UDC 627.17:574.1(540.69)
Orginal Scientific Paper
https://doi.org/10.62598/JVA.10.1.1.1

Received: May 29, 2024
Accepted for publishing: June 25, 2024

REVITALISING FRESHWATER PONDS: ASSESSING PHYSICAL STRUCTURES BIO-RECHARGING STRATEGIES THROUGH COMMUNITY ENGAGEMENT

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ABSTRACT

Purpose*: The purpose of this study is to revitalize the freshwater ponds by assessing physical structures, water quality parameters and sustainable bio-recharging strategies through community engagement.*

Research Design*:The study employs a combination of exploratory and descriptive research approaches. Sampling was conducted among the individuals who are in direct access with the freshwater ponds.*

Methodology*: Data collection was carried out through direct surveys using a structured questionnaire, and water samples were gathered from the designated areas for water quality analysis.*

Results*: The results reveal that there are ponds that need immediate restoration and rejuvenation in order to sustainably take up the matter of a balanced ecosystem for the better survival and coexistence of individual species along with mankind by proper maintenance of the water body for a better tomorrow. The water quality analysis shows significant causes of deterioration due to ecological instability and overuse of the resources by improper management strategies which resulted in loss of biodiversity and habitat loss.*

Originality of Research*: This study records the revitalization of freshwater ponds by assessing physical structures, water quality parameters, and sustainable bio- recharging strategies through community engagement.*

Keywords*: Revitalization, Biodiversity, Bio- recharging, Water quality*

1. INTRODUCTION

Attractive ecosystems that add to the diversity of our natural environment are freshwater ponds. These tiny, still freshwater ponds provide special insights into the delicate balance of aquatic ecosystems

while also supporting a wide variety of plant and animal life. Freshwater ponds, from their origin to the rich web of life they support, are dynamic microcosms that capture the wonder and intricacy of nature. The preservation and restoration of freshwater ponds are greatly aided by conservation initiatives. This entails controlling human activity near pond habitats, putting sustainable land use strategies into place, and keeping an eye on water quality. Freshwater pond health and biodiversity are preserved through the establishment of buffer zones, rehabilitation initiatives, and the preservation of natural habitats. Freshwater ponds are vibrant, complex ecosystems that offer important ecological services and are brimming with life. Ponds serve as prime examples of the delicate balance found in natural ecosystems, from their origin through the seasonal variations and the wide variety of flora and animals they sustain. It is crucial to comprehend and value freshwater ponds in order to support conservation initiatives that guarantee the long-term health and vitality of these fascinating aquatic ecosystems.
The objective of this study is to identify and map the freshwater ponds of Thrikkakara region of the state of Kerala in India that needs restoration and conduct biodiversity study of flora and fauna of the selected ponds, to conduct surveys among the people residing the area about their dependency on the pond and regarding the need for restoration, also to assess the water quality of the selected ponds and analyse the chemical and biological parameters responsible for deterioration ,to understand the source of deterioration and to impart the relevance of restoration that helps recreation and community groups to cherish the pond for the future

2. REVIEW OF LITERATURE

The creation and maintenance of habitat for biodiversity, water purification, flood mitigation, and cultural benefits (such as recreational opportunities) are just a few of the many ways that ponds and "pondscapes," or networks of ponds, are essential habitats for biodiversity and for providing numerous benefits to humans, often known as "Nature's Contribution to People." Ponds do not, however, usually qualify as nature-based solutions that offer all of these advantages. Furthermore, there is a dearth of information regarding the optimal management and restoration of ponds to enhance their capacity to fortify ecosystems and society against the effects of climate change. To enhance the application of ponds as Nature-based Solutions for providing a diverse range of Nature Contributions to Humans, it is imperative to produce and include ecosystems, biodiversity, sociological, economic, and policy dimensions (Cambronero, et.al 2023)
Zainulabdeen and Nagaraj (2022) review the material that has been published on the effects of human activity on Kerala's wetlands and conservation efforts. Wetlands are an essential component of the state and provide several ecosystem services to humans, including food production, flood control, erosion control, biodiversity support, and subsurface water recharge. Wetlands are currently in danger due to population pressure, accelerated urbanization, and careless land use patterns. Kerala's wetlands have been divided, contaminated, and restored for different uses. Man is putting not just humans but also other species at peril if this trend keeps up. Realizing the value of wetlands, scientists and environmental conservationists have investigated the detrimental effects of human activity on wetlands.
Chidi and Aryal (2022) analyzed the current purposes of ponds in Nepal's Lumbini Province's Nawalparasi West district. Ponds are essential to many facets of both human and natural existence. Its significance ranges from a marvel of nature to religion, culture, and economy. Ponds can be used for a variety of purposes, depending on factors including accessibility, topography, society, and climate. It is essential to understand how the pond is used and valued by the community to plan development more effectively and ensure long-term sustainability. Data for this report came from fieldwork conducted in the Tarai plain areas, where locals use multiple ponds, as well as from maps. The study found that

