LACUSTRINE FISHERIES

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Lacustrine (=Lake) Fisheries : Introduction

The fisheries of the lakes is termed as Lacustrine Fisheries. Natural and the man made lakes together constitute potential fishery resource of the country. It is estimated that the natural lakes cover about 0.72 million hectare area while the man – made reservoirs cover over 65 million hectare area of the country. Various natural lakes of India include the great Mansarowar lake (200 sq. miles), the Rakes tal (140 sq. miles), Koko Nor Lake (1600 sq. miles), Bhimtal and Naini lakes of Nainital and the Pongkong, Tsamorni of Kashmir etc.

Definition of Lake

A lake is defined as

➢ A body of standing water occupying a basin and lacking continuity with sea – F A Forel (1892)

➢ Those bodies of standing water which are of considerable expanse and deep enough to stratify thermally –R A Muttkowskii (1918)

➢ All large bodies of standing water (except ponds) It is completely isolated from the sea and differ from the ponds in being deep enough to produce some what on its periphery a barren wave swept share -P S Welch(1952)

➢ A lake is defined as an inland depression on the surface of the earth, ranging from few meters to about 150 meters in depth and containing standing water (Vernberg, 1970).
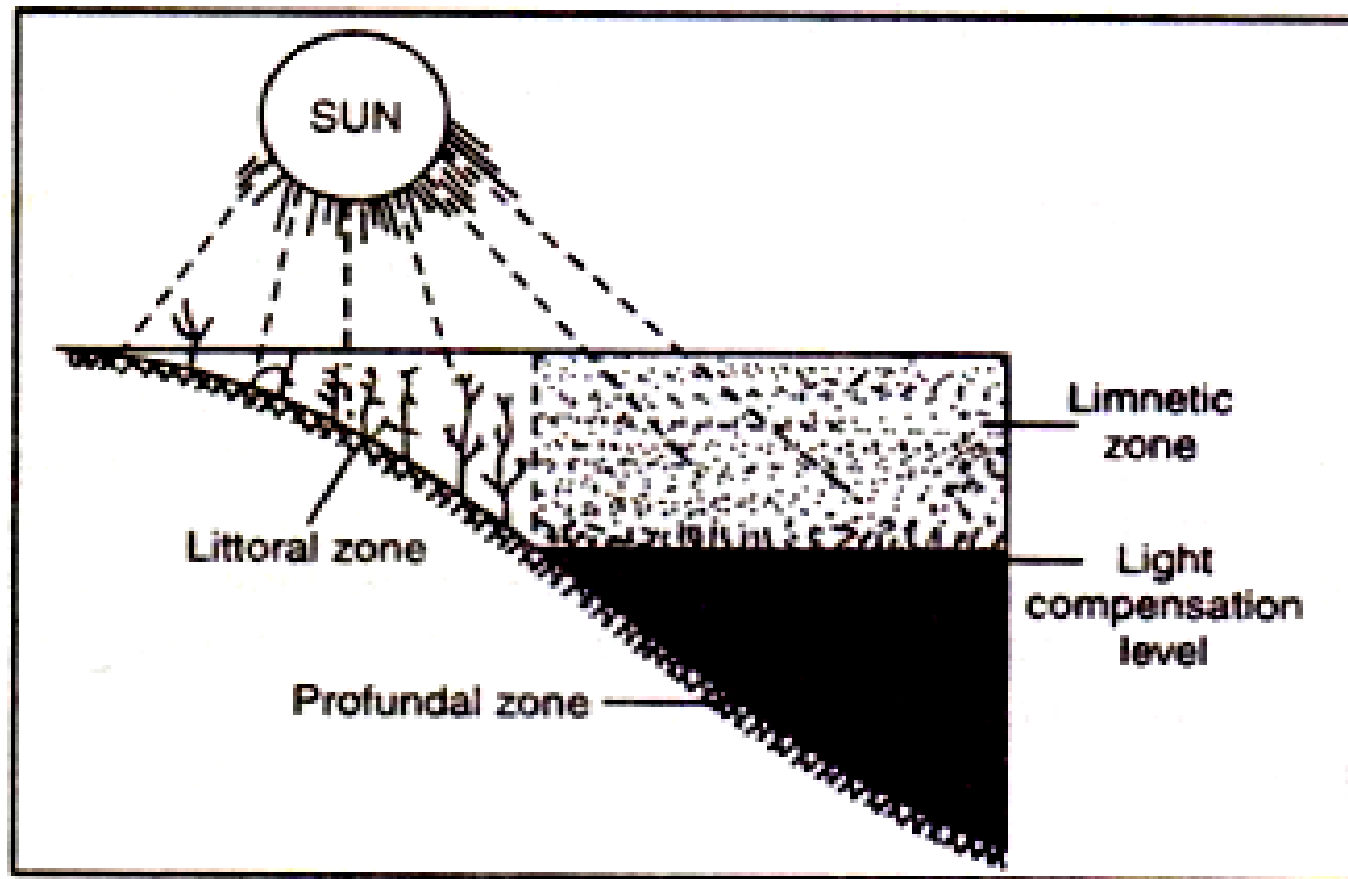
Characteristics of Lake

