

NETAJI NAGAR COLLEGE FOR WOMEN



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170/13/1, Netaji Subhas Chandra Bose Road


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TO WHOM IT MAY CONCERN

This is to certify that that the following Under Graduate Students of Semester-II of Session 2022-23 of the College has successfully completed their Projects (**Titled: Pond ecosystem**) of Ability Enhancement Compulsory Course (AECC-2) in Environmental Studies (ENVS) for partial fulfilment of her Graduation Degree of University of Calcutta.


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Netaji Nagar College for Women
Regent Estate, Kol - 92



(Dr. Tapan Kumar Ghosh)

PRINCIPAL

Note: List Enclosed

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Date:

List of Under Graduate Students of Semester-II of Session 2022-23 of the College has successfully completed her Project (**Titled: Pond ecosystem**) of Ability Enhancement Compulsory Course (AECC-2) in Environmental Studies (ENVS)


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3	Athraei Chakraborty	223056-11-0026	056-1211-0102-22
4	Debjani Addy	223056-11-0004	056-1211-0072-22
5	Anindita Das	223056-11-0022	056-1211-0097-22
6	Anushka Gupta	223056-11-0036	056-1211-0103-22
7	Tania Ghosh	223056-11-0017	056-1211-0092-22
8	Gargi Kundu	223056-11-0028	056-1211-0105-22
9	Renuka Mondal	223056-11-0038	056-1211-0086-22
10	Kojagoree Banerjee	223056-11-0015	056-1211-0089-22
11	Tista Das	213056-11-0023	056-1211-0117-21
12	Priyanka Priyandarshini Patra	223056-11-0039	056-1211-0195-22
13	Samprikta Das	223056-11-0024	056-1211-0100-22
14	Priyanka Naiya	223056-11-0025	056-1211-0101-22
15	Ankita Sardar	223056-11-0030	056-1211-0076-22
16	Sruti Debnath	223056-11-0034	056-1211-0069-22
17	Triasha Bhattacharjee		056-1211-0071-22
18	Shayanee Saha Roy	223056-11-0006	056-1211-0078-22
19	Suchismita Jana	223056-11-0011	056-1211-0084-22
20	Simran Bera	223056-11-0021	056-1211-0096-22
21	Shreya Bera	223056-11-0010	056-1211-0083-22
22	Shraboni Mistry	223056-11-0029	056-1211-0075-22
23	Riya Halder	223056-11-0031	056-1211-0077-22
24	Aryaa Chaudhury Sinha	223056-11-0016	056-1211-0095-22
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32	Susmita Ghosh	223056-12-0007	056-1211-0193-22
33	Esha Das	222056-11-0001	056-1211-0002-22
34	Priya Halder	222056-11-0019	056-1211-0023-22
35	Baishakhi Nandy	222056-11-0011	056-1211-0015-22
36	Shampa Jana	222056-11-0021	056-1211-0025-22
37	Joya Khatun	222056-11-0042	056-1211-0058-22
38	Barnali Mondal	222056-11-0055	056-1212-0042-22
39	Priyanka Ghosal	222056-11-0046	056-1211-0066-22
40	Priya Roy	222056-11-0037	056-1211-0051-22
41	Snigdha Halder	222056-11-0052	056-1212-0033-22
42	Mukti Naskar	222056-11-0054	056-1212-0039-22
43	Dipannita Acharyee	222056-11-0015	056-1211-0019-22
44	Lakshmi Chanda	222056-11-0045	056-1211-0064-22
