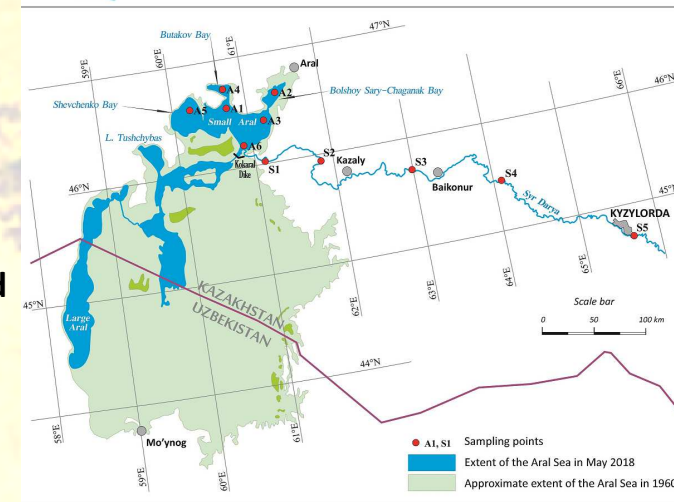


Differentiation of biotopes and biocoenoses of Small Aral Sea and lower course of Syr Darya River Spring survey 2018

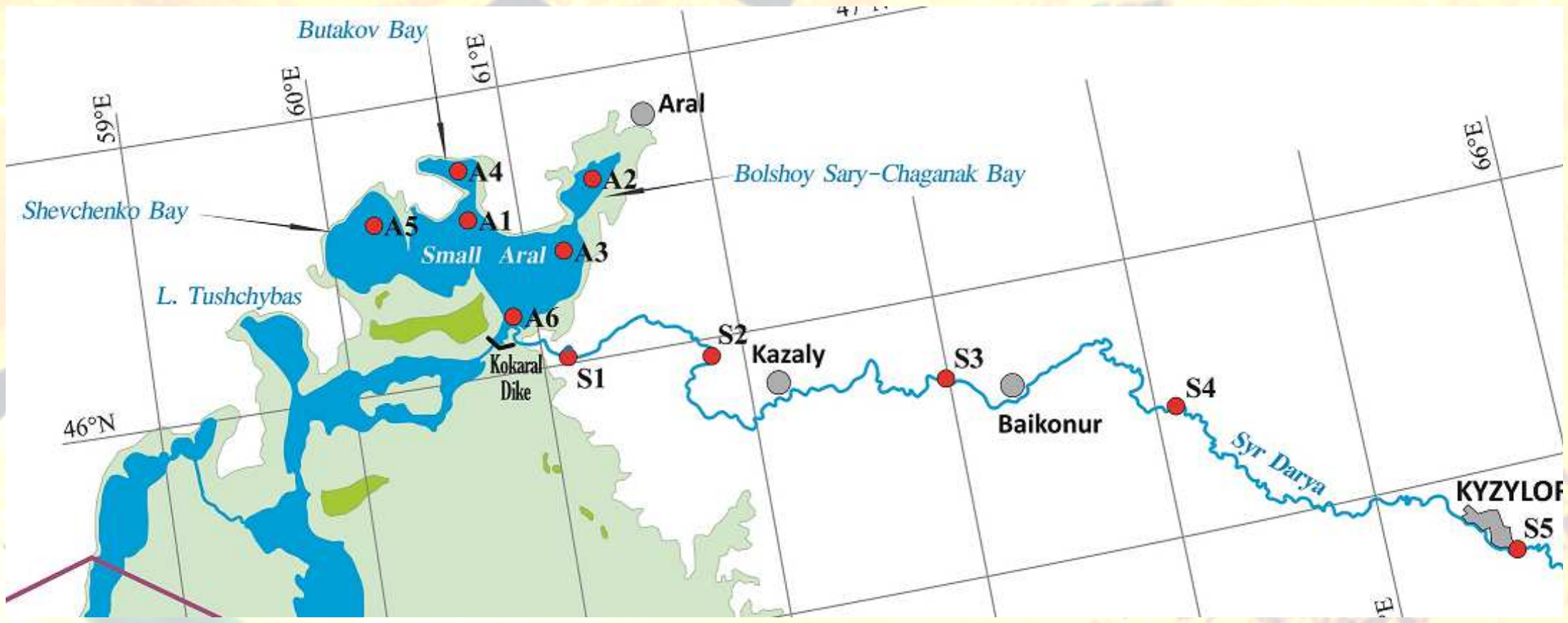
Klimaszyk P., Marszelewski W., Rzymiski P., Kuczyńska-Kippen N., Szelaąg-Wasielewska E., Borowiak D., Nowiński K., Niedzielski P., Baikenzheeva A., Kurmanbaev R., Aladin N.V.