the ponds serve a variety of purposes. Fishing is the primary usage of the majority of privately held ponds, and household income is directly correlated with this activity. Community fishing at many public ponds was found economically significant. Furthermore, the indigenous inhabitants of the area have historically associated numerous public ponds with their cultural traditions and religion. In terms of ecology, a few ponds are significant at the research location.

Manikandan and Bhuvanesvari (2022) focus on their study of how farm ponds improve rural livelihood in India. Their paper examines a case study of farm ponds that support agricultural activities and raise people's standards of living, particularly in rural areas. Farm ponds also help to recharge groundwater levels, control soil erosion, and increase crop production for financial gain. Irrigation from farm ponds preserves agriculture. India experiences short spells of intense rainfall these days, but throughout the summer, the country experiences extreme drought. As a result, people depend on water for both their cattle and everyday needs. People's resilience to the climate cost them dearly. Agricultural ponds are among the greatest remedies in this case. A case study undertaken as a part of the Asian Development Bank (ADB) special evaluation study on small-scale freshwater rural aquaculture development. Small-scale fisheries and aquaculture development within the irrigation command regions in the Meghna-Dhonagoda irrigation system (MDIS) in Chandpur District, Bangladesh. The study documented the human, social, natural, physical, and financial capital available to impoverished people involved in the production and consumption of freshwater-farmed fish using primary and secondary data as well as published information. It also identified channels through which the poor can benefit, such as through access to livelihood assets, markets and prices, services and facilities, and important institutions and processes. The study focuses on small-scale freshwater aquaculture, mainly in tiny ponds, for the impoverished through extension services, organizational and management development support, and credit inputs.

Karim E. et al. (2023) assessed the primary productivity and phytoplankton abundance in Dingapota Haor, which is a wetland ecosystem in the northeastern part of Bangladesh. Phytoplankton is one of the primary producers in aquatic environments. It is essential to the diversification of aquatic species and the production of oxygen via photosynthesis. There were 41 phytoplankton genera identified, with the most prevalent being Bacillariaophyceae (37.02%), followed by Chlorophyceae (15), Cyanophyceae (8), and Euglenophyceae (4). Pre-monsoon had the highest cell density ever measured. Pre-monsoon diversity indices were likewise much higher. The five species that contributed the most to the seasonal fluctuation were Euglena (2.88%), Bacillaria (3.13%), Volvox (2.95%), Spirulina (2.92%), and Cyclotella (3.60%). The most fruitful time was before the monsoon. This investigation yielded significant baseline data that will facilitate the development of conservation and management plans for wetlands. The impact on phytoplankton abundance, which in turn affects fish growth. To assess a body of water's potential for fish production and, consequently, to create effective fishery management plans, researchers have focused a great deal of attention on its primary productivity.

Smith. P et al. (2022) evaluated that the quantity of freshwater ponds has been steadily declining due to changing land management methods in the UK's Severn Vale catchment since 1900 was calculated in their study. Changing forms of land use, and freshwater ponds' long-overlooked role as stores of biodiversity. Identifying important places for conservation action begins with determining the regional extent of pond loss. A comparison of the total number, density, and distance between modern and historic ponds was made possible by the identification of the location of the ponds and the surrounding land use on historical and modern maps. Between 1900 and 2019, the number of ponds decreased from 7.3 to 4.5 ponds km−2, accounting for 57.7% of the total ponds that were present. As a result, the average distance between modern ponds increased by 24.6 meters. Their findings show how much of a pond has been lost in Severn Vale since 1900 and offer a useful starting

point for landscape restoration. The techniques outlined have broad applicability to other areas that have historically had ponds or that have an environment suitable for supporting them.
In a study, different financing options for municipal projects with social significance are discussed. The article examines the pros and cons of financing through in-house funds, bank loans, bond issuance, pooling, and revolving schemes, while keeping in mind the opportunities and constraints associated with municipal budgets using the municipality of Burgas as an example. The focus of the study is on the variables that affect the decision of which financing option to choose: funding costs, financial infrastructure level, regulatory framework, debt risk, degree of decentralisation, and revenue-generating potential. The difficulties involved in implementing socially relevant municipal initiatives are explained through the use of specific diagnostic indicators (Dancho 2015).

