

One year of freshwater quality monitoring in Emilia-Romagna (Italy)



Francesco Di Grazia^{1,2}, Bruna Gumiero^{1,2}, Stefano Fabbri^{1,2} ¹Departmennt of Biological, Geological and Environmental Sciences (BiGeA) - University of Bologna, Bologna, Italy; ²Osservatorio Citizen Science, CIFLA - Fondazione Flaminia, Ravenna, Italy. francesco.digrazia@studio.unibo.it, www.osservatoriocitizenscience.org.

Abstract

Freshwater ecosystems are essential for human needs and wildlife. Human activities are the main cause of water quality degradation and freshwater habitats loss which in turn affect biodiversity reduction. Other factors related to this decline are the increasing presence of alien species and abundance of plastics in aquatic systems. With this in mind, a year ago we opened a Citizen Science Observatory (CSO). To date, the main activity we are developing is monitoring the quality of freshwater ecosystems. CSO is linked to FreshWater Watch platform and it is collaborating with protected areas, environmental authorities and local associations to create a bridge between science, citizens and authorities. Water quality data and ecological observations are collected by trained citizens in predefined sampling areas. In addition we submitted to the citizens a questionnaire before and after a few months from their involvement. The objectives of the questionnaires are different among which: characterize the people involved, their perception and knowledge of the aquatic environments. The post questionnaire will give us an estimate of how much the scientific knowledge of citizens has improved. This study analyse the scientific and social results of this first year of freshwater quality monitoring in Emilia-Romagna (Italy) and the Ravenna Water Blitz data.

Introduction

Citizen science and community based monitoring have been shown to provide opportunities for gathering reliable data to monitor ecosystem health and identify the need for intervention or restoration (3).

Furthermore, citizen science engages communities with local environmental issues, making people stewards of their own environment. Therefore, citizen science based water quality monitoring is essential good opportunity to increase available information on ecosystem dynamics as well as promoting environmental stewardship (3).

FreshWater Watch (FWW) is an international Citizen Science project investigating the water quality at a global scale (3,4). Citizen Science Osservatorio, located in Ravenna, has chosen this programme because it represent a solid structure for the high and continuous involvement of citizens in science by simple and trustable methodology. We started engaging two protected areas authorities: "Parco del Delta Po" and "Parchi del Ducato", association "APS Amici dei Parchi di Monteveglio e dell'Emilia" and members of the local community who have interest to joining in the project. We conducted both ecological and sociological research. Our aims are to raise awareness to become local stewards of their territory and rivers.

Materials and Methods



Results

126 Emilia-Romagna water samples



Figure 1. Emilia-Romagna samples map by Earthwatch.

Citizens Environmental Perception



9. What interventions would you like to see made in the most frequent aquatic environment? (Choose all that apply)



NITRATE (N-NO3) ppm yy 2017/2018 PHOSPHATE (P-PO4) ppm TURBIDITY (NTU) Season Spring Summer Autumn Winter Spring Summer Autumn Winter Spring Summer Autumn Winter Site name **Ducato Parks** 0.35 0.035 0.01 12 River Taro 0.1 0.1 1.5 0.01 0.01 12 12 14 **Delta Po Park** Alfonsine - Pond Fornace Violani 0.35 0.1 0.1 0.35 0.35 0.075 0.01 0.01 12 16 12 12 0.75 0.01 0.01 0.01 3.5 0.1 1.5 0.15 35 18 21 245 S. Alberto - River Reno Cohousing San Lazzaro (BO) 0.01 0.1 0.01 17 3.5 Stream Idice 12 0.01 12 7.5 0.01 17 12 Stream Zena APS Amici dei Parchi di Monteveglio e dell'Emilia 0.01 0.75 Pond Bellreguard Park

Table 1. Test kit ranges and Clean Water for Wildlife
 thresholds for nitrate 1 mg/l and phosphate 0.1 mg/l. Red values indicate high pollution level.



Bologn

103 Ravenna Water Blitz water samples



Figure 2. Ravenna Water Blitz samples map, nitrate and phosphate average.

Discussion

The continuous data gathered by citizens will be a valuable tool to better understand which rivers are polluted and report it to the competent authorities for something to be done about it (1). The high nitrate concentrations were due that land use in the immediate surroundings of the sampling sites was agricultural. After the rain, the effect of soil runoff has led to an increase in nitrate concentration (2). The absence of riparian vegetation and poor banks naturalness have been chosen by a few citizens, this may mean that many do not know the importance of riparian vegetation (5).

Conclusions

Emilia-Romagna freshwater quality monitoring was still at an early stage but was already showing important results on nutrient concentrations and it is necessary to continue this work in the future, by increasing the number of sites to be monitored.

Social aspects are essential when we talk about citizen science. The questionnaire results showed that volunteer have an overall positive perception of the aquatic environment and expect it to achieve good quality in the future. They were familiar with the water issues, but they showed lack of scientific knowledge on the importance of riparian vegetation and on the low banks naturalness. In the future, it is planned to administer the post-questionnaire to assess whether the citizen is more aware of the local freshwater ecosystems issues.

References

- Buytaert W., Zulkafli Z., Grainger S., Acosta L., Alemie T.C., Bastiaensen J., De Bièvre B., Bhusal J., Clark J., Dewulf A., Foggin M., Hannah D.M., Hergarten C., Isaeva A., Karpouzoglou T., Pandeya B., Paudel D., Sharma K., Steenhuis T., Tilahun S., VanHecken G., Zhumanova M., (2014). Citizen science in hydrology and water resources: opportunities for knowledge generation, ecosystem service management, and sustainable development. Frontiers in Earth Science 2, 26.
- Eckard R.S., Pellerin B.A., Bergamaschi B.A., Bachand P.A.M., Bachand S.M., Spencer R.G.M., Hernes P.J., (2016). Dissolved Organic Matter Compositional Change and Biolability During Two Storm Runoff Events in a Small Agricultural Watershed. J. Water Resour. Plann. Manage., 142(4): 01816002
- Loiselle S.A., Frost P.C., Turak E., Thornhill I., (2017). Citizen scientists supporting environmental research priorities. Science of the Total Environment 598:937
- Thornhill I., Loiselle S., Lind K., Ophof D., (2016). The Citizen Science Opportunity for Researchers and Agencies. BioScience, vol: 66 (9) pp: 720–721. /illiams J.B., (2010). Phytoremediation in Wetland Ecosystems: Progress, Problems, and Potential. Critical Reviews in Plant Sciences, 21:6, 607-635.