SURVEY – MAY 2018



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Kyzylorda State University, Kyzylorda, Kazakhstan
Laboratory of Brackish Water, Russian Academy of Science, St. Petersburg, Russian Federation

Study Site



Methods



Sampling and analyses



Up to 500 m from the shore line

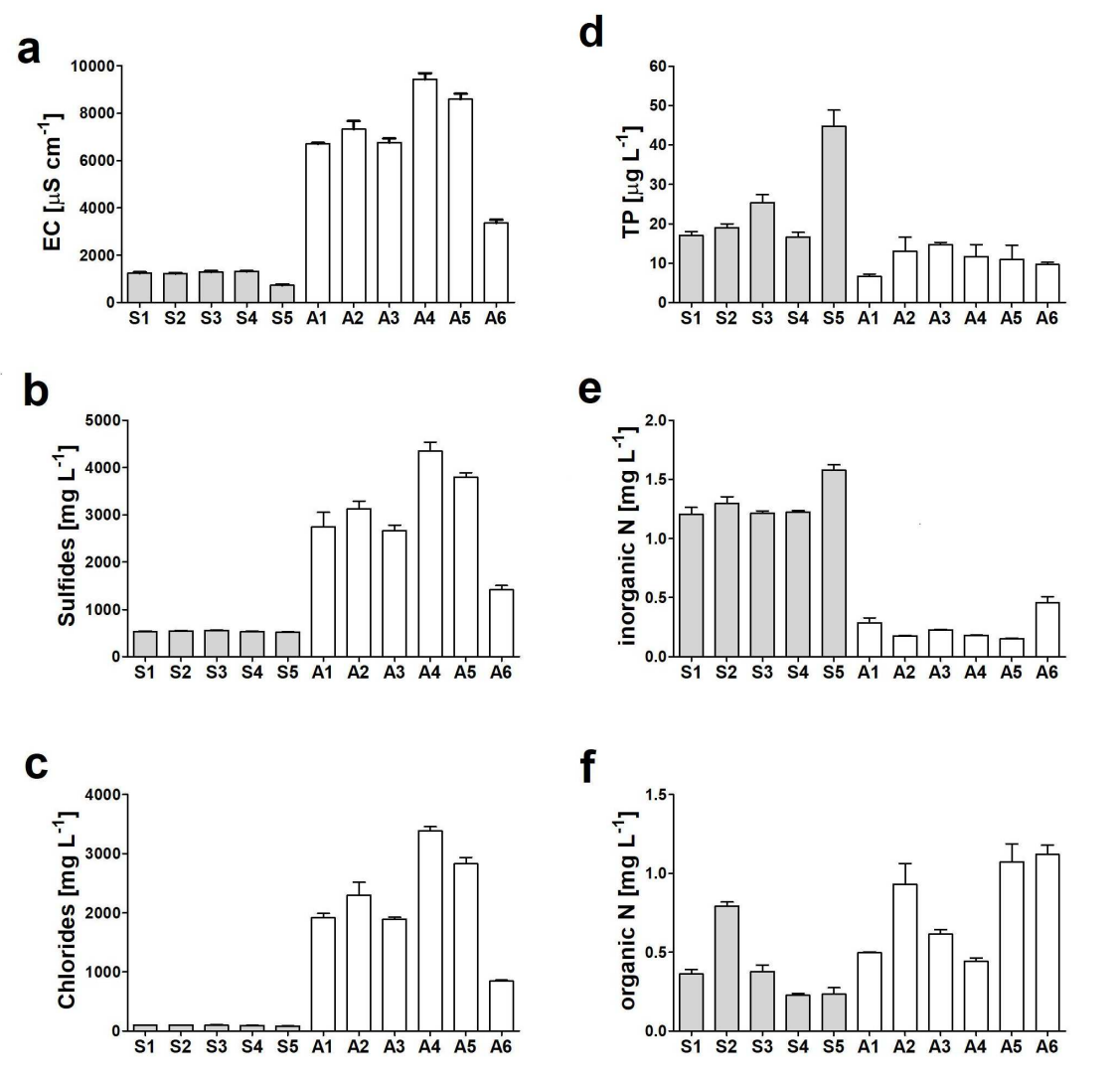
Surface water - at the depth of 0,5m

For chemical analyses samples were preserved with chlorophorm and nitric acid

