-video 1 env and ecology-

1. what is ecology-

-hackel and tansley described ecology as reln among organism hteir reln with env;

-ecosystem = biotic(live) + abiotic(soil,water etc);

-ecad or EcoPhenes= plant species having same genetic stock, but diff physcial features(due to env influence), which are REVERSIBLE(i.e If one type of ecad is transplanted into environment of another type of ecad, the differences would disappear.);

CANNOT interbreed;

-ecotype=speices which can interbreed; genetically diff; they represent LOCALLY Adapted organisms of same species BUT diff genetic stock; CAN interbreed; IRREVERSIBLE;

-species = organism capable of interbreeding;

2.ecological succession= transformation from primary simpler species like lychen etc to very complex speices, called as Climax species;

if occurs in bare area, it is primary succession;

if occurs in area with earlier existence of life, it is secondary succession;

-SERULE=ecological succession for microorganism like bacteria etc;

-SERAL - A seral community (or sere) is an intermediate stage found in ecological succession in an ecosystem advancing towards its climax community. In many cases more than one seral stage evolves until climax conditions are attained.

3. auto ecology and syheecology-

-syheecology= ecology of group or community is syhe ecology;

-autoecology=if unit of study is individual;

4. ecological niche= physcial and functional role of species in a community;

-edaphic= anything related to SOIL:;

-ecological equiivalence=similar ecological niche in diff geeographical regions;eg - america it is steppes and in eurasia it is praries etc;

5. therms == classification based on temp survival;

-mega therm=high temp high rain= tropical rain forest;

-meso therm=alternating high and low temp; tropical decidious forest;

-micro therm= low temp throughout the year; mixed confierous forest;

-hekisto therm= very low temp; alpine forest;

6. Biomes-

- they are largest unit present;

-there are 11 biomes around the world;

7. Abiotic factors: imp ones are->

\*temp=most imp; controls enzymatic factors, their kinetic factor s and basic metabolic rate;

\*water;

\*light

\*soil- it is Edaphic factor;

8. response to abiotic factor-

there are 5 classes of responses-

a. regulators- human beings;their internal levels remian constant even as external env changes;

b. conformers- internal level is changing along with external level; they change along with changing env;

c. partial regul;ators-their internal level changes with external env to some extent and after that it remains constant;

d. migrants-they migrate to odr locn under extreme conditions;

e. suspension- bacteria, fungus form spores which are converted into organisms under favoirable conditions;

9.Adaptation-

-any rules(morphological,physiological,behavioural) that facilitates in survival and reproduction of an organism is called adaptation;

-it is both a process as well as already existing trait;

-as a process it leads to evolution;

a. allen's rule-

\*it defines reln bw surface area and body volume of endothermic animals;

\*endothermic= to gain energy from env, not necessarily by absorbing in form of heat;

\* cold climates, Allen's rule predicts that animals should have comparatively low ratios of surface area to volume

\*In warm climates, Allen's rule predicts that animals should have comparatively high ratios of surface area to volume. Because animals with low surface area to volume ratios will overheat quickly, Allen's rule predicts that animals in warm climates should have high surface area to volume ratios to maximize the surface area by which they dissipate heat, allowing them to dissipate more heat.

b. taq polymerase-

\*taq=thermophilus aquaticus;

\*\*this is bacteria whose DNA is thermo stable and so can survive in high temp;

\*use in PCR for DNA amplification; PCR=polymerase chain reaction;

c. chaperone protein-

\*protein that helps survive in HOT temp;

\*they are HEAT Shock Proteins;

d. Camp pathway-

\*involves conversion of leaves into spines;

\*it allows photosyntheiss in night in desert plants as they cannot do photosynthesi in daytime as that will lead to water loss;

e. kangaroo rat-

\*dont take water for days, and get water form - fat oxidation and concentration of urine(so water loss occurs);

f. altitude sickness-when people go to higher level env, they adapt dynamically to higher level altitude by incr rbc cells in body; once they return to normal level body restores back;

10. Polulation Pyramid-

-base= represents children;

-top=represents elderly;

a. expanding popln- wide base and narro top;

b. stable popln- near same size across top to bottom;

c. declining popln= narrow base and top; middle is wide;

-base = pre reproductive age;

-top=post reproductive age;

-middle=reproductive age;

-video 2-

1. ecological succession-

-observed pocess of change in the species str over a period of time;

-it means replacememt of simpler species by more adaptable species till climax is reached;

-primary succession= happens in bare area where no life exists before this;

-secondary succession=happens in area where life existed earlier; so it follows disruption of pre-existing community;

-serule =ecological succession of micro organism;