3. RESEARCH METHODOLOGY

The study focused on residents of the Thrikkakara region, specifically those living near freshwater resources slated for restoration. Participants were chosen from ward numbers 4, 7, 17, 24, 26, 27, 28, 31, and 35. These individuals, living close to public freshwater ponds, were the main participants in the data collection process. The purposive sampling method ensured the study targeted individuals directly connected to the ponds.Surveys were conducted among residents near selected public freshwater ponds within the Thrikkakara municipality. The aim was to gather local community insights and opinions regarding the condition and restoration needs of these ponds. The survey responses were crucial in identifying which ponds required urgent restoration.Based on the survey results, three out of nine ponds were identified for immediate restoration, as the others had been restored within the past two years. The primary data collection tools were prepared paper questionnaires, which were manually analyzed to draw meaningful conclusions.To assess the water quality of the ponds identified for restoration, water samples were meticulously collected. Sterilized 500ml bottles were used for the samples, which were gathered early in the morning, between 6 and 7 am, to ensure consistency and prevent contamination. One sample from each of the three ponds was taken. For dissolved oxygen analysis, the samples were fixed on-site using laboratory-provided reagents, ensuring the integrity of the measurements. Additionally, water temperature and pH levels were measured directly at the sites using a mercury thermometer and a pH meter, respectively.The study aimed to involve the local community in restoration efforts by leveraging their proximity and firsthand knowledge of the ponds. The purposive sampling method ensured that the data collected was relevant to the ponds under consideration. Manual analysis of the questionnaires provided a clear understanding of the ponds' current state and necessary actions.
In conclusion, the study focused on restoring and maintaining the health of public freshwater ponds in Thrikkakara by involving local residents. The use of prepared questionnaires and meticulous water sampling processes ensured reliable and actionable insights. These findings are intended to guide future restoration efforts, ensuring the long-term sustainability of these vital freshwater resources.

3.1 AREA OF STUDY

Nine public school ponds located in nine different wards of Thrikkakkara Municipality were selected for the study. The public pond named Varikoy Chira (latitude and longitude - 10.00810376, 76.32348295) with an area of 0.32 acres situated at Ward no. 31 Snehanilayam, Chembumukku, Pulikillam West Road near V Square IT Hub was the first studied pond. The next site Chinnampilli Chira (latitude and longitude -10.01152237,76.33492492) having an area of 0.03 acres was exactly 1.3 kilometres distant from Varikorichira and was located at Ward no.26 Padamugal, Chinnampilli Chira Road, Kakkanad West. Third pond Poyyachira (latitude and longitude - 10.01419674,76.33975993)

with an area of 2 acres situated in Ward no.24 TV Centre, Justice Anna Chandy Road, Kakkanad. And it is half a kilometre away from Chinnampillichira. The former two ponds were in densely populated residential areas. The latter one was quietly isolated and surrounded by few households and automobile workshops. Pond named Methakulam (latitude and longitude - 10.02532553,76.33087512) of area 0.2 acres at Ward no.28 Kunnepuram East, NPOL Karimakkad Road, Thrikkakkara near Heritage Villa. Another pond named Valiyakulam (latitude and longitude - 10.01883557,76.33251529) comprises 0.12 acres and is situated at Ward no.35 Housing Board Colony, Mythripuram Cross Road, Vazhakkala. Erumakulam (latitude and longitude -10.01953320,76.33872527) of area 0.05 acres at Ward no.27 NGO Quarters, Ambadimoola, near MIR Jade Heights. The remaining three ponds are Kuzhipillimoola pond (latitude and longitude 10.03506897,76.33797425) comprises 0.43 acres at Ward no.4 Thrikkakkara, Vallathol Padi, Vidhya Nagar Colony, Muthirachira (latitude and longitude -10.03348030,76.36855479) of area 0.19 acres at Ward no.7 Valyattu Mugal, Vyavasaya Kendra Road, Thrikkakkara North and Chittethukara Kulam (latitude and longitude - 9.994841056,76.35450672) having 0.24 acres of area at Ward no.17 Chittethukara, Rajagiri Valley Road, Kakkanad. Most of these wards are located in the urbanized region of Thrikkakkara Municipality.