For zooplankton samples were concentrated with plankton net - mesh size 45 μ m

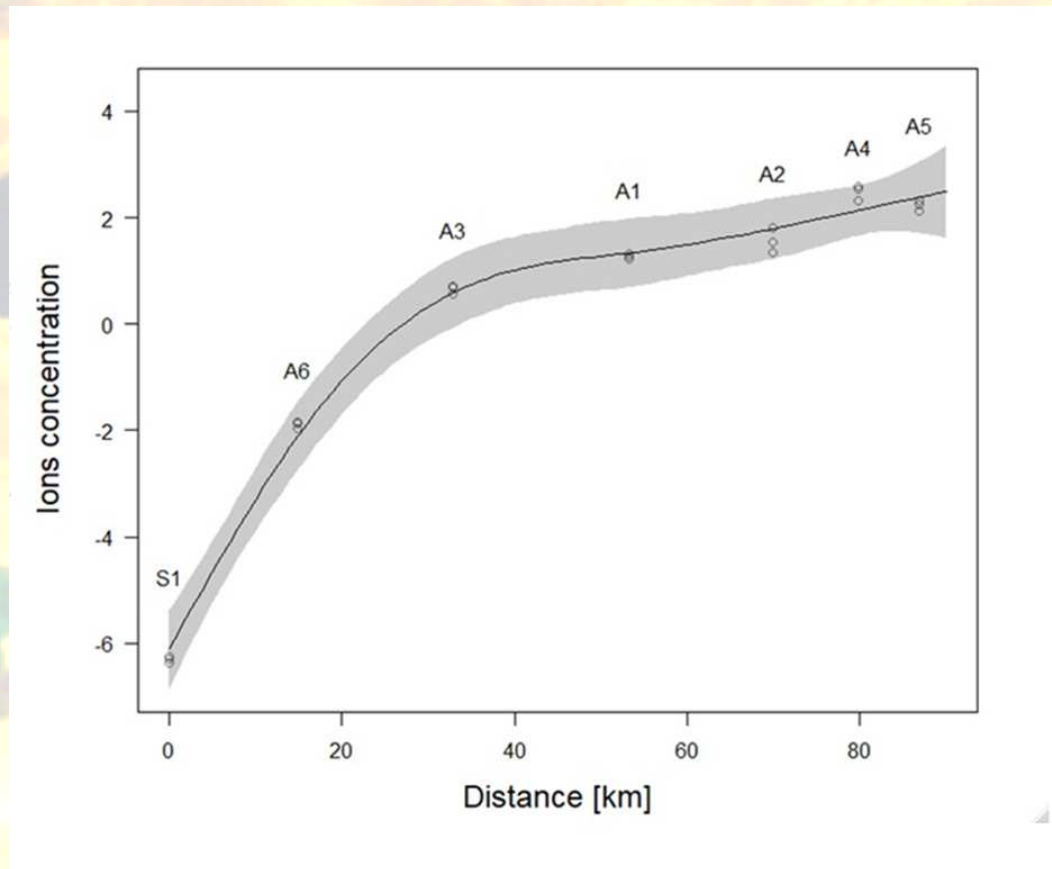


Results



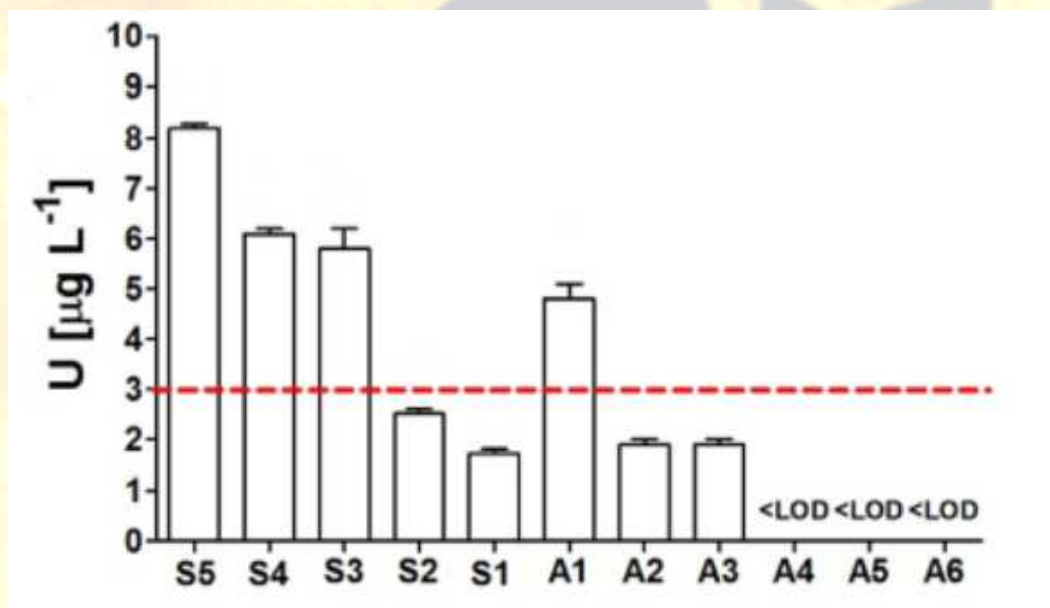
The mean and SD of electrical conductivity (a) and concentration of: sulfides (b), chlorides (c), total phosphorus (d), inorganic nitrogen (e) and organic nitrogen (f) in Syr Darya River (S1-S5) and Small Aral Sea (A1-A5)