45	Pranati Das	222056-11-0041	056-1211-0057-22
46	Shreya Chowdhury	222056-11-0020	056-1211-0024-22
47	Asmita Banerjee	222056-11-0044	056-1211-0063-22
48	Sonia Das	222056-11-0044	056-1211-0043-22
49	Somaiya Mondal	222056-11-0032	056-1215-0059-22
50	Afrin Kurase	222056-11-0066	056-1215-0060-22
51	Payel Dey	222056-11-0067	056-1211-0027-22
52	Lipika Raptan	222056-11-0049	056-1212-0009-22
53	Sathi Mondal	222056-11-0056	056-1212-0044-22
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61	Priya Mallick	222056-11-0012	056-1211-0016-22
62	Rakhi Jha	222056-11-0040	056-1211-0055-22
63	Debjani Murmu	222056-11-0063	056-1213-0061-22
64	Payel Mandal	222056-11-0060	056-1212-0065-22
65	Aishwarya Singh	222056-11-0024	056-1211-0029-22
66	Payel Sikder	222056-11-0057	056-1212-0045-22
67	Dipannita Das	222056-11-0025	056-1211-0031-22
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69	Sweta Nandi	222056-11-0013	056-1211-0017-22
70	Koyel Das	222056-11-0016	056-1211-0020-22
71	Nisha Sahani	222056-11-0009	056-1211-0013-22
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73	Rita Patra	222056-11-0029	056-1211-0038-22
74	Riya Makal	222056-11-0050	056-1212-0028-22
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92	Suparna Das	222056-12-0069	056-1212-0141-22
93	Tanu Das	222056-12-0062	056-1211-0179-22
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95	Rinku Naskar	222056-12-0068	056-1212-0129-22
96	Sabnam Khatoon	222056-12-0010	056-1211-0116-22
97	Lata Pariya	222056-12-0059	056-1211-0176-22
98	Sania Mondal	222056-12-0075	056-1215-0136-22
99	Babita Mondal	222056-12-0006	056-1211-0111-22
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104	Sayantani Banik	222056-12-0014	056-1211-0122-22
105	Ankita Biswas	222056-12-0072	056-1212-0175-22
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121	Saheli Das	222056-12-0008	056-1211-0114-22
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123	Susmita Saha	222056-12-0023	056-1211-0133-22
124	Mampi Mondal	222056-12-0025	056-1211-0135-22
125	Keya Halder	222056-12-0004	056-1211-0109-22
126	Zaara Khan	222056-12-0003	056-1211-0108-22
127	Arifa Mondal	222056-12-0076	056-1211-0174-22
128	Asha Majhi	222056-12-0065	056-1212-0119-22
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130	Durga Mondal	222056-12-0053	056-1211-0167-22
131	Samapti Dolui	222056-12-0020	056-1211-0130-22
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134	Tina Das	222056-12-0043	056-1211-0156-22
135	Medha Mondal	222056-12-0024	056-1211-0134-22
136	Puja Das	222056-12-0030	056-1211-0142-22
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139	Riya Das	222056-12-0049	056-1211-0163-22
140	Riya Kayal	222056-12-0067	056-1212-0128-22
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148	Keya Nayek	222056-12-0005	056-1211-0110-22
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PROJECT REPORT OF ENVIRONMENTAL
STUDIES (AECC-2) ON

