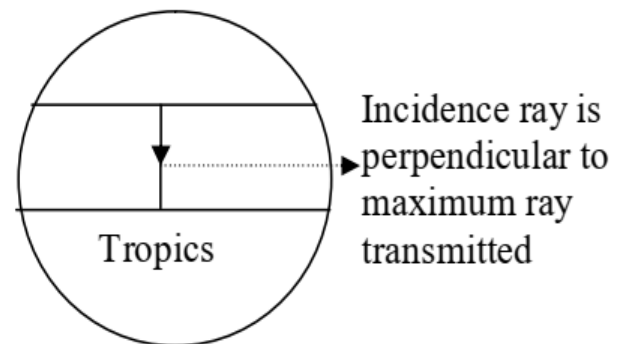
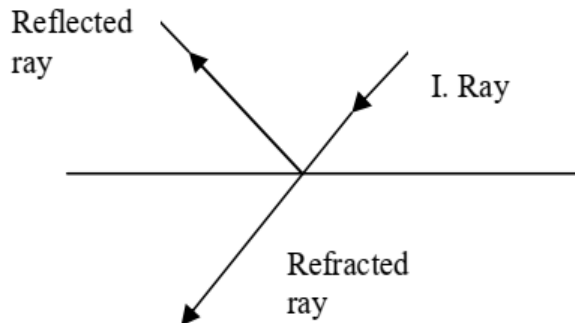


LIGHT OR WATER TRANSPARENCY

This is the amount of light entering the water. This affects production or photosynthesis (basis of aquatic production and population). Light/transparency is changes in spectral quality and decrease in intensity as it passes through water because of scattering and differential absorption by the water. In pure water, roughly 53% of intensity light is transformed into heat and undergo extension (quenching) which in the first meter Angle of Incident ray affect transparency. Amount of ray refracted has to do with transparency. Maximum ray transmitted when Incident ray is perpendicular to the water surface reason why light penetration is greater in the tropics than in the higher latitude.



Maximum light penetrations occur about mid day when sun ray is vertical above water surface. In the morning sunlight angle is $<90^\circ$, much of light is reflected. Water movement also affect transparency. During water movement oncoming light rays will not hit the water at the same angles. Also in raining season hence low light penetration.

Lecture 3



In dry season, water is still, maximum penetration as transparency is high.

TURBIDITY

Turbidity can be defined as the amount of suspended solids in water. In turbid water, the soil absorbs/ reflects light rays reducing the amount available for primary production.

Though, when transparency is too much, it may indicate low productivity. Light loving organism stay at the upper part while low light tolerating organisms move down to the bottom of the water. Organisms have different light quality regime. The optimum quality of each organism tends to correspond to the usual light intensity in their natural environ.

Longer wavelength (Red and Orange) and shorter rays (Indigo and Violent) are more rapidly quenched than rays of intermediate length, blue, green and yellow. Animal living in strong light usually accumulate in blue and violet end of the spectrum; while those living in dark environ collect in the red; and animals living in moderately light regime are evenly distributed in the tube though majority congregate in the blue end i.e. they reflect what is in their natural environ. Light intensity affect embryo activity, breeding period, visibility, by enemies or avoidance. At optimum light intensity, higher photosynthesis thus dissolved oxygen released into the atmosphere and carbon dioxide is removed. At

higher light penetration more nutrients NO_3^- , PO_4^- , etc are utilized thus pH becomes greater (alkali) as all the acidic CO_2 are used up.

Measurement of water transparency/light

PHOTOMETER converts radiant energy of light into electric energy and record.

SECCHI DISC measure light depth penetration. When the immersed secchi disc disappears and reappears. Find mean of the two depths which is equal to secchi disc transparency. When secchi disc disappear we believe no more light below at a zone called EUPHOTIC ZONE and it's twice secchi disc penetration.



A sinker is attached to it if wood is used to sink it down.

ATTENUATION/EXTINCTION COEFFICIENT

Rates at which light decreases in water with depth

$$EC = \frac{2.30 (\log I_1 - I_2)}{d_2 - d_1}$$

$$d_2 - d_1$$

Where I_1 = light intensity at depth d_1

I_2 = light intensity at depth d_2

Light enters water gradually hence gives a curve linear relationship shown above

Embryo subjected to light is more active and develop quicker but weigh less at hatching, have greater morality rat and genetic change.

AMOUNT OF SUSPENDED SOLIDS IN WATER (TSS)

When light penetrated water, any suspended solid absorb/reflect light rays reducing amount of light going beyond them. Thus, the more dissolved solid, the more turbid water and the less light penetrate it. To use this we filter to remove all suspended solids (both living and non living, organic and inorganic) using a very fine filter paper with micropore or milipore (40nm) called micropore membrane filter paper. Paper must be ashless with non organic material in water can wash away e.g. glass fibre filter paper.

WATER COLOUR

True water colour caused by amount of substance in solution/ colloidal suspension in it and colour result from unabsorbed light ray. *Remember from the incident light.*

WATER DEPTH

Depth shows relative distance between the beds of water to the overlain shallow water. It is related to light penetration, thermal stratification, volume and photosynthesis and distribution of organism in the water body. It is difficult to define "shallow" or "deeper"

of a water body because in some purpose 100m is shallow while 30m is deep in some other areas. The actual variables are:

- 1) The extent to which benthos is illuminated by light.
- 2) The degree at which benthos is separated from the surface water.

In shallow water, wind and current induce mixing and efficiency of energy transfer and nutrient cycling is therefore enhanced in shallow water, benthos can feed directly on planktons. At the surface on a sunny day, the rate of photosynthesis is inhibited. Rate increase as one goes deeper to reach a maximum which is moderately clear water (2-3m deep). Below this maximum, photosynthesis falls off in relation to irradiance (lack of light). Layer within photosynthesis is termed PHOTIC or EUPHOTIC zone which depend on time of the day.

Critical depth is the point in water which photosynthesis is the same as respiration. The shallower the water, the greater the diurnal swing in temperature and because a large proportion of the whole water is within the reach of light radiation. Depth of water also determines its volume available at any point. When water is deep, takes more volume of water which affects movement and migration of aquatic organisms.

NOTE:- the very existence of a standing water depends upon the relationship between rainfall and evaporation. Rate of evaporation depends on temperature and vapour pressure, the atmosphere, humidity, wind stress at the surface. Rate of evaporation per unit volume of a lake and rate at which it may alter the water position also depends on the relationship between surface area and volume. The balance between rainfall and evaporation at different season over the years is a distinguishing feature between climates of different region in the tropics. Hence tropical climate is one which high temperature

Lecture 3

greater than small seasonal fluctuations. No clear art divide between tropical and temperature climates which grade one into the other with many intermediates. There are some parts of tropics without tropical climate though equatorial region has more uniform climate, high rainfall and humidity with relatively high temperature and it's easier to define ecologically.