Results



Relation the Small Aral Sea water ions concentration and salinity to the distance to the Syr-Darya estuary (S1)

Results



The mean±SD concentration of uranium in the Syr Darya River (S1-S5) and Small Aral Sea (A1-A6). The red dotted line indicates the WHO guideline level for drinking water.

WHO level Al, As, B, Ba, Cd, Cr, Cu, Ni, Pb, Sb, U rare-earth elements Ce, Eu, Er, Gd, La, Nd, Pr, Sc, Sm, Dy, Ho, Lu, Tb, Tm, Y, Yb

Pollution with trace elements and rare-earth metals in the lower course of Syr Darya River and Small Aral Sea, Kazakhstan

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HIGHLIGHTS

- Pollution of Syr Darya River (SDR) and Small Aral Sea (SAS) was studied.
- Waters of SDR exceeded WHO guideline values for Al, As, Cd, Pb and U.
- No pollution with Hg and Sb was detected.
- Concentrations of B, Ba, Cr, Cu, Ni and Se fall below WHO guideline levels.
- Increased levels of REEs, particularly Pr, Ce and Nd, were found in SDR and SAS.

ARTICLE INFO

Article history:
 Received 2 May 2019
 Received in revised form 19 May 2019
 Accepted 5 June 2019
 Available online 7 June 2019

Handling Editor: Paweł Oleczak

Keywords:
 Aral Sea
 Syr Darya
 Toxic metals
 Arsenic
 Rare-earth elements
 Kazakhstan

ABSTRACT

Over recent decades the Aral Sea has faced a major human-driven regression leading to environmental, economic and health impacts. Previous research has indicated that its region may be highly polluted yet there is little recent data to assess the scale or nature of the pollution. The present study investigated the concentration of elements for which the World Health Organization (WHO) has established guideline levels (Al, As, B, Ba, Cd, Cr, Cu, Ni, Pb, Sb) as well as 16 rare-earth elements (Ce, Eu, Er, Gd, La, Nd, Pr, Sc, Sm, Dy, Ho, Lu, Tb, Tm, Y, Yb) in the Small Aral Sea (SAS) and its inflow, the Syr Darya River (SDR). The latter displayed increased levels of Al (mean 351 µg L⁻¹), As (35.8 µg L⁻¹), Cd (2.8 µg L⁻¹), Pb (10.1 µg L⁻¹) and U (4.9 µg L⁻¹), exceeding the guideline limits at selected sites. In the SAS these limits were exceeded at certain locations in the case of As and U. The total mean concentration of REEs in the SDR and SAS amounted to 22.6 and 61.7 µg L⁻¹, respectively, with Pr, Ce and Nd constituting the greatest share. The concentrations of B, Ba, Cr, Cu, Se and Ni were below the WHO guideline levels at all studied sites while Sb and Hg were always below detection limits. This research provides an updated status on the levels of contamination of the surface waters in the ecological disaster zone of the Aral Sea in Kazakhstan.