“POND ECOSYSTEM”

University Registration :- 056-1211-0195-22

University Roll No. :- 223056-11-0039

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I would like to express my special thanks and gratitude to my respected professor in environmental studies. His valuable guidance and support carry on my AECC-2 project work in environmental studies under the title "pond ecosystem". It is based on a brief field work.

I would rather like to express my gratitude to my parents and neighbour who helped me for the surveyed of the pond.

INDEX

TOPIC	Page No.
1. Introduction	1-2
• (Ecology, Ecosystem, pond ecosystem)	1
2. Biodiversity of pond ecosystem	3-4
3. Stratification of pond ecosystem	4-5
4. {Function of pond Ecosystem Importance	6
5. Report on the pond surveyed	7-8
6. Conclusion	8
7. Bibliography	8

INTRODUCTION

What is Ecology?

→ Ecology is the study of the relationship between living organisms, including humans, and their physical environment;

→ The word ecology comes from Greek word 'oikos' mean house or surrounding and logos means study or knowledge. So simply ecology can be defined as the study of surrounding animals human being.

All organisms must interact with both living and non-living things that surround them.

It also provides information about the benefits of ecosystems and how we can use Earth's resources in ways that leave the environment healthy for future generations.

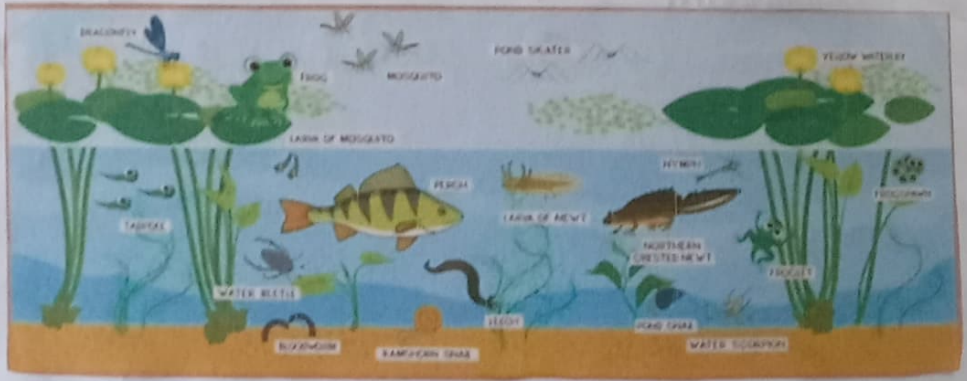
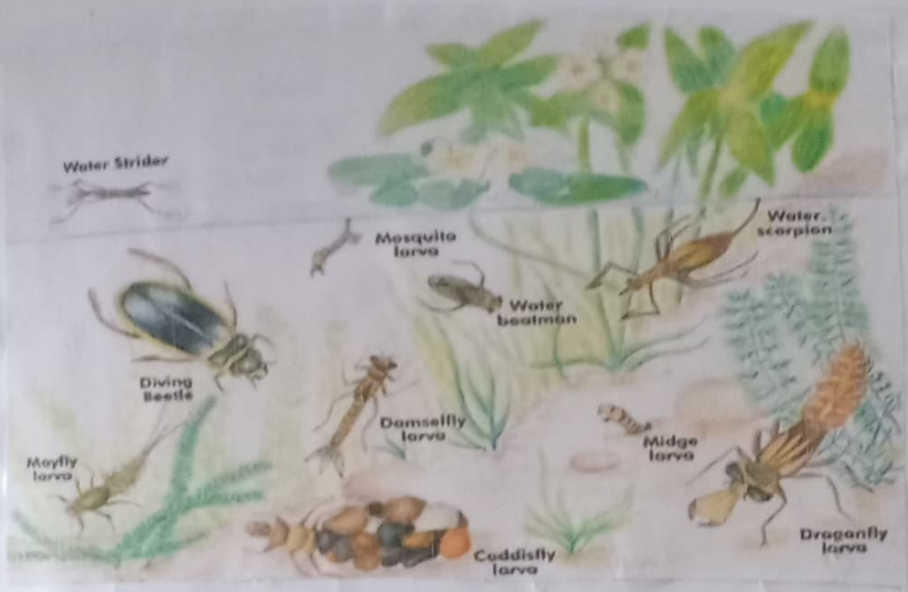
Ecology overlaps with the closely related sciences of biogeography, evolutionary biology, genetics, ethology and natural history.

Ecology is a branch of biology, and it is not synonymous with environmentalism.

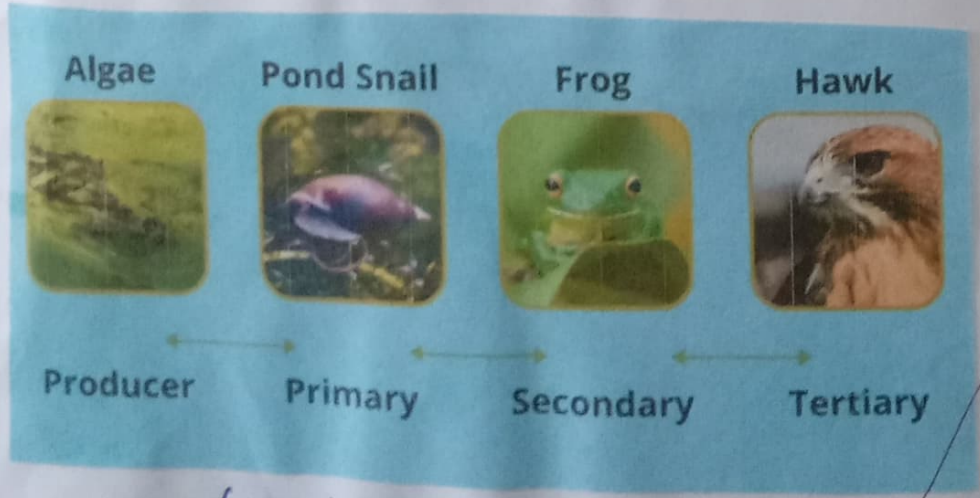
Ecology is study of life processes, anti fragility, interaction and adaptations.

The movement of materials and energy through living communities.

→ The many specialities within ecology such as vegetation and statistical ecology, provides us with information to better understand the world around us. This information can also help us to improve our environment, manage our natural resources, and protect human wealth.