-pioneer species= 1st to arrive ; few in no. ;

2. sequence of sucession-

a. nudasion- bare area without any life;'

b. invasion= pioneer species come establishing themselves first(via migration), then sucession(start living), then aggegation(start reproducing--incr in no. of individual per species);

c. competition-both inter and intra species ;

co-action = member of a speices somehow affects odr member of species;

d. re-action=most imp stage ; env is modified under influence of living organism;

e.Stabilization=climax community; climax community become more or less stabilized; env and organism are in equilibrium over a period of time;

3. exceptions to success chain sequence-

-retrogressive succession -forest to shrubs to grass; so backward direction; coz of -

a. disruption by continuous biotic influence like human actions of pollution, atom bomb etc;

b. climate factors - ice age etc;

c. forest fires

d. volcanic eruption;

4. Climax-

- it is a stage of harmony of organism with env;

-both influence each odr, and adapt continously;

-there is - wide diversity, well drained spatial str and complex food chain;

-poly climax=there is no one final stable stage ; there can be many;

5. Population Interaction -

-no speices can survive in isolation;

-so interaction is a basic necessity;

-these are-

'-' = bad for species;

'+'=good for species;

'0'=no impact for species;

a. Mutualism = ++ ;

b. Competition= --;

c. Parasitism= +-;

d. Predation = +-;

e. Commensalism= +0;

f. Amensalism= -0;

6. Amensalism-

there are certain plants which from their roots release toxic elements which doesnt affect them, but are damaging for other plants;

7. Predation -

-every species in an ecosystem carries energy with it;

so predation helps in release of fixed energy by consumption of one species by another;

-predation helps in control of prey popln, and thus assist in maintaining **high Biodiversity** in the ecosystem;

eg-

\*in aus, when prickly pear cactus got imported, it spread rapidly in the area, and so to control its popln, its predator-MOTH- had to be imported;

\*In pacific intertidal area, when the predator Pisaster Starfish was removed, it led to 10 species of invertebrate disappeared;

-if predator is too efficeint- then it extincts prey first, and then itself; so predator must be prudent in order to survive;

-techniques used by prey to save itself-

a. camouflage;

b. monarch butterfly - extremely distasteful; so no ones liked to eat it;

c. against phytophagus insects(insect that eat plants), plants like acacia and cactus have developed Spines;

d. Calotropis- it is a plant, which contains cardian glycosides which is extremely toxic;

e. following extracts are defence mechanism by plants -

\*nicotine

\*caffine - in coffee and tea

\*Opium- in morphine;

\*quinine- against malarial infection; from Cinchona Bark;

\*strychnine - used in sugar;

8. Competition-

-darwin has said survival of the fittest among closely related species competing for the same resource;

-but this is not fully true as there are many exceptions to it;

eg -

\*Unrelated species= flamingos and fish compete on consumption of zooplankton; both are diff speces, but resource on which they compete is same;

\*even if resources are abundant, due to difference in feeding efficiency, competition occurs; one may consume more other less such that one specie flourish at the cost of odr;

-new defn of Competition = if fitness of one species(i.e. reproductiveness, popln etc) is significantly lower in presence of odr spcies, then it is a case of comptetion;

eg-

\*abingdon tortoise got extinct in 10 years due to intro of goats on Galapagos island;

-competitive release=if competitor is removed, the species geo spread increases. eg - removal of barnacle Balanus that dominates smaller barnacle Chathamus in Scotland;

-Gause's Competitive Exclusion Principal= if u are competiting for same resouces, it cannot last indefinitely and one or the odr species will be removed;

But not always true - thru resource partitioing. eg - Warblers live on same tree with diff foraging activities;

9. Parasitism-

-involves free residence, transport and food; So very popular; found in plants, higher vertebrates, small micro-organisms etc;

-co-evolution of host and parasite- if host specie evolves then parastie has to evolve, otherwise it will die;

so parasite has developed following features-

\*loss of unnecessary SENSE organs like touch, tongue,eyes, ears etc;

\*loss of digestive system;

\*has presence of adhesive organs or Suckers to cling on to host so that it does not get washed off in digetsive tract, respirartory tract etc;

\*has high reproductive capacity so as to expand to odr organisms;

-has extremely complex life cycle. Eg- Human liver Fluke(trematode) depends on 2 intermediate hosts-snail and fish;

-3 types of parasites-

a. ecto parasite

b. endo parasite

c. Brood parasite

-ecto parasite-

\*they are outside like Lice(human hairs), Ticks(dogs),Cupepods(infects marine fish), Cuscuta(it is a plant that has no Chlorophyll and so gets attached hedge plants as a parasite);

