Analysis of the Aquatic Environment of Two Wetlands in Attica, Greece

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Background

Schinias Marathon National Park, and Vravrona wetland, both protected Natura 2000 areas in Greece, were visited to analyze their water quality and overall ecosystem characteristics through biological and chemical methods. Water samples from three designated sites per location were tested for abiotic factors such as pH, conductivity, salinity, dissolved oxygen (DO), nitrates, phosphates, and oxidation-reduction potential (ORP), as well as for the presence of living organisms.

Objectives

- Examine the water quality and biodiversity of the wetlands of Schinias and Vravrona via chemical water analysis and qualitative biological observations for the terrestrial and aquatic environments.
- Gain a better understanding of Greece's wetland ecosystems.

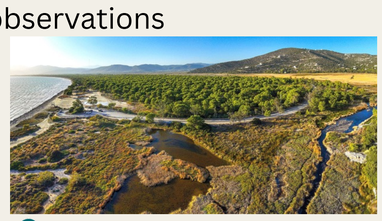
Materials and Methods

Water samples were collected or tested on site in estuarine environments of both ecosystems and analyzed for the following:

- pH - Hanna Multimeter
- Salinity – Hanna Multimeter
- Dissolved Oxygen (DO) - Winkler titration (Aquamerck)/Hanna DO Meter
- Nutrients – Colorimetric water analysis kit (Visocolor)
- Plankton - Plankton net and Microscope (one sample per site)
- Terrestrial Plants - Qualitative observations