(Biodiversity)



(Food chain)

Ecosystem

- An ecosystem is a community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or environment.
- An ecosystem is a community of living and non-living things considered as a unit.
- Ecosystem is a complex set of relationships among the living resources, habitats and residents of an area. It includes plants, trees, animals, fishes, birds, micro-organisms, air, water, soil and people.
- organisms are typically dependent on each other and their habitat for survival.
- They can be natural or artificial.
- An ecosystem is a self regulating group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter.
- Ecosystem function is the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
- Ecosystem functions are conceived as a subset of ecological processes and ecosystem structures.

Pond Ecosystem

A pond ecosystem is a freshwater ecosystem that can either be temporary or permanent and consists of a wide variety of aquatic plants and animals interacting with each other and the surrounding aquatic conditions. The pond ecosystem falls under the category of a lentic ecosystem because the water remains stagnant for a longer period.



Types of Pond ecosystem:- There are the following types of pond ecosystems.

(1) Garden pond ecosystem:-

These are man made artificial pond ecosystems that comprise ornamental plants and animal species exported from all over the world.

(2) Salt Pond ecosystem:-

These ecosystems are naturally formed at the seaside and contain brackish water. These are formed due to waterlogging. These can be also be found in rocky areas on the beach called rock pools. Since it contains brackish water, it can accommodate sea plants and animals.

(3) Fresh water pond ecosystem:-

These ecosystems are naturally formed due to rainfall or soil water saturation due to continuous rain. Moreover, they can also be formed due to the flow of river water into a large and depression. These ecosystem serve as a home to freshwater fishes, amphibians, crustaceans, and many other kind of wildlife.

(4) vernal pond ecosystem:-

These are seasonal ponds that are temporarily formed during to the heaviest rainfall due to the accumulation of water in the depressions in the ground. With the change in the seasons, they often turn in desert land.

(5) Mountain pond ecosystem:

Naturally formed ponds are found in the mountain regions. These are formed due to the shifting of rocks and snow melting. They accommodate rare or endangered aquatic species.

Components of Pond ecosystem

It contains two main components i.e. abiotic components and Biotic components.

Abiotic Components of the pond ecosystem

Abiotic components are the non-living components of an ecosystem that matter for the aquatic species' survival. These are the following main abiotic components of a pond ecosystem.

- (i) Light : Light serves as a main abiotic component required for the photosynthetic activities of the phytoplankton. The littoral zone has the maximum light penetration whereas the profound zone has the least light penetration.
- (ii) Temperature :- As the depth of the pond increases, the temperature of the water gradually decreases due to the gradual decrease in the light penetration.
- (iii) Dissolved oxygen :- The amount of dissolved oxygen is maximum in the shallow water and gradually decreases while moving from the surface to the depth of the pond.
- (iv) Dissolved oxygen :- The quality of the water in a pond, including the pH, dissolved oxygen and nutrient levels, can have a significant impact on the plants and animals that live there.