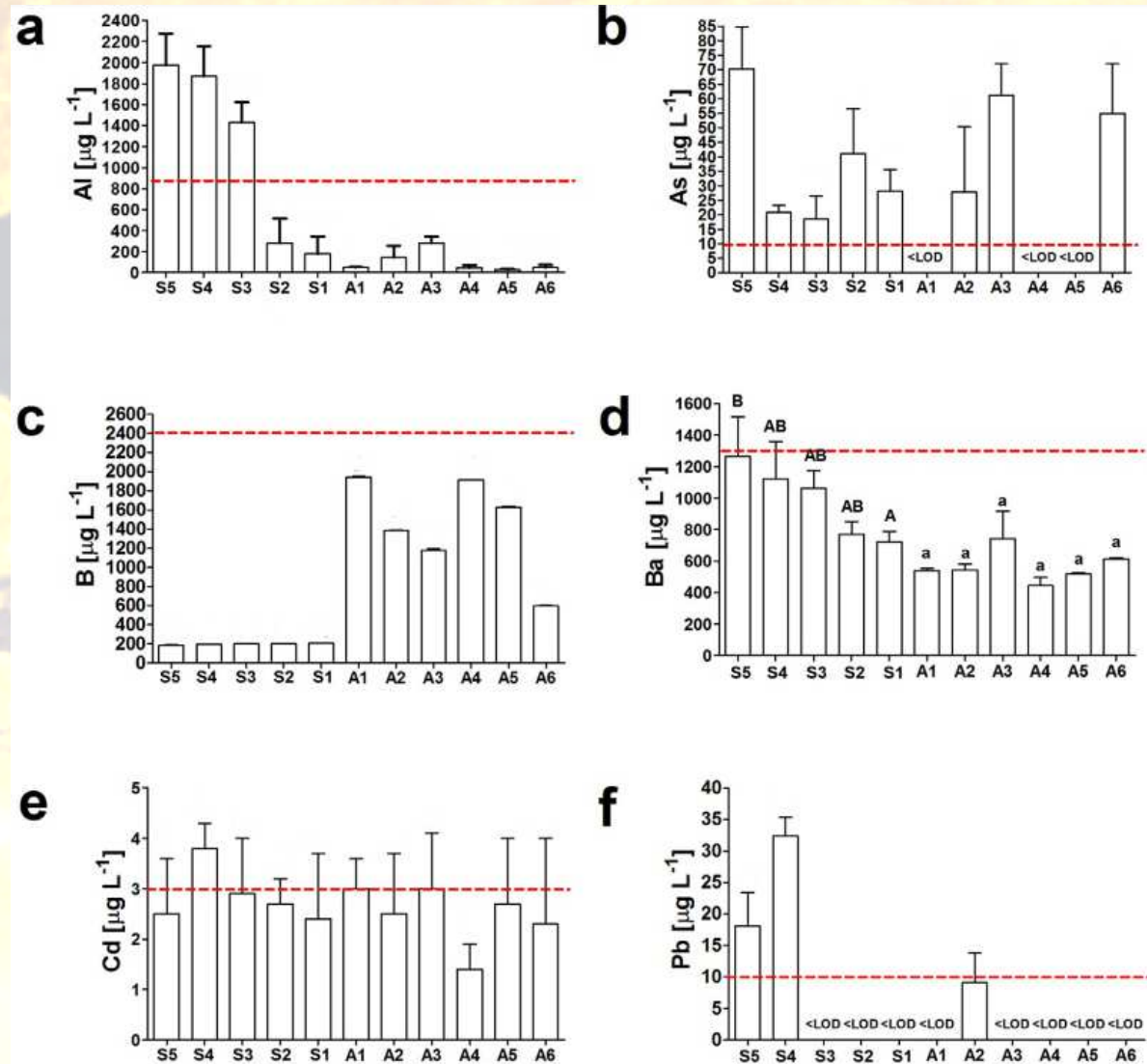
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1. Introduction

In the last century, the Aral Sea, once the fourth largest lake on Earth, experienced an unprecedented human-driven regression initiated by decisions to divert its two feeding rivers, the Amu Darya and the Syr Darya, mainly for the irrigation of cotton and rice

Abbreviations: ICP-OES, inductively coupled plasma optical emission spectrometer; LOD, limit of detection; REE, rare earth element; SAS, Small Aral Sea; SDR, Syr Darya River; WHO, World Health Organization.
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 E-mail address: rzymkipiotr@ump.poznan.pl (P. Rzymki).

