the evaporation rate on Lake Urmia was insignificant (maximum 4 mm in annual amount and 4 mm in monthly amount). Therefore, the amount of evaporation was calculated by ignoring the amount of heat storage energy for the years 2014 to 2017. The maximum daily evaporation was approximately 6.7 mm during the simulation period, and the annual values were 930, 1003, 1002, and 976 mm/year for 2014–2017, respectively. The results of this study can help in the management and restoration of the lake.

Keyword: *Evaporation, Lake Urmia, Remote sensing, Pitzer equations, Penman equation*

Full-Spectrum Cytometry Analysis in Algal-Microbial Communities Development

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Developing spectral-based technologies to rapidly evaluate algal community dynamics is essential for ecological monitoring and engineering of synthetic algal-microbial communities. Traditional methods for studying these communities, such as microscopy and pigment analysis, are limited in throughput and resolution. Advancements in full-spectrum cytometry, however, offer high-throughput, multidimensional analysis of single cells based on size, complexity, and spectral fingerprints, providing more precise and comprehensive analysis than conventional flow cytometry. By measuring full emission spectrum from each cell, spectral cytometry can differentiate between intrinsic fluorophores, essential in phytoplankton research due to the diversity of algal pigments and their overlapping spectral signatures.

This work demonstrates the use of full-spectrum cytometry for analyzing synthetic algal-microbial communities, enabling rapid species identification and enumeration. The workflow involves recording individual spectral signatures from monocultures, utilizing autofluorescence, and creating a spectral library for further analysis. The library is then utilized in the analysis of a cyanobacterial mix (*Microcystis* sp., *Synechococcus* sp., *Synechocystis* sp.), demonstrating successful separation of not only taxonomically close species, but also smaller phytoplankton (0.2-2 μm). Next, in a synthetic consortium experiment, algal growth was monitored, with results from different cytometers – SONY ID7000, BD FACSAria and Amnis ImageStreamX – compared. In addition to successful identification of the components of the synthetic mix recorded using the spectral cytometer, low emission intensity dispersion throughout the experiment was revealed as well. Obtained results highlighted the advantages of the spectral virtual filter system for precise population separation and abundance tracking. This approach showed higher flexibility and accuracy in analyzing multi-component algal-microbial assemblages and tracking temporal changes in community composition.

Described technology, still in its early stages in phytoplankton research, offers significant potential for ecological studies applicable to saline and freshwater lakes research. With development of standardized spectral libraries, our work demonstrates improved characterization of algal communities, advancing research in synthetic biology and phytoplankton ecology.

Keyword: *full-spectrum cytometry, synthetic communities, nanopore-based sequencing, algal communities*

Sharing Saline Lake Stories Through Online Maps to Increase Awareness and Coordinated Conservation

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Brigham Young University

Saline lakes worldwide are experiencing rapid declines due to unsustainable water use and climate change. These shrinking water bodies pose significant threats to biodiversity, human health, and regional economies. While the collapse of each lake creates acute local environmental problems, the public is largely unaware of this global crisis. To better understand and communicate the severity of this issue, we employed remote sensing and geographic information systems (GIS) to analyze 35 years of Landsat data for multiple saline lakes around the world. By extracting annual shoreline changes, we developed interactive maps that visualize the dramatic transformations these lakes have undergone. We have integrated these maps into a publicly accessible website that tells the unique story of each lake, raising awareness about the challenges they face. Our goal is now to engage researchers, managers, and educators to share their "saline lake stories" from lakes around the world. We invite you to participate in this effort to highlight the challenges and progress for your endorheic lake to increase awareness and inspire collaborative action to restore and protect the Earth's terminal lakes.

Keyword: *Saline Lakes, GIS, Landsat*

Response of Littoral Epilithic Communities to Climate Warming: an in-situ Warming Experiment Design**Onat Arıkan***, Korhan Özkan*Middle East Technical University, Institute of Marine Sciences*

Global warming and increasing anthropogenic pressures have severe effects on aquatic ecosystems, resulting in biodiversity degradation and reduced ecosystem services. Littoral communities, situated at the interface of land and water, play a key role in aquatic ecosystem functioning. Hence, a comprehensive understanding of how these communities respond and adapt to climate change is helpful for better ecosystem management. We designed a novel in-situ experimental setup, consisting of a set of heated plates and reference plates that enables to monitor epilithic communities. The setup consists of reference plates equipped with temperature sensors to monitor ambient temperatures as well as heated plates equipped with temperature sensors and heating elements. The entire system is connected to an Arduino based controller and data-logging system enables a dynamic heating based on the reference natural temperatures and desired heating offset. The heating is achieved by electrical heating cables with 75 W / m capacity installed into the channels engraved on bottom of the plates. The plates are manufactured from natural travertine stones, measuring 37.5 cm x 32 cm x 3 cm. The plates were embedded in a polyester frame and an extra layer of natural stones with dimensions of 4 cm x 4 cm x 1 cm were placed on top of the heated plates for easy sampling of epilithic communities. The experimental design enables manipulations of habitat structure and trophic interactions as well as experimental warming and it can be applied to various aquatic ecosystems to investigate effects of global warming on littoral epilithic communities. The pilot trials have been conducted in the semi-enclosed harbor of the Institute of Marine Sciences at Middle East Technical University, East Mediterranean, Turkey and the first results will be presented. Overall, we hypothesize that climate change will induce significant shifts in community composition and ecosystem function of littoral ecosystems, which is further modulated by habitat structure and trophic interactions.