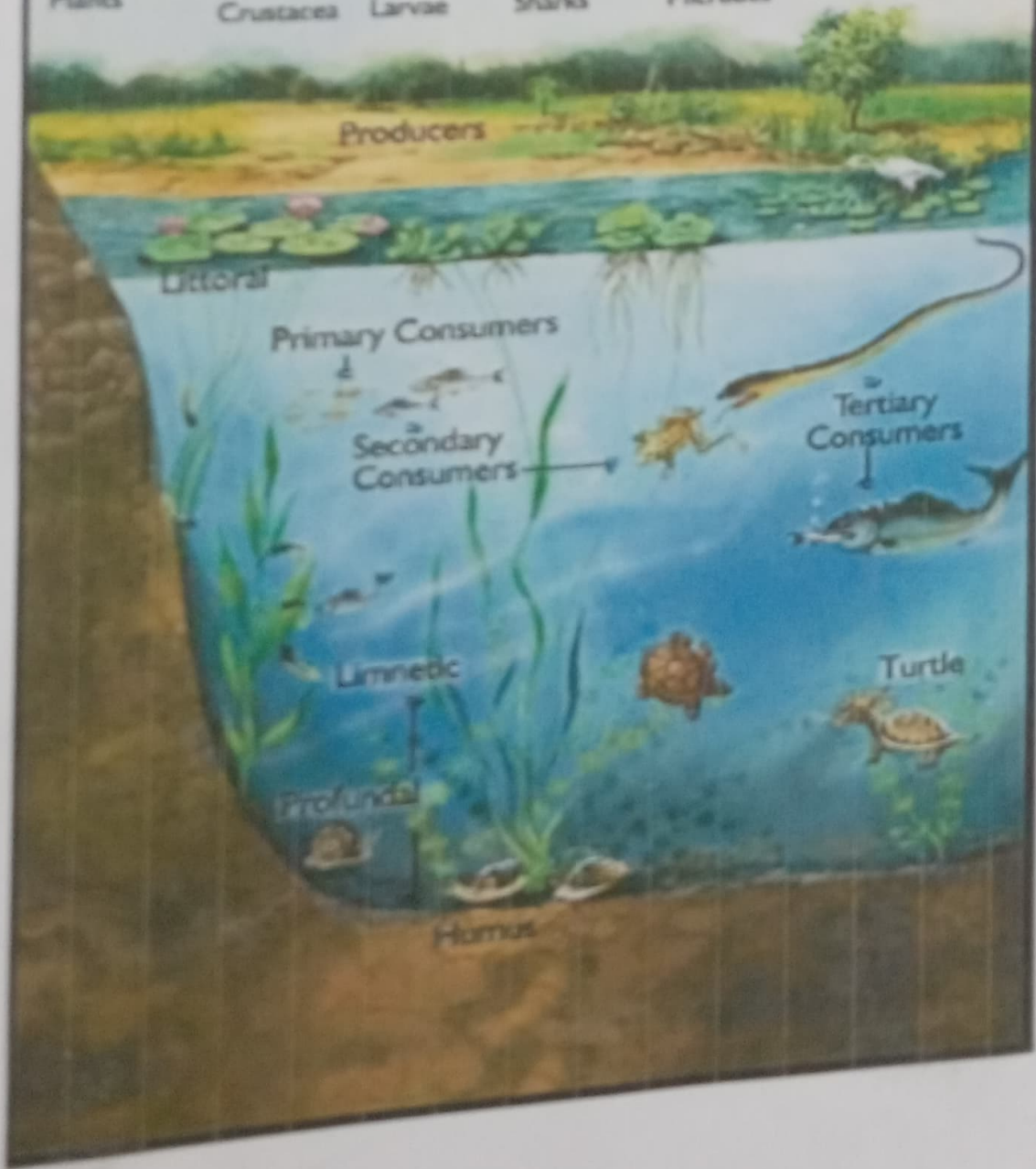
Biotic Components of Pond Ecosystem

Biotic components are living components. A wide variety of living components are found in the pond ecosystem can be discussed as follows.

- (1) Producers :- These include species of rooted, submerged, emerged, floating plants and algae. The most common filamentous algae found in pond is spirogyra. Mougeotia and zygnema are some other algae found in the ponds. Azolla, Hydrilla, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Potamogeton, Jussiaea etc. are few example of green plants that are found in the pond ecosystem.
- (2) Primary Consumers :- These include large animal sp. such as frogs, big fishes, water snakes, crabs etc. The consumers of the highest order might include mammals like water shrews, water voles, herons, ducks, Kingfishers etc.
- (3) Secondary consumers :- A large population of zooplanktons are the main primary consumers. Besides these small herbivores such as snails, insects, small fishes, tadpoles, and larvae of aquatic animals are the primary consumers often found in the pond.
- (4) Decomposers :- These include different types of bacteria and fungi that feed upon dead and decaying parts of the aquatic species.

POND ECOSYSTEM

Biotic Factors					Abiotic Factors
Producers	Consumers			Decomposers	
Algae	Primary	Secondary	Tertiary	Bacteria	Light
Hydrophytic Plants	Protozoa	Insects	Fishes	Fungi	Heat
	Crustacea	Larvae	Sharks	Microbes	Water
					Minerals



STRATIFICATION IN THE POND ECOSYSTEM

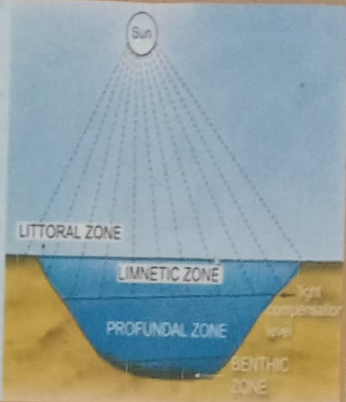
Different factors such as distance from the shore, penetration of light, depth of water, plant and animal species, etc. determine the following zones found in the pond ecosystem.