Map showing the 9 selected geographical places for data

Source: Google maps

4. DATA ANALYSIS:

4.1 Survey of the Respondents:

The majority of respondents felt that the pond's presence had no bearing on them. Since the majority of them had only recently moved close to the pond, the ponds were obviously in bad shape when they first learned about them. The ponds were initially in good shape, but their quality was determined throughout time, according to an analysis of the subjective ratings given for their opinions, where 1 represents good and 3 stands for Excellent. Furthermore, because the majority of the ponds showed signs of recent poor quality, the immigrants were already unaware of the pond's good condition.

The Kerala State Agriculture Department, has begun to turn fallow areas into farms as part of the government's "*Subhiksha Keralam*" Project, which aims to fight food scarcity in the state. Approximately 25,000 hectares of fallow land are the goal for the government to turn into farms. Under the Subhiksha Keralam Padhathi program, all departments are coming together to form one. In order to decrease costs and increase revenue, the government is working to develop effective integrated agricultural models. As a part of the "Subhiksha Keralam" Project, Poyyachira actively engages in cage aquaculture, small-scale agriculture, and cattle husbandry, all of which contribute significantly to the best possible maintenance of the pond. The rehabilitation of Methakulam Pond started in February 2024 and is centred on making the most of the pond's active use by hosting swimming lessons and other small-scale aquaculture operations.

4.1.1 Effect of construction activities

Construction activities have no influence on ponds like Varikorichira, Chittethukara, and Erumakulam, but they do have an impact on ponds like Poyyachira, Muthirachira, Kuzhipillimoola, Valiyakulam, and Methakulam. The pond's area has been reduced due to the houses nearby for the pond Varikorichira. A road is close to the Chittethukara Pond. Additionally, it includes the adjacent properties of some houses. As a consequence, the pond's water quality declined and the surrounding walls collapsed, bringing trees down into the water body. In contrast, Erumakulam is located in the middle of a residential complex. It was once a sizable pond, but as of November 2023, it had undergone reconstruction. But this reconstruction hasn't helped much, though, as the pond's natural ecology has been disrupted and none of its plant or animal species remain. It remains there solely as a recreational area.

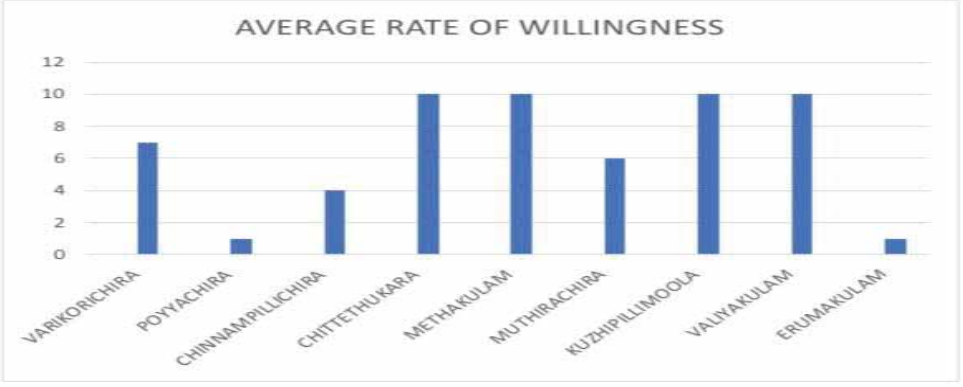
4.1.2 Pollution:

The survey concluded that passengers, sewage, local communities and other natural pollutants are the main sources of pollution in the ponds. The main contaminants observed from the ponds are listed as sewage (30%), glass bottles (10%), and plastics (60%).

4.1.3 Willingness for restoration:

This refers to the readiness, interest, or commitment of individuals and communities living near the ponds to engage in efforts aimed at rehabilitating and revitalizing ponds. On a scale of 1 representing not at all willing and 10 representing fully willing, the average rate of willingness for restoration was plotted. The results suggest that people are interested in restoring the pond. Overall, the concept encompasses the broad spectrum of support and active involvement required to successfully restore ponds to a healthier state, ensuring their ecological, social, and economic benefits are sustained and considerable.