Fig. 4.9. Three major zones of a freshwater lake.

Ecological Characteristics of Lake

❖ One of the important characteristics of its thermal stratification. During summers the top layer (epilimnion) becomes warmer than the bottom layer (hypolimnion) owning to low thermal conductivity of water. In between these two lies an intermediate layer, the thermocline or metalimnion, that prevents the mixing of the epi and hypolimnion.

❖ During autumn when the temperature of the environment decrease and oxygen concentration of the environment decreases and oxygen concentration of water increases, (owing to reduced temperature), the layer of lake mix with each other.

Characteristics of Lake

❖In winters, when the atmospheric temperature further declines and surface water cools below 4°c (winter stratification), Oxygen concentration eventually decreases owing to presence of ice layer on the water surface.

❖ During spring, when ice melts and water sinks because of higher temperature of surface, the water of lake again mixes and oxygen contents become uniform in the whole lake (spring overturn).

Characteristics of Lake

❖ The supply of Nutrients is dominated by input from outside the lake (allochthonous supply) but the production may also be from within the habitat(autochthonous).

❖ A large hypolimnion prevents nutrient cycling and since there is little detritus to decay, they remain aerobic.

❖ On the other hand, the shallow lakes show rapid acceleration in autochthonous production. Increasing inputs of nitrogen and phosphorous of the lake.
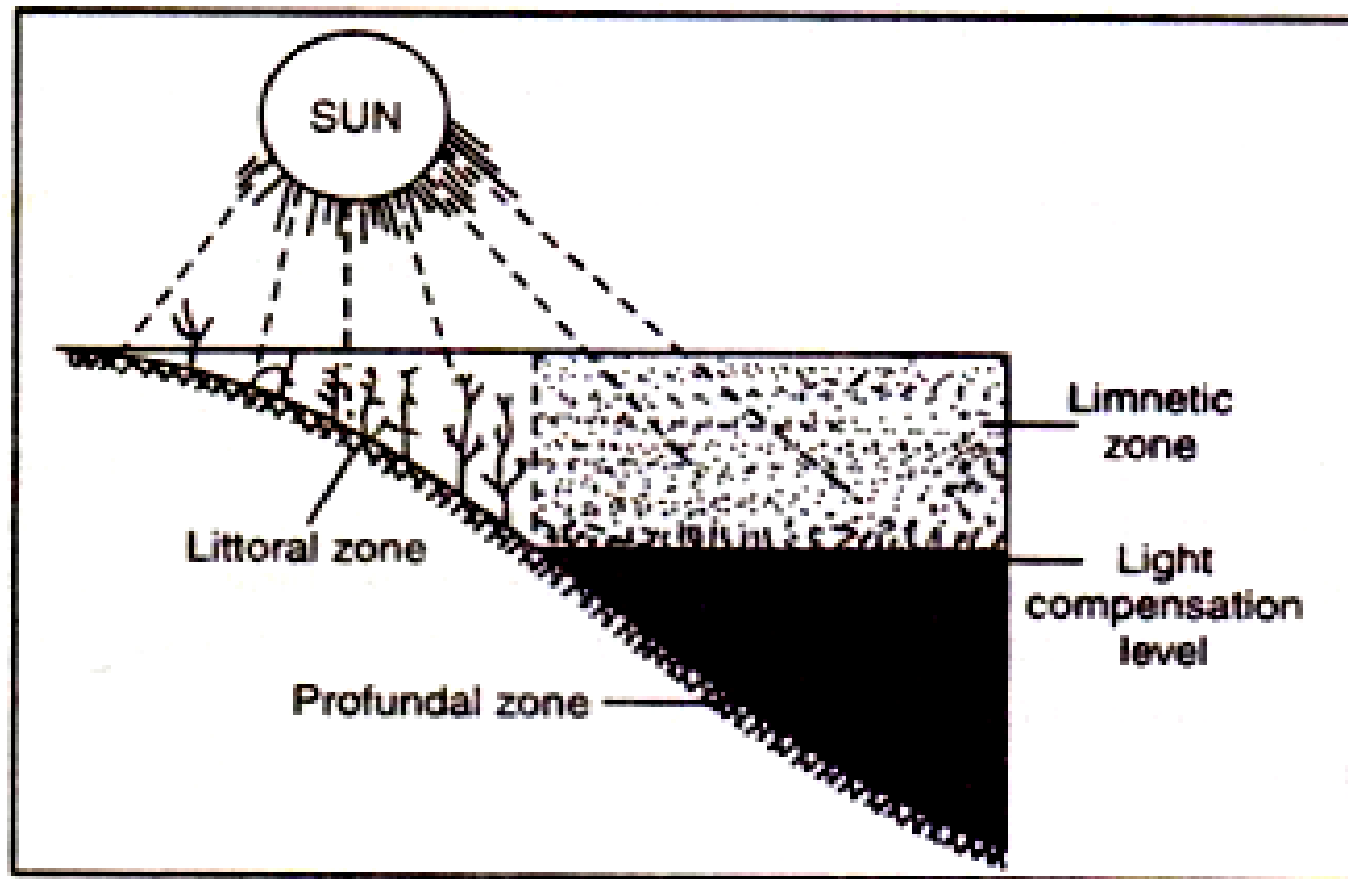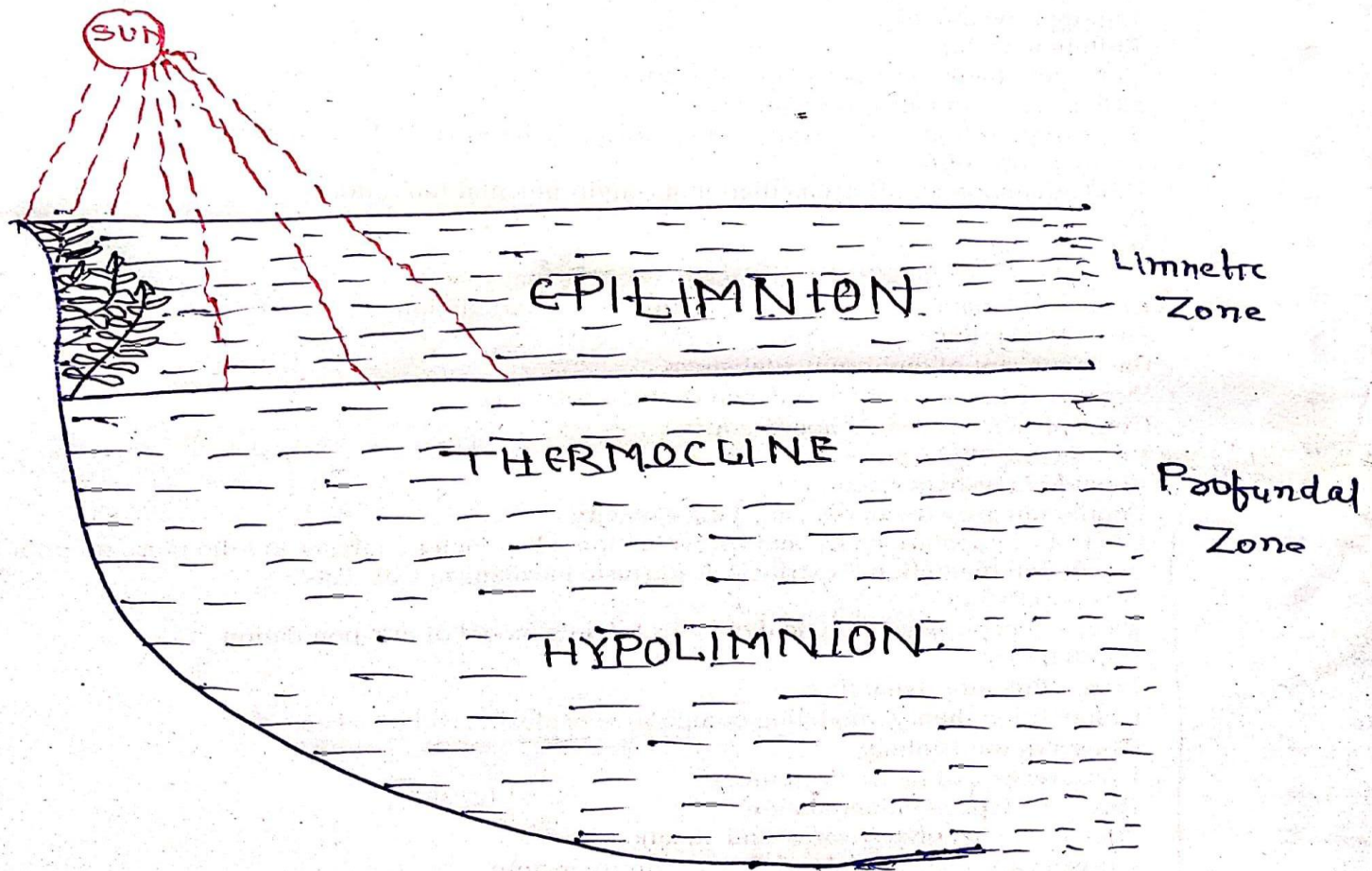
Characteristics of Lake

