CHAPTER 17

ENVIRONMENTAL STUDIES

Doctoral Theses

01.   GAURAV
        Diversity, and Spatiotemporal Distribution of Ophiofauna in Changing Climate of Urban Delhi, India.
        Supervisor: Prof. Chirashree Ghosh
        Th 27483

Abstract

Delhi, the capital city of India is, highly urbanized and surrounded by remnant forests, farms, ridges, and other green areas that experience regular snake encounters in and around residential, institutional, and industrial areas. A long-term sampling was conducted wherein we, studied the snake assemblage in Delhi to determine the species composition, encounter frequency, seasonal activity patterns, and probable encounter sites in an urban setup. We documented 23 species from Delhi in total. Snakes were found inside forests, public parks, homes, drain networks, streets, office buildings, and even in school-college buildings. The most recorded species being Ptyas mucosa (37.37%, n=139), Naja Naja (19.62%, n=73), and Lycodon aulicus (13.44%, n= 50). The highest numbers of incidents were reported in the month of July (22.04%, n=82) and August (19.89%, n=74) during the peak monsoon season, for identifying high encounter sites, we used a geostatistical modeling tool, Ordinary kriging to identify places having more snake occurrences. We further used a statistical spatial method called average nearest neighbor distance to detect the pattern distribution of snake species. Spatial interpolation done through Ordinary kriging highlighted two areas having concentrated snake encounters. The results of the average nearest neighbour distance analysis showed three species having clustered and two species having dispersed distribution. The incidence of snake encounters was found to be highly seasonal and appeared to be associated mainly with monthly rainfall, temperature, and humidity. The findings of this study on snakes` distribution patterns provide valuable insights into the conservation of these species. Understanding their habitat preferences and spatial distribution is crucial for the implementation of effective conservation strategies.

Contents

1. General Introduction 2. Assessment of urban ophiofaunal diversity and threats they are facing across various habitats of urban Delhi 3. Establishing the relationship of snakes with the influencing meteorological parameters in changing climate of Delhi 4. Frequencies and spatiotemporal distribution of snake assemblage in urban Delhi by using geostatistical modelling technique and statistical spatial method to describe the distribution pattern of the species in the area 5. Conclusions and Recommendations List of publications.

02.   MUKHERJEE (Paromita)
Unraveling Dye-Microbial Communities Feedback in Riverine Ecosystem through Microcosm-Based Investigations.
Supervisor: Prof. Vandana Mishra
Th 27484

Abstract

Environmental release of untreated textile dye effluents remains a concern despite extensive research. Shifting textile dyeing industries from developed to developing countries has also increased environmental and economic burdens in developing nations due to untreated or poorly treated dye effluent discharge. Dyes are known water pollutants, but their environmental impact is not well-studied. We investigated the behavior of azo dye (AO7) and triarylmethane dye (CV) in a water-sediment microcosm. Native microbes notably affected AO7 decolorization and its transfer between water and sediments. Phase transfer was observed from dye-infused to uncontaminated matrices. Despite advancements in wastewater treatments, environmental processes impacting the fate of dyes have been overlooked. 16S metagenomic analysis showed AO7-induced alterations in bacterial community structure in water and sediment, predominantly within Proteobacteria. Notably, Niveispirillum sp. diminished in dye-infused water, while Pseudomonas sp. thrived under azo dye pressure. Functional profiles, assessed via KEGG pathways, responded uniquely to AO7 exposure, with certain metabolic pathways suppressed, activated, or entirely silenced. Dye presence altered bacterial community structures and functions in both water and sediment. Upon evaluating the prolonged AO7 exposure`s impact on water-floodplain soil ecosystems, azo dye half-life diminished with each exposure cycle. Dominant taxa decreased under dye stress, whereas dye-degrading genera like Pseudomonas and Serratia proliferated. Certain metabolic pathways increased, while others decreased with dye exposure. Despite dye infusion only in water, associated soil also reflected shifts in microbial structure and function, validating our primary findings. Our study highlights how native microbes influence dye distribution in river water, sediment, and soil, helping better manage textile dye pollution in river ecosystems.

Contents

1. Introduction 2. Dyes in environment: Routes of exposure, processes and impact on sediment and soil health-A literature review 3. Microbial communities drive flux of Acid Orange 7 and Crystal Violet dyes in water-sediment system 4. Deciphering the ecological impact of azo dye pollution through microbial community analysis in water-sediment microcosms 5. Impact of long-term exposure of azo dye AO7 on microbial community in a floodplain ecosystem: An analysis of decolorization kinetics, community structure and function 6. Advanced Oxidation Processes and biological technologies at the forefront of textile dye detoxification. Summary and Conclusions. References. Appendixes.