Graph 1: Average rate of willingness for restoration



Source: Data analysis

4.2 Water Quality Analysis:

Table 1: Showing analysed water quality parameters (obtained values)

SL NO	PARAMETERS	AREA-1 KUZHIPILLIMOOLA	AREA-2 CHITTETHUKARA	AREA-3 VARIKORICHIRA	IDEAL LEVEL
1	TEMPERATURE	23°C	22°C	22°C	20°C -30°C
2	PH	6.73	6.76	6.56	6.5-8.5
3	SALINITY	6ppt	8ppt	8ppt	1.3ppt-2.5ppt
4	PHOSPHATE	0.002 mg/L	0.020 mg/L	0.085 mg/L	0 mg/L -0.5 mg/L
5	BICARBONATES	100 mg/L	100 mg/L	150 mg/L	50 mg/L -200 mg/L
6	NITRITE	0.004 mg/L	0.001 mg/L	0.001 mg/L	0 mg/L -0.5 mg/L
7	NITRATE	0.095 mg/L	0.018 mg/L	0.002 mg/L	0 mg/L -10 mg/L
8	AMMONIA	0.055 mg/L	0.118 mg/L	0.151 mg/L	0 mg/L -0.02 mg/L
9	TDS	0.2134 mg/L	0.1814 mg/L	0.1859 mg/L	0 mg/L -500 mg/L
10	TSS	0.023 mg/L	0.0053 mg/L	0.0251 mg/L	0 mg/L -50 mg/L
11	TOTAL HARDNESS	150 mg/L	200 mg/L	150 mg/L	50 mg/L -150 mg/L
12	CALCIUM HARDNESS	40 mg/L	60 mg/L	160 mg/L	20 mg/L -100 mg/L
13	DISSOLVED OXYGEN	2mg/L	4mg/L	2 mg/L	6 mg/L -8 mg/L
14	BIOLOGICAL OXYGEN DEMAND	2mg/L	6mg/L	10mg/L	3 mg/L -5 mg/L
15	TOTAL COLIFORMS	1100 MPN/100 ml	1100+ MPN/100 ml	43MPN/100 ml	0 MPN/100ml

Source: Data Analysis

The pH values of all ponds (6.73, 6.76, 6.53) fell within the ideal range (6.5-8.5), making them suitable for species survival. The recorded temperatures (22°C, 22°C, 23°C) also fell within the ideal range (20-30°C), indicating favourable conditions for aquatic life. However, the salinity values (6 ppm, 8 ppm, 6 ppm) exceeded the ideal range (1.3-2.5 ppm), suggesting stress on organisms not adapted to higher salinity, potentially due to factors like freshwater input deficiency, human activities, and evaporation. Phosphate levels were 0.002 ppm in Kuzhipillimoola, 0.02 ppm in Chittethukara, and 0.085 ppm in Varikorichira. The value for Varikorichira exceeded the ideal range (0-0.02 ppm), indicating eutrophication and algal blooms, which deplete oxygen and disrupt the ecosystem. All ponds had bicarbonate levels (100 ppm, 100 ppm, 150 ppm) within the ideal range (50-200 ppm), supporting aquatic plant growth.

Nitrite concentrations (0.095 ppm, 0.018 ppm, 0.002 ppm) were within the ideal range (0-10 ppm), indicating good water quality, and nitrate levels (0.095 ppm, 0.018 ppm, 0.002 ppm) also fell within the ideal range (0-10 ppm), supporting plant growth without causing eutrophication. Ammonia concentrations (0.055 ppm, 0.118 ppm, 0.15 ppm) exceeded the ideal range (0-0.02 ppm) in Chittethukara and Varikorichira, posing a risk to aquatic life due to potential gill damage and stress. The TDS values (0.213 ppm, 0.118 ppm, 0.15 ppm) were within the ideal range (0-500 ppm), indicating appropriate mineral and organic matter levels, and TSS values (0.0023 ppm, 0.0053 ppm, 0.0251 ppm) were within the ideal range (0-50 ppm), ensuring water clarity and light penetration.