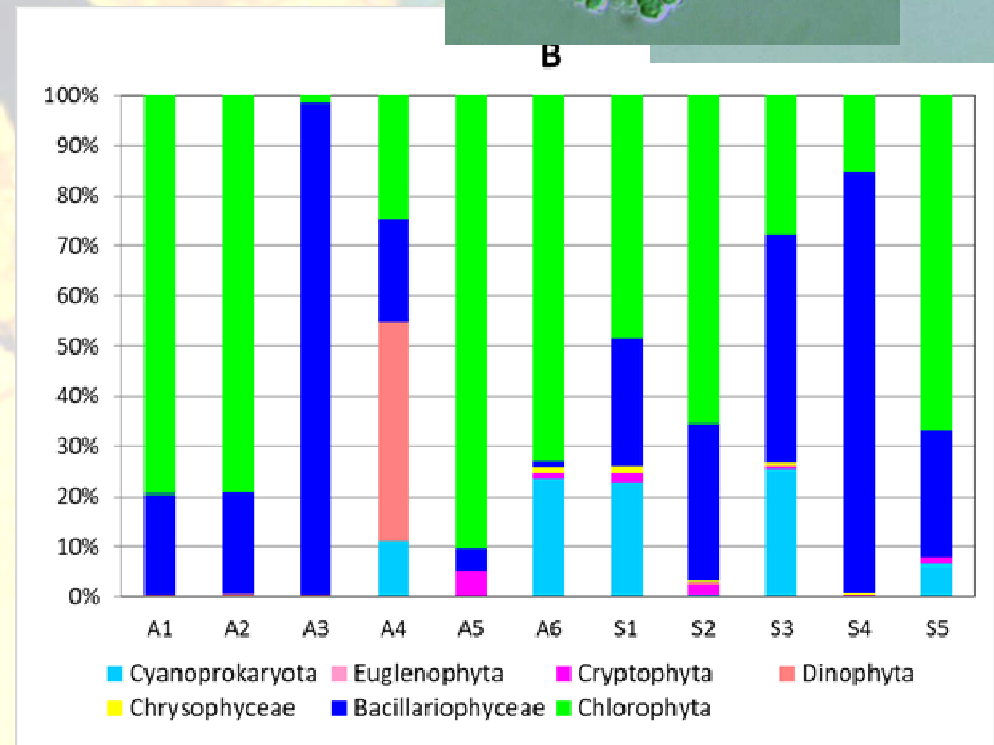
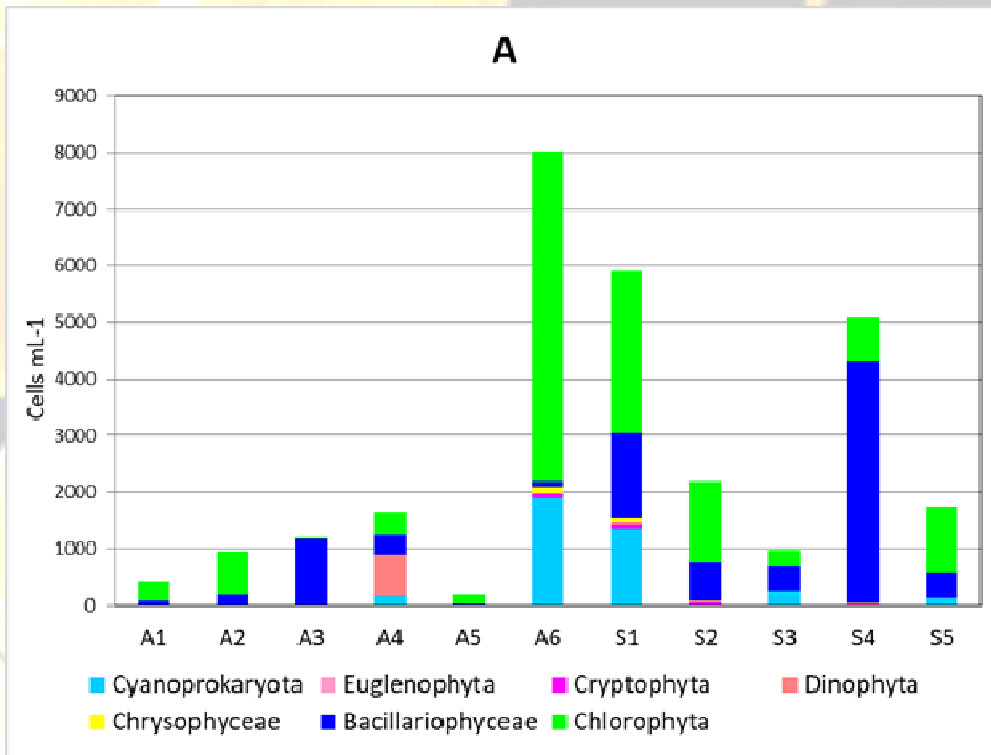
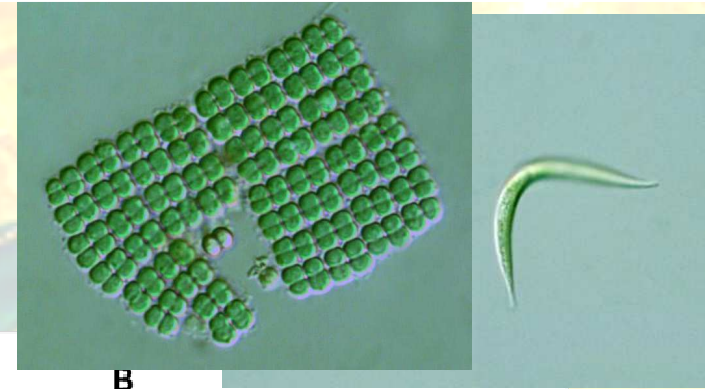
Results