Fig. 4.9. Three major zones of a freshwater lake.

Fig. Showing Various Zones of a Lake

Types of Lakes

Mainly there are two types of lakes

1. Temperate lakes

2. Tropical Lakes

1. Temperate Lakes

- Thermal stratification is the characteristics of temperate lakes and the thermocline so formed acts as an effective barrier for any vertical exchange of oxygen from epilimnion to hypolimnion and nutrients from hypolimnion to epilimnion.

- Thus, in temperate lakes thermocline limits the distribution of warm water and cold water fishes, except in spring when the entire water of the lake mixes together.

2. Tropical Lakes

- Tropical lakes do not display thermal stratification owing to a continual mixing of surface and deep waters. They are thus more productive than the temperate lakes.

- Further, the shallow lakes are more productive than the deeper lakes and their productivity is inversely proportional to the depth of the lake.

Classification of Lakes on the basis of the circulation of water (Hutchinson , 1957)- 4 Types

1. **Monomictic Lakes :** - Such lakes have a single seasonal overturn of water and so the lake may either be cold type (temperature never more than 4°C) or warm type(temp. never below 4°C) . Lakes of such type are usually found in polar or sub tropical region.

2. **Dimictic Lakes :** - These lakes include two seasonal periods of free circulation viz. the autumn overturn and spring overturn.

3. **Polymictic :** - Water circulation in these lakes is continuous throughout, involving only a short period of stagnation. These lakes are found at high altitudes an in equatorial zone.

4. **The Oligomictic and Meromictic :** - In oligomictic lakes, water temperature remains more or less stable and the circulation of water is very slow while in meromictic lakes, permanent stratification occur due to the chemical difference in hypo and epilimniotic lakes.

Classification of Lakes

Welch (1952) classified lakes into various types on the basis of the availability of nutrients in water followed by Lagler et al (1972), Benton (1958) and Warner (1966), attempted classification on the basis of productivity and recognised three categories, compared as in the following table.

Table: Characteristics of three types of Lakes

Sl. No.	Oligotrophic lakes (few food)	Eutrophic lakes (good food)	Dystrophic lakes
1.	Very deep	Shallow and warmer lakes	Lakes have high concentration of humic acid making water unfavorable for organism to grow.
2.	Narrow littoral and sub littoral zones, profundal zone extensive.	Littoral and sub littoral zones, abundant, sides slopping, bottom sandy.	
3.	Littoral and sib littoral zones less productive.	Greater primary productivity due to light penetration and availability of O_2.	