The total hardness values (150 ppm, 200 ppm, 150 ppm) were within the ideal range (50-150 ppm) except for Chittethukara, which was slightly higher, affecting osmotic balance.
Calcium hardness values (40 ppm, 60 ppm, 60 ppm) were within the ideal range (20-100 ppm), supporting aquatic health and osmotic balance. Dissolved oxygen (DO) levels (2 ppm, 4 ppm, 2 ppm) were below the ideal range (6-8 ppm), indicating poor oxygen levels that could lead to reduced biodiversity and aquatic life stress. BOD values (2 ppm, 6 ppm, 10 ppm) indicated that Kuzhipillimoola had minimal organic pollution, whereas Chittethukara and Varikorichira had high organic pollution, leading to hypoxic conditions. Finally, all ponds had coliform bacteria counts (1100 MPN, >1100 MPN, 43 MPN), indicating faecal contamination and potential health risks from sewage or runoff.

5. RESULT AND OBSERVATIONS

5.1 SOCIAL IMPACTS OF THE POND

Thrikkakara municipality, with a population of approximately 71,319 and a density of about 1820 people per square kilometer, is densely populated. Ponds play a crucial role in such communities by replenishing surrounding water bodies and maintaining the groundwater table. The ponds in Thrikkakara municipality are vital for preserving water sources and addressing the community's water shortage issues.However, the impact of these ponds varies across different locations. The desire for pond restoration is particularly strong among residents who have lived in the area for over 30 years and are older than 50. These long-term residents view the ponds as essential for future generations. In contrast, children have recently begun using the ponds primarily for fishing.Despite these differences, many residents are enthusiastic about contributing to the maintenance of public ponds. They recognize the benefits of utilizing these water bodies for small-scale farming, aquaculture, and recreational activities. Overall, there is significant community support for preserving and enhancing the ponds to ensure they continue to serve the needs of the population..

5.2 ECOLOGICAL IMPACTS

5.2.1 Species diversity

The pond and the area show medium diversity when coming to the species diversity. However, the majority of the ponds are covered with heavy, dense vegetation cover, mainly algae. The surroundings of the pond include vegetation covers all over with both invasive and indigenous species.
Table 2 Showing the Flora of the selected regions:

SL.No	COMMON NAME	SCIENTIFIC NAME
1	Water velvet	Azolla pinnata
2	Common duckweed	Lemna minor
3	Water lettuce	Pistia stratiotes
4	Water thyme	Hydrilla verticillata
5	Butterfly fern	Salvinia auriculata
6	Cupid's shaving brush	Emilia sonchifolia
7	Alligator Weed	Alternanthera philoxeroides
8	Barnyard grass	Echinochloa crus-galli
9	Great manna grass	Glyceria maxima
10	Touch-me-not	Mimosa pudica

SL.No	COMMON NAME	SCIENTIFIC NAME
11	Coconut tree	Cocos nucifera
12	Chandada	Macaranga peltata
13	Cherry tree	Muntingia calabura
14	Mango	Mangifera indica
15	French plantain	Musa paradisiaca
16	Tomato plant	Solanum lycopersicum
17	Green chilli	Capsicum annuum
18	Eggplant	Solanum melongena
19	Elephant ear plant	Colocasia esculenta
20	Bitter gourd	Momordica charantia
21	Betel palm	Areca catechu
22	Cassava	Manihot esculenta
23	Sedge	Cyperus rotundus
24	Parthenium	Parthenium hysterophorus
25	Lantana	Lantana camara
26	Devil weed	Chromolaena odorata
27	Sessile joy weed	Alternanthera sessilis
28	Bengal dayflower	Commelina benghalensis
29	Yellow nutsedge	Cyperus esculentus
30	Water primrose	Ludwigia spp.
31	Billy goat weed	Ageratum conyzoides
32	Par grass	Urochola mutica

Source: Survey

Table 3 Showing the Fauna of the selected regions:

SPECIES	SL.NO	COMMON NAME	SCIENTIFIC NAMES
FISHES	1	Barramundi	Lates calcarifer
	2	Climbing perch	Anabas testudineus
	3	Indian mottles eel	Anguilla bengalensis
	4	Panchax	Aplocheilus lineatus
	5	Stripped snakehead	Channa striata
	6	Stinging catfish	Heteropneustes fossilis
	7	Tilapia	Oreochromis spp
	8	Pearl spot	Etroplus suratensis
	9	Valencienne'c clarid	Clarias batrachus
BIRDS	1	Little Egret	Egretta garzetta
	2	Indian Pond Heron	Ardeola grayii
	3	White-breasted Waterhen	Amaurornis phoenicurus
	4	Indian Cormorant	Phalacrocorax fuscicollis