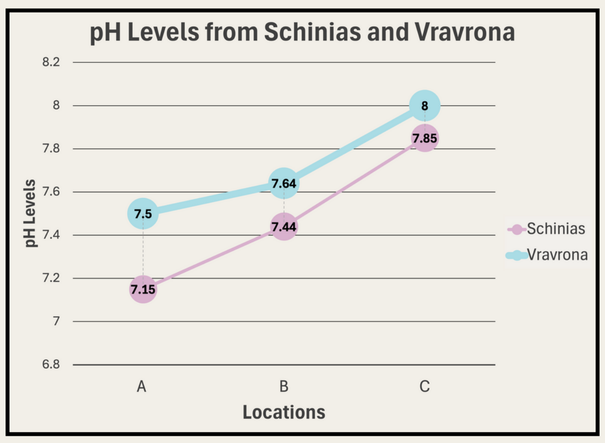


1 Vravrona Wetland

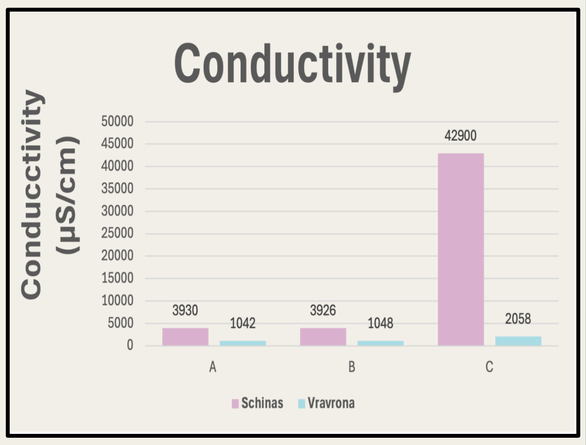


2 Schinias Wetland

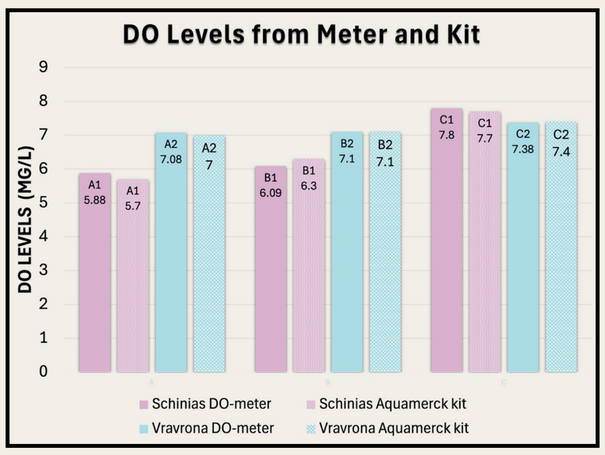
Chemical Analysis Results



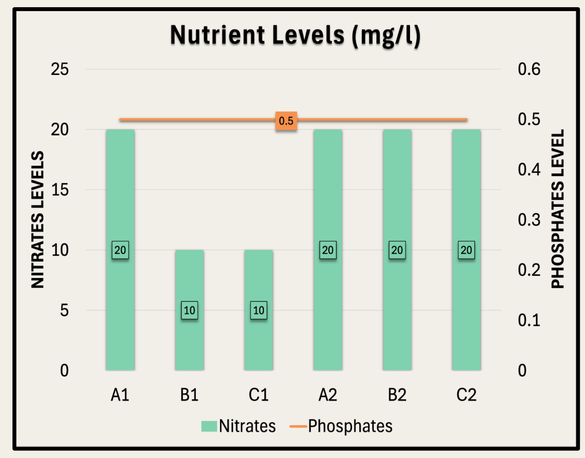
Healthy freshwater has pH levels between 6-8 and brackish/sea water have levels between 7.5-8.5 (Monash University, n.d.). Both sites show healthy pH levels. Locations A and B are mostly freshwater, while C is mixture of freshwater and seawater.



Conductivity levels show the concentration of ions in the water. It can be used to find the salinity and total dissolved solids which is indicative to an aquatic ecosystem's health. Freshwater should not be under 1000 (µS/cm) however, locations tested exceeded these levels. This is probably due to the mixing of freshwater with sea water, as the locations studied were very close to the sea (estuarine ecosystems). Location C in Schinias is sea water.



The DO levels for each location were measured twice; one at the site the other in the lab. This was done to find DO levels at a constant temperature in all three areas and compare them to the field measurements and find the BOD (biochemical oxygen demand, indicative of the presence of organic material). A freshwater ecosystem needs a DO higher than 5 mg/L for organisms to not experience environmental pressure (US EPA, 2013). Both sites show higher levels than the baseline, indicating healthy levels of oxygen, required to support aquatic life.



The nutrient levels for aquatic ecosystems should not go beyond certain levels, as it can lead to eutrophication of aquatic ecosystems. The most important nutrients are nitrates which should not go beyond 25 mg/l, and phosphates which should not exceed 1.0 mg/l (USGS, 2019). Nutrients in both aquatic systems are below these levels, which shows good land management of both areas, as there is agriculture near both locations, which is the most common cause of nutrient introduction into a water source.

Biological Analysis Results

Schinias



Bacillariophyceae - Diatom Algae



Hydra - Carnivorous Jellyfish-like animal



Protozoa and algae – Single-celled organisms

Presence of Diatoms and other microscopic organisms indicates a productive water ecosystem



Pinus pinea- Umbrella pine (Gymnosperm)



Phragmites australis - Common reed (Flowering plant)



Tamarix - Tamarisk (Flowering plant)

Characteristic vegetation of wetlands present as well as the unique Umbrella Pine display a healthy terrestrial ecosystem

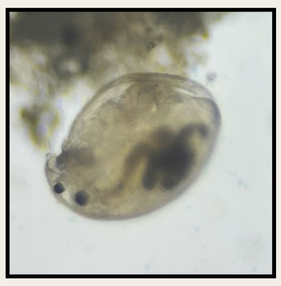






Seabirds and tadpoles observed; this indicates a healthy ecosystem

Vravrona



Daphnia magna - Planktonic crustacean



Cyclopoida – Arthropoda



Bacillariophyceae – Diatom (Algae)

Presence of Diatoms and other microscopic organisms indicates a productive water ecosystem



Tamarix - Tamarisk (Flowering plant)



Phragmites australis - Common reed (Flowering plant)



Shrubland species

Characteristic vegetation of wetlands present displays a healthy terrestrial ecosystem



Seabirds and frogs observed, indicates healthy primary producers



Conclusions

- The chemical analysis of both Schinias and Vravrona estuarine aquatic systems shows that the two protected areas have water quality parameters within normal levels, which indicates healthy conditions for aquatic life.
- Microscopic and qualitative observations of the vegetation and of plankton species revealed a rich biodiversity for both Schinias and Vravrona ecosystems.
- A more detailed and systematic study and monitoring of these aquatic environments is required to draw safe conclusions about ecosystem health.

References

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