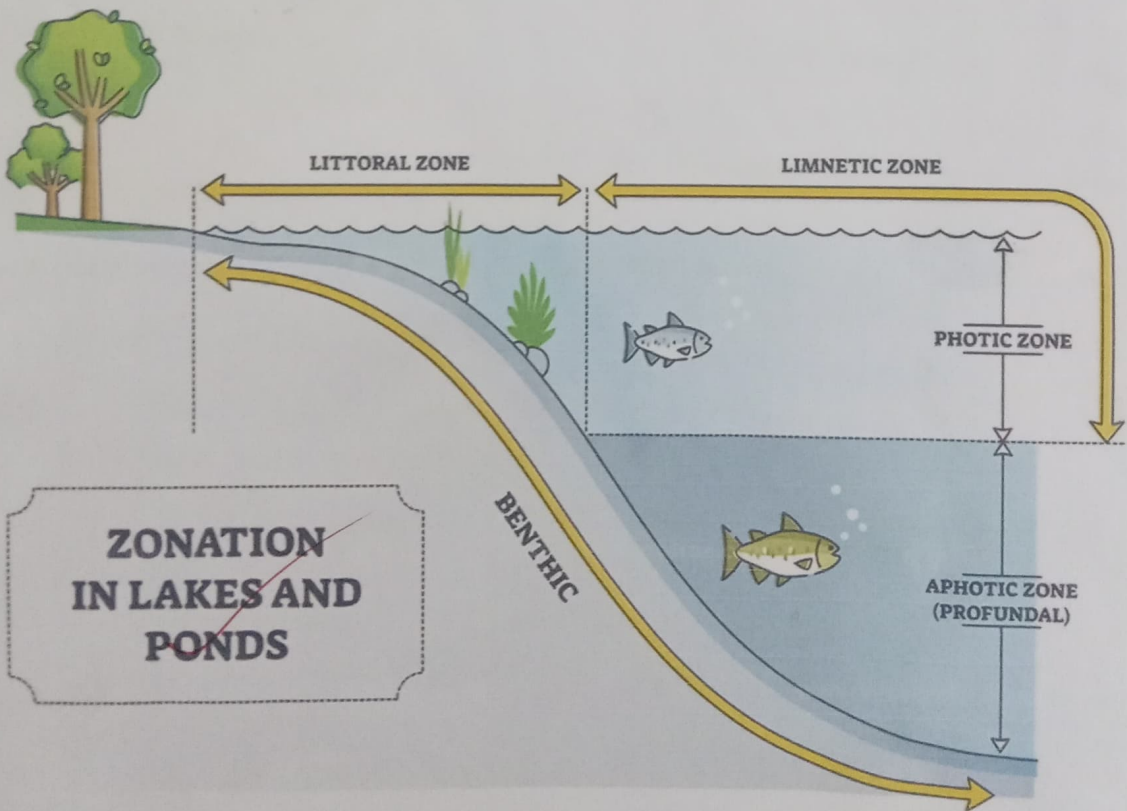
- (i) Littoral zone :- It is the zone closer to the shore. It contains shallow water and allows easy penetration of light. Rooted plants species occupy it. Animal species include reeds, crawfish, snails, insects etc.
- (ii) Limnetic zone :- The limnetic zone refers to the open water of the pond with an effective penetration of light. Rooted This zone is dominated by phytoplankton. Animal species mainly include small fishes and insects.
- (iii) Profundal zone :- The region of a pond below the limnetic zone is called a profundal zone with no effective light penetration. Some amphibians and small turtles occupy it.
- (iv) Benthic zone :- The bottom zone of a pond is benthic and is occupied by a community of decomposers. The decomposers are called benthos.

Diagram Stratification of Pond Ecosystem

Zones of pond
(Based on distance, penetration of light and depth)

- Littoral zone - Closest to the shore.
- Limnetic zone- Open water of the pond.
- Profundal zone- Below the limnetic zone.
- Benthic zone- Bottom of the pond.