Keyword: *Climate Change, Warming, Epilithic Communities, Experimental Ecology*

Conservation Planning for Endemic Freshwater Fish in the Konya Closed Basin: Assessing Habitat Loss and Climate Change Impacts

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Protecting and managing biodiversity can be achieved through the establishment of conservation areas that limit human activities, aiming to mitigate habitat loss, protect endangered species, and safeguard ecosystem services. Creating a network of protected areas has proven to be an effective strategy for biodiversity conservation and management. In this study, we focused on endemic freshwater fish species in the Konya Closed Basin, utilizing data from various sources along with field studies conducted between 2012 and 2022. Species distribution modelling (SDM) was employed to determine the current distribution of these species and to predict their potential ranges for the period 2081-2100, based on the CMIP6 climate model. We analyzed current and future species distributions, considering temperature and precipitation trends in the region, to propose conservation areas. Based on the SDM analysis, identified protected areas for species that are currently threatened by pollution, drought, salinization, dam construction, irrigation, and water extraction. These areas were selected to safeguard species that are expected to be negatively impacted by climate change and are predicted to lose their suitable habitats.

Keyword: *Species distribution modelling, endemic freshwater fish, climate change, conservation*

Assessing the Combined Effects of Salinization and Climate on Shallow Lake Ecosystems through Synchronized Mesocosm Experiments

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The rising issue of freshwater salinization, intensified by local factors and climatic events, threatens aquatic biodiversity. To investigate the separate and combined effects of salinization and climate on shallow lakes, we conducted a synchronized mesocosm experiment in two distinct climatic regions of Türkiye: Ankara (cold-dry semiarid) and Mersin (warm Mediterranean). The experiment featured a gradient design with 16 salinity levels (ranging from 0 to 50 g/L) over eight months (September 2021 to May 2022), divided into three phases: salinization (daily increase in salinity), stable, and desalinization (decrease in salinity). Generalized additive models and random forest methods were used to assess the isolated and combined impacts of salinity and other factors on turbidity and nutrient levels during the stable phase. Both experimental locations showed a unimodal turbidity pattern, with the clearest water occurring at mid-salinity levels (10-30 g/L). Lower and higher salinity levels led to increased turbidity, driven by high chlorophyll-a and suspended solids at high salinity and inorganic suspended solids at low salinity. The distinction between clear and turbid states was influenced by total phosphorus, suspended solids, and salinity levels. Chlorophyll-a levels were primarily affected by total nitrogen, followed by soluble reactive phosphorus and salinity. High levels of total phosphorus and nitrogen were observed at both low and high salinity levels, primarily associated with turbidity-related variables. Salinity was a key factor, ranking fourth for total nitrogen and first for nitrate. Nitrate levels were also influenced by temperature and alkalinity. Our results demonstrate that salinization directly impacts turbidity, partly because fish could not tolerate salinity levels above 17 g/L, and indirectly affects nutrient dynamics. Additionally, climate plays a crucial role in nitrogen dynamics. Our study underscores the detrimental effects of increasing salinity on shallow freshwater ecosystems, with consequent impacts on biodiversity, ecosystem functions, and services. Therefore, mitigation measures should be adopted to ensure adaptation to salinity changes.

Keyword: *Freshwater Salinization, Nutrient dynamics, Eutrophication, Climate change, Turkish lakes*

Comparing AI Supported Imaging Flow Cytometry with Classical Microscopy to Quantify Phytoplankton Responses to Experimental Salinization.

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Phytoplankton are crucial primary producers in aquatic ecosystems. The classical microscopy method of identification is time-consuming and requires in-depth taxonomic skills. High-throughput, image-based flow cytometry techniques have the potential to drastically reduce the time needed to analyse phytoplankton and allow analysis of live plankton. Immediate analysis of live plankton is a major advantage to classical approaches, as it allows researchers to quantify organisms that do not fix well (or at all), such as naked ciliates, and delicate structures like colonies that otherwise escape detection, but are often critical for understanding the systems they exist in. However, the large volume of image data generated by imaging flow cytometry, such as by the FlowCam (YOKOGAWA) used in our study, requires a significant post-processing time investment, even if the provided VisualSpreadsheet software is used. By incorporating artificial intelligence (AI), we expect to enhance precision and uniformity of phytoplankton classification by facilitating fast, high-throughput, and AI-supported analysis. This study aims to (i) evaluate the effectiveness and precision of the FlowCam technique compared to microscopy identification, (ii) incorporate AI for classification, and (iii) validate the latter using the microscopy identification and quantification data. For that purpose, phytoplankton samples were collected from a mesocosm experiment conducted within the EU H2020-INFRAIA project AQUACOSM-plus (No. 871081) and TÜBİTAK 232 programs in 2021 at the METU Mesocosm System II, Türkiye, where the effect of 16 salinity concentrations was tested on the structure and function of lake ecosystems. Phytoplankton samples were processed by classical microscopy and FlowCam to compare taxonomic groups and morphological traits. To automate taxonomic identification from FlowCam images, we constructed a machine learning model, which was trained and tested with different sets of annotated FlowCam data from the experiment. By utilizing high-throughput imaging technology combined with imaging pipeline and AI models, and comparing the results with classical microscopy, our research validates phytoplankton identification through FlowCam and paves the way for an accessible, open-source imaging technique.

Keyword: *Phytoplankton Classification, High-throughput Flow Cytometry, Artificial Intelligence (AI), Mesocosm Experiment, FlowCam (YOKOGAWA)*

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