The mean \pm SD concentrations of Al (a), As (b), B (c), Ba (d), Cd (e) and Pb (f) in the Syr Darya River (S S1-S5) and Small Aral Sea (A A1-A6). The red dotted line indicates the WHO guideline level for drinking water.

Results

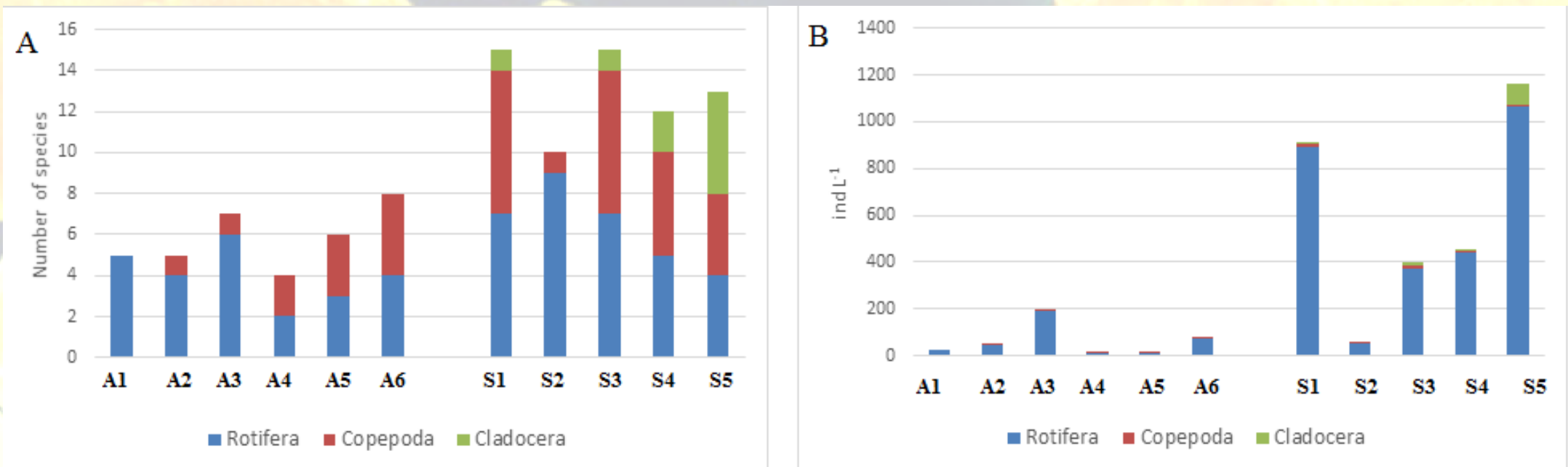
PHYTOPLANKTON SURVEY



A abundance (cells mL⁻¹) and B share (%) of taxonomic groups of phytoplankton in the Small Aral Sea and Syr Darya River