Table: Characteristics of three types of Lakes

Sl. No.	Oligotrophic lakes (few food)	Eutrophic lakes (good food)	Dystrophic lakes
4.	Density of phytoplankton and zooplankton low.	Plankton denser and rich.	
5.	Plankton blooms rare.	Plankton blooms are characteristic feature.	
6.	O_2 at high concentration in hypolimnion.	O_2 concentration reasonably variable, Hypolimnion devoid of O_2.	O_2 nearly lacking.
7.	Poor in phosphorous, nitrogen, calcium and other minerals.	Rich in nutrients.	Rich in phosphorus and nitrogen, calcium absent.

Table: Characteristics of three types of Lakes

Sl. No.	Oligotrophic lakes (few food)	Eutrophic lakes (good food)	Dystrophic lakes
8.	Poor in organic materials and electrolytes.	Organic materials more concentrated and electrolytes rich.	Rich in organic materials, electrolytes low.
9.	Found in India	Found in India	Not found in India

Formation of Lakes

Lake formation depends upon the various factors. It may be due to

- action of glacier forming basins
- by land slide obstructing the open ends of valleys
- by dissolution of rocks at the base with a subsequent sinking of the portion lying above
- by volcanic rivers, wind or by crustal action of earth.

Principal Lakes

Salient features of some important and most well studied lakes of the country are as follows:

1. **Kodaikanal Lake :** - This lake is situated in the Plani Hills, at an altitude of 2,285 m. It covers an area of 26 hectares and has an average depth of 2.0 m, maximum being 10 m. Productivity of the lake over 5.3 kg per hectare per year.

2. **Yercaud Lake :** - This lake is situated in Shevarry hills, at an altitude of 1.340 m. The lake covers an area of more than 8 hectare and has an average depth of 2.0 m, maximum being 5.5 m. The annual fish production of the lake was estimated to exceed 31.6 kg per hectare.

3. **Ooty Lake :** - Ooty lake in the Nilgiris lies at an altitude of 2,500 m. It has an area of 34 hectares with a maximum depth of 10 m and average depth of 3 m. The fish yield was recorded to be 75 kg per hectare per year.

Principal Lakes

4. **<u>Logtak Lake :</u>** - Logtak lake in Manipur is fed by a number of streams like the Nembal, Thangia, Orok, and Phubala etc. It has a water spread of 4,480 – 27,300 hectare and a maximum depth of 4.5 m. The annual production is about 262 tonnes.

5. **<u>Brackish Water Lakes :</u>** - Brackish water lakes are placed near the mouth of river where they meet the sea. The water is a mixture of fresh water of river and the saline water of the sea. The great Chilka lake is a very good example of brackish water lake.

 In addition to aforesaid, there are various bheels and jheels found in mountains and plains of India, and supporting fishery of some commercial value.

Lake Fisheries

Productivity of lake is mainly regulated by the following factors.

1. Natural productivity of water
2. Availability of natural food to fishes
3. Availability of stocking material
4. Capacity to catch on commercial basis
5. Prevention of water pollution

Lakes in the hill region support the cold water fisheries. Principals fishes of these include the trout, mahseers, snow trouts along with some exotic fishes like the brown trout. European carp, and the Carnatic carp, *Barbus tor* is also represented from the Nainital lake of U.P. Other species of low land include the major carps, murrels, cat fishes and Osphronemus etc.

Lake Fisheries

The principal freshwater fisheries of plain lakes are the following:

- Catfishes- *Mystus sps., Wallago attu, Clarias batrachus, Heteropneustes fossilis*
- Murrels- Channa sps.
- Mullets- Mugil sps.
- Major carps- Catla, Rohu, Mrigala, Calbasu
- Eels- *Amphipnous cuchia*
- Minor carps- *Labeo fimbriatus, L bata, L kontius, Cirrhinus cirrhosa*, Puntius sps.
- Perches- *Anabas testudineus*, Colisa sps
- Feather backs- *Notopterous notopterous* and *N chitala*

Lake Fisheries

- Besides above, few species of poisonous fishes belonging to order Tetradontiformes viz. *Tetradon cutcutia* are also found in freshwater lakes of planes. Fisheries of the freshwater hilly lakes include the trouts, mahseers and snow trout. *Barbus tor* is also present in hilly lakes of U.P.

- Many exotic species have also been introduced in various lakes of India .

- The rainbow trout *Salmon truta* was introduced in Up from Europe. The European carp Cyprinus sps was introduced in 1939 from Srilanka'

- Lakes of hilly regions support the cold water fisheries of India

Suggested Readings

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Thanks

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