CLIMATE CHANGES ADAPTION INTERVENTIONS OF THE KUNE-VAINI LAGOON SYSTEM - ECOLOGICAL APPROACH

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MSc Research Program is set up between the departments of Biology and Chemistry, FNS, UT, focused in the ecological approach of the Kune-Vaini lagoon system (Lezha). The Program is covering the monitoring of three important biotic components: Phytoplankton, Zooplankton, and Aquatic plants (Macrophytes), all in response to Kune-Vaini Project intervention (tidal channel). It goes in parallel with monitoring of physical and chemical parameters, nutrients (N & P) and chlorophylls. 5 Msc students are working with each separate part of the program: 3 from MSc course Environmental Biology, and 2 students from MSc course Chemistry, each supervised by at least one expert in mentioned fields.

The joint field trips are organized in groups of botanists, zoologists and chemists, tutors and students together, bimonthly, in July, September, November 2018, and in January and March 2019; it will continue to July 2020. At least **5 sites** are visited within the Kune-Vaini system (Ceka, Zaje and Merxhani) (*see* Fig. 1 & 2). It is quite important the training of the young researchers on the correct application of respective EU standards for all selected parameters, either in the field or in the lab.

Chemistry: General physic-chemical and chemical parameters determined in all mentioned stations are: Water Temperature, pH, Conductivity, Salinity, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Dissolved Oxygen, Biological Oxygen Demand, Total Phosphorus, Reactive Phosphorus, Nitrate, Nitrite, Ammonium, Chlorophylls, Total Hardness, Calcium, Magnesium, Sulphate, Chloride, and Heavy Metals. Water analyses are conducted by using standard methods reported on APHA/AWWA (2017) and EPA (1971); several instruments are used eithe in the filed or in the lab: Multi-parameter, UV-VIS Spectrophotometer SHIMADZU 2401, VWR UV-1600 PC, Analytic Jena Atomic Absorption Spectrometer NOVAA 400, Thermostat at 105±5°C, etc.

Physic-chemical parameters, such as temperature, pH and conductivity are measured *in situ*; while the other parameters were analysed in the lab. Water samples are filtered soon in the lab, and preserved according APHA/AWWA (2017); most of the parameters are analysed within one week, except the heavy metals and chlorophyll that are planned to be analysed later.

Phytoplankton approach: Water samples (200 ml) are taken at about 0.5 m of depth (using the Ruttner bottle, 2 L) for the quantitative assessment of plankton algae (cells/ml), using an inverse microscope OPTICA; samples were preserved with Lugol's solution (Utermöhl, 1958; EN 15204-2006). Also net samples are collected for qualitative analyses (mesh size 25 μm), preserved in formaldehyde (up to 4%). Diatom frustules are cleaned by boiling in H_2O_2cc, and permanent slides are prepared using Naphrax (index 1.73) (http://www.brunelmicroscopes.co.uk/naphrax.html; EN 14407:2004). Examinations and photos are carried out using the light microscope Motic BA310, with the Motic camera (CMOS 1/2" 3MP – 2048 x 1536 pixel). Determinations of species is going on using Hallegraeff *et al.* (2004), Krammer & Lange-Bertalot (1986-2005), Trégouboff & Rose (1957), Witkowski *et al.* (2000), Moestrup (2004), Sournia (1978), Guiry & Guiry (2019), etc. The checklist list of microscopic algae in plankton will be prepared, focused mainly in the most dominant or also harmful species. Also ecological considerations will be given, related with the primary productivity and water trophy of different wetland basins.

Macrophytes: Submersed macrophytes are collected following the protocol suggested and used by ISPRA in Italian lagoons (i.e. ISPRA, 2010; Sfriso & Facca, 2010). Sampling is performed according to 20-30 m radius plots, where 10 representative samples of submersed macroalgae present are collected at random, using a long-tail garden rake handled by the boat. Depending on the rake number that would get algae, the percentage of algal cover is assessed. Meanwhile, the angiosperms present are also identified. All the taxa are sorted and examined fresh when possible, or after fixation up to 4% formaldehyde, by means of a stereomicroscope Motic, and a light microscope Motic BA310, both with digital cameras. An appropriate literature is used for species determination: Al-Yamani *et al.* (2014), Bertuccio (2013), van der Valk (2012), etc. Collected algal specimens and angiosperms are dried in Herbarium, too.

Macrophyte Quality Index will be calculated using: Macroalgae taxa present, identified at species level; percentage coverage of macroalgae; relative abundance of the dominant macroalgae; taxa of marine phanerogams present, identified at species level and percentage coverage of individual species. In addition, during next spring period samples will be taken along the shoreline, at a distance of about 100 m both for the identification of aquatic and terrestrial flora.

Zooplankton approach: Samples are collected using a plankton net (diameter 25 cm and mesh size 55 μm) and Ruttner bottle (2 L); in total 6 L of water is filtered for quantitative approach; moreover, net samples of horizontal and vertical tows, and sediment samples are collected, all in two replicas. The samples are preserved in formaldehyde 4% and examinations are carried out using the stereomicroscope OLYMPYS CZX9. Determinations of species is going on using the keys: MAATTM & ICRAM

Ed. (2006), Rampi & Zattera (1982), Trégouboff & Rose (1957), etc. The preliminary data shows that the holoplankton community results in a low species diversity, consisting of marine neritic species, that mostly belong to the groups: Foraminifera, *Ciliophora (Tintinnida) Rotifera* and *Copepoda*. Numerically the zooplankton community was dominated by nauplius larvae. The planktonic larvae of bivalve and annelida are common in meroplankton, where the bivalve were dominant. This approach will consolidate the reported data on species abundance, fluctuations and interspecies relations during different seasons in the lagoon system.

Additional parameters are assessed in parallel by other master students of Environmental Biology course, i.e. microbiology (coliforms and heterotrophes), waterbirds, terrestrial higher flora and vegetation, phytobenthos: diatoms, meiobenthos: invertebrates, organic compounds, and microplastics. It will help to have a better view in our ecological approach of the whole Kune-Vaini wetland complex.

This Program is based on the Agreement between the Ministry of Tourism and Environment and UT, aiming to support students and strengthen long-term capacity of both partners on ecosystem based Adaptation under the project 'Building the Resilience of Kune-Vaini Lagoon System through Ecosystem based Adaptation' (Kune-Vaini project), founded by UNEP, GEF and Albanian Government. This project aims to increase the resilience of Kune-Vaini Lagoon system and communities living nearby it through the implementation of a portfolio of adaptation measures with focus on ecosystems (http://kunevain.com/).

Keywords: Lezha lagoons, Kune-Vaini project, master program.

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Figure 1. Sampling stations in Kune-Vaini lagoon system (Lezha, Albania) within Kune-Vaini Project (http://kunevain.com/).

Figure 2. Fieldl trip in Kune-Vaini lagoon system (Lezha, Albania) within Kune-Vaini Project (July 2018 – March 2019) (http://kunevain.com/)