Bio Diversity of Pond Ecosystem

A defining feature of a pond is the presence of standing water which provides habitat for a biological community, commonly referred to as pond life. Because of this many ponds contain large members of endemic species that have gone through adaptive radiation to become specialised in their preferred habitat. familiar examples might include water lilies and other aquatic plants, frogs, turtles, fishes, snakes etc.

often, the entire margin of the pond is fringed by wetland, and these wetlands support the aquatic food web, provide shelter for wildlife and stabilise the shore of the pond. This margin is also known as the littoral zone and contains much of the photosynthetic algae and plants of this ecosystem called macrophytes. other photosynthetic organisms such as phytoplankton (suspended algae) and periphytons (organisms including cyanobacteria, detritus, and other microbes) thrive here and stand as the primary producers of pond food web. some grazing animals like geese and muskrats consume the wetland plants directly as a source of food. In many other cases, pond plants will decay in the water. Many invertebrates and herbivorous often groups of ponds is a given landscape - so-called 'pondscapes' - offer especially high biodiversity benefits compared to single ponds. A group of ponds provides a higher degree of habitat complexity and habitat connectivity.



(Diagram :- Biodiversity of Pond)

Importance of Pond Ecosystem

The importance of the pond ecosystem can be discussed as follows:

- some aquatic plants help to improve the water quality by absorbing pollutants and heavy metals.
- The shoreline plants absorb nitrogen and phosphorus and therefore prevent the algal bloom and maintain the oxygen level in the pond. Moreover, aquatic plants absorb animal wastes to reduce the nutrient availability for plants and therefore prevent the growth of algae.

- The pond ecosystem is one of the sites for the conservation of biodiversity as different types plant and consumers occupy different strata in the pond and live together by interacting with each other. ponds in mountain regions conserve the endangered species.
- The pond ecosystem also serves as a source of water for the species that do not live in the pond.
- pond ecosystem contributes to the beauty of nature as they accommodate a variety of ornamental flowering plants.
- stratification in the pond ecosystem determines the distribution of animal species in the pond. It reduces the competition among the species to some extent.

Function of Pond Ecosystem

1. It regulates the essential ecological processes, support life systems and renders stability.
2. It is also responsible for the cycling of nutrients between biotic and abiotic components.
3. It maintains a balance among the various trophic levels in in ecosystem.
4. It cycles the minerals through the biosphere.
5. The abiotic components help in the synthesis of organic components that involves the exchange of energy.



(JUMH Pond)



?

Captions

Report On THE Pond Surveyed

I went to the pond named JUMH Pond. It is located at Poolbari Nagari, Jadavpur, Kolkata, Pin - 700032. The survey was done on 20 May 2023.

Biodiversity of the Pond :-

The pond is a big pond. It stand across 10 acre plot. I observed different types of Animals, birds and plants.

- At first algae were noticed floating in the pond. I collected some for identification. Then I looked for more things.

- Then I saw many amphibians such as frogs, Toad etc. one more cute thing that eggs and tadpoles were seen at the bank of that pond under the water plants. But I was unable to click pictures of them as they were underwater.

- As the weather was too warm water snakes were there in the pond to feel cold. I saw a double row of scale was present, that's how I recognized the snake. so I observed rainbow water snake (Erhydris erhydris) and dog-faced water snake (Cerberus rynchops) By took the help of google I identified to those snakes.

- Then I saw ducks were swimming in the water. They were in a group so that view was amazing. It was a great survey.

Health of the Pond :-

The Health of the pond is really very bad. The pond is polluted with garbages. The surrounding people throw garbage into that pond, they take bath as well as wash their clothes, but the another side of that pond is clean as that is a very big pond. But that pond should be well maintained and clean both sides. that's how these Birds, animals and plants will be safe in future.

Conclusion :-

ponds provide not only environmental values, but also practical benefits to society. one increasingly crucial benefit that Ponds provide is their ability to act as greenhouse sinks. Most natural lakes and ponds are greenhouse gas sources and aid in the flux of these dissolved compounds. However, manmade farm ponds are becoming significant sinks for gas. mitigation and the fight against climate change. These agriculture runoff ponds receive high pH level water from surrounding soils. Highly acidic drainage ponds act as catalysis for excess carbon dioxide be converted into forms of carbon that can be stored in sediments.

Bibliography :-

1. For making this project I took the help of Text book of environmental studies.
2. Components and functions of pond ecosystem from following websites.
 - (i) www.embibe.com
 - (ii) woodlandstewardship.asu.edu

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