SPECIES	SL.NO	COMMON NAME	SCIENTIFIC NAMES
INSECTS	1	Dragonflies	Sympetrum vulgatum
	2	Common Skimmer	Orthetrum sabina
	3	Crimson Marsh Glider	Trithemis aurora
	4	Pied Paddy Skimmer	Neurothemis tullia
	5	Water Striders	Aquarius remigis
	6	Water Boatmen	Sigara striata
REPTILES	1	Checkered Keelback	Xenochrophis piscator
	2	Banded Racer	Argyrogena fasciolata
	3	Common Water Snake	Enhydris enhydris
	4	Indian Black Turtle	Melanochelys trijuga
AMPHIBIAN	1	Indian Bullfrog	Hoplobatrachus tigerinus
	2	Marsh Frog	Pelophylax ridibundus
DOMESTIC ANIMALS	1	Cattle	Bos taurus
	2	Buffalo	Bubalus bubalis

Source: Survey

5.2.2 Water quality

Water quality analysis was conducted for the ponds at Kuzhipillimoola, Chittethukara, and Varikorichira, identified as needing immediate restoration based on respondent feedback and their poor condition compared to other ponds. The analysis assessed the current water composition and its potential for rejuvenation. It revealed that poor maintenance and neglect had severely degraded these freshwater sources. The tests indicated a high oxygen demand in these ponds, signifying poor aquatic life conditions. Additionally, the biological oxygen demand was elevated, confirming the same poor status. The Varikorichira pond exhibited significant eutrophication, exacerbated by ongoing legal disputes over its name, contributing to its deterioration.Despite these issues, the community's strong willingness to restore these ponds offers a positive outlook for their rejuvenation. Effective maintenance could significantly improve water quality and enhance survival rates for aquatic life, ensuring these freshwater resources serve as valuable assets for future generations.

6. DISCUSSION

The market demand for ornamental flowers, such as water lilies and lotuses, presents a lucrative opportunity for small-scale farming. Cultivating these flowers can generate a significant source of income for local farmers.Local self-governments also have a crucial role to play. They can identify and clean abandoned ponds, then lease these ponds to small-scale farmers for pisciculture and aquaculture. This arrangement benefits both the self-government and the farmers, as it revitalizes neglected water bodies and provides farmers with new business opportunities. This approach promotes sustainable use of water resources and supports the local economy.A creative and collaborative approach to increasing pond usage is essential. By involving local communities, utilizing smart technologies, and supporting small-scale farming and aquaculture, we can ensure the better survival of organisms in and around the pond, enhance biodiversity, and contribute to sustainable water management practices. The leadership should adopt and promote these strategies to maximize the ecological and economic benefits of pond rejuvenation.

7. CONCLUSION

The study concludes the current condition of the public ponds of the selected geography which is the heart core part of Ernakulam district of Kerala in India that accounts for 43 wards with a population density of 1820 per sqkm and an overall population of around 71,319. The sampling was done from 3 among the 9 public ponds of ward numbers 4,7,17,24,26,27,28,31 and 35. Three ponds were selected based on the survey that insisted immediate need for restoration from the respondents. This study helped in understanding and evaluating the dependency of the people on freshwater resources. The survey benefitted in interacting with the local people, understanding their perception, and letting them express their perspective about further development in the pond for the future which came back with a highly positive response. The qualitative analysis helped in the improvement of the experimental side where the parameter's variation showed the reasonable condition of the pond currently. The experimentation helped in a better understanding of the water quality status and the parameters that needed improvement in raising the value of restoration. Through the survey, the social status of the people, their social behaviour, and their responding attitude were also imbibed. The study helped us know more about the process of restoration and the current restoration work going on in the Valiyakulam at Kunnumpuram under the local self-government. Similar activities like 'Subhiksha Keralam' were also undertaken by the local self-government for the pond of Poyyachira and recent restoration works were done for the ponds Erumakulam and Muthirachira ponds under their plan to conserve the resource.

With proper management strategies and skilled farmers, the ponds could be used for aquaculture recreation. Other small-scale farming is water lily for ornamental flower production, and Azolla as animal feed. With a good developmental plan and project idea, one can utilize the pond to its fullest and thus hope for a better tomorrow.

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