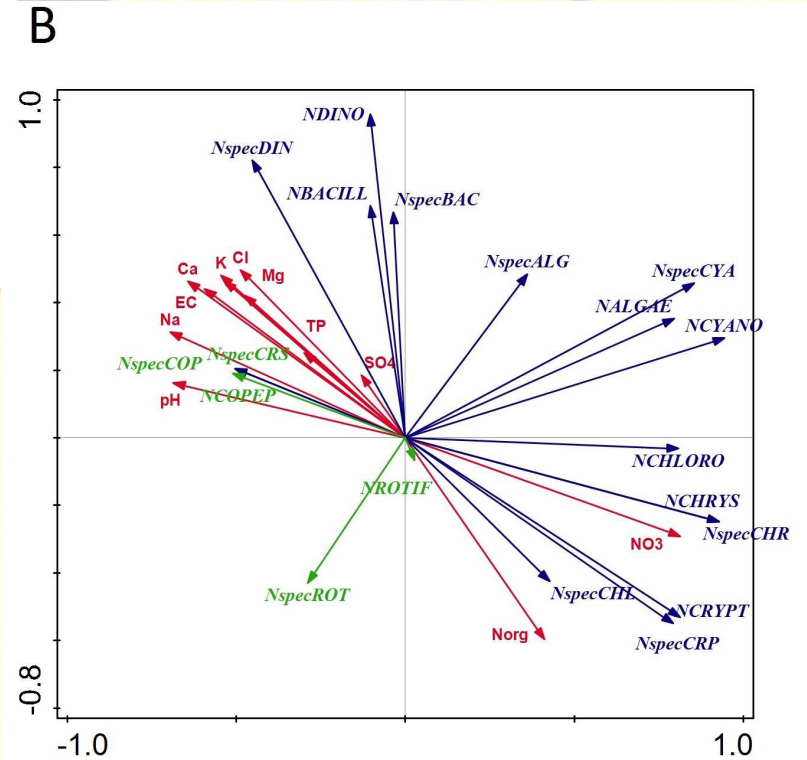
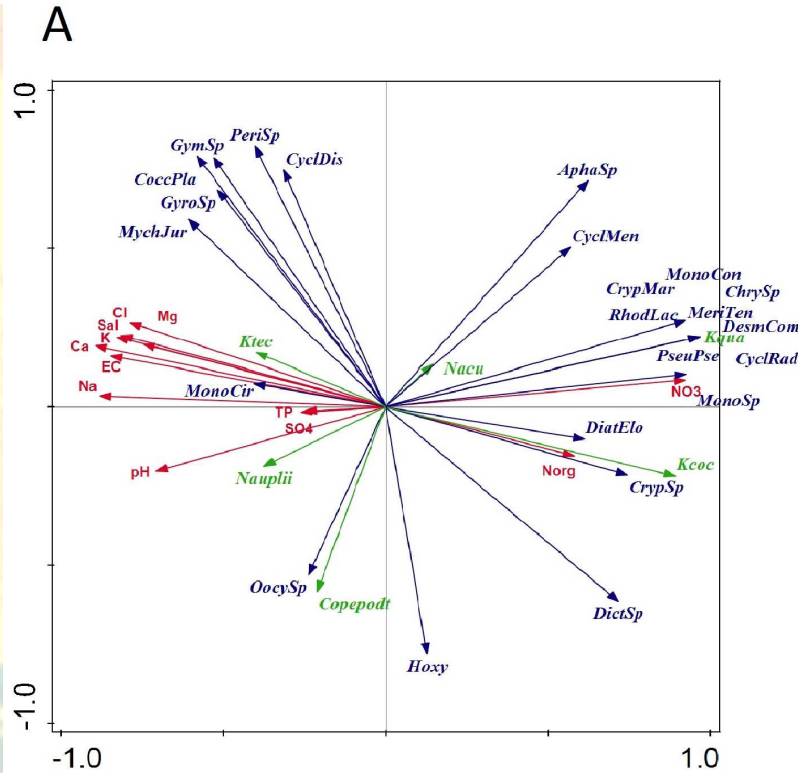
Results

ZOOPLANKTON SURVEY



The number of zooplankton species (A) and the densities (ind L⁻¹) of zooplankton communities (B) in the Small Aral Sea (stations A1-A6) and in Syr Darya River (stations S1-S5)

Results



Principal Component Analysis (PCA) diagram showing relation between water chemistry (red arrows) and: (A) zooplankton (green arrows) and phytoplankton (blue arrows) taxa density, (B) zooplankton and phytoplankton groups density and groups species richness

Conclusions

Small Aral Sea is very dynamic ecosystem, and changes in biotopes and biocoenoses occurs in:

- long term scale
- seasonal scale
- horizontal scale

Temporal and spatial patterns of functioning of biotope and biocoenoses of the Small Aral Sea depend on the water balance of the ecosystem (amount of freshwater supplied by Syr Darya vs rate of evaporation)



Present trophic status of the Small Aral Sea is low, however chemical composition of Syr Darya water must be monitored

The unique ecosystem of Small Aral Sea needs more detailed biological and hydrochemical studies. The quality and quantity of many groups of organisms are completely unknown

THANK YOU FOR THE ATENTION