-endo parasite-

\*found inside liver( fluke), kidney, RBC(plasmodium),lungs etc

\*in RBC we have Plasmodium parasite which is transferred by female anopheles mosquito(a vector that spreads malaria)

-Brood Parasite-

\*happens in spring season;

\*seen in case of cuckoo placing its egg in NEST of crow;

-parasites harm the host; they reduce its survival, growth, reproduction, poplmn density etc; but they USUALLY DONT KILL the host;

-NOTE- female anopehles mosquito is a VECTOR and not a parasite as although it consumes human blood but that is for nourishment of its fertile eggs, and not uses blood as food; it transmits plasmodium Vivax to human body which is a parasite of RBC;

10. Commensalism-

-one benefits and odr unaffected;

-eg ->

\* orchid or other epiphytes(grow on odr plants) - grow on odr trees for support;

\* cattle egret(small animals)---as cattle moves forward, insects in grass come out and this is fed upon by egrets.

\* sea anemone has stinging tentacles, and so Clown fish lives among them to safeguard themselves from predators;

11. Mutualism-

-both benefits

-mycorhizae=fungus(so CANT do photosynthesis); it helps root of plants absorb essential nutrients; in return it gets food(energy yielding carbohydrates) from plants;

-lichen = it carries mutualism bw algae and fungi, where algae prepares food via photosynthesis, and fungi does transport;

-Pollination - here pollen grains from one flower needs to be transferred to plant of same species so that fertilization occurs and seeds and fruits can be produced; so when animals eat fruits(i.e. pollen and nectar), in the process they are aslo helping in dispersal of seeds thru faecal matter etc; so animal and plant both benefitting;

Here also CO-EVOLUTION is extremely imp; any change in pollen or nectar means animals/insects will stop coming to that plant for fruit, and hence that plant wont be able to reprduce and continue its existence;

eg -

\*fig is able to propagate its existence due to mutualism reln with Wasp;

How- wasp lays egg inside fruiits of fig, and when lava emerges from egg, it feeds on seeds of fig; in return, wasp pollinated fig inflorescence;

\*mediterranen orchid, called as Ophyrus, does sexual deceit ;

it resembles female of the insect species; so when male comes for copulation, the pollen on orchid reach to pollen on odr orchid/ophyrus; there is psuedocoputalion wid 2 or more leading to polination; here also co-evolution is a must;

Wiki - These plants are remarkable in that they successfully reproduce through [pseudocopulation](https://en.wikipedia.org/wiki/Pseudocopulation), that is, their flowers mimic female insects to such a degree that amorous males are fooled into mating with the flowers, thereby pollinating them.

**Video 3**

1. ecosystem = smallest structural and functional unit of nature; largest = biosphere;

-it consist of both biotic community and abiotic env, which have close interaction, that is essential for life processes;

-this interaction involves-

\*flow of energy - unidirectional = solar energy;

\*flow of matter- bi directional = nutrient cycle= bio geo chemical cycles;

-entire biosphere is considered as Global Ecosystem;

-A biosphere is sum of all the local ecosystem on earth;

2. str of ecosystem includes-

-input(productivity-primary,secondary etc)

-transfer of energy and matter(nutreint cycle)

-ouput in the form of degradation and energy loss;

3. Ecosystems have indistinct and overlapping boundaries with odr ecosystems;

-they may be temporary or permanent;

-they may be as small as drop of water or as large as whole earth;

4.types of ecosystem-

a. on basis or ORIGIN -natural and artificial;

-natural - no need for man for their existence;

eg - forest,desert,grassland;

eg-aquatic ecosystems like lake, ponds, wetland etc;

aquatic ecosystem is of 2 types - Lotic(running fresh water, river etc) and Lentic(stagnant water like pond, lake, swamp etc);

-artificial ecosystem- crop field(monoculture) and aquarium etc;

b. on basis of size we have -

mega ecosystem - covers entire biosphere;

macro ecosystem - major biomes like tropical rain forest etc

micro ecosystem - pond, aquarium etc;

nano ecosystem - drop of water;

5. component of ecosystem-

-biotic components- include any Living component from smallest microbe, fungi to largest animals and plants;

-abiotic components - include -

\*inorganic substance like carbon, nitrogen, carbon dioxide, water etc; they are involved in natural cycles(biogeochemical cycles), air, water, and odr physical factors;

\*organic compouns like proteins, carbohydrates and humus;

\*temp

\*light

\*soil

\*water

6. Temperature-

-it is MOST IMP env factor as Spatial distribution of species is dependent on temp;

-specie distribution is highest at areas of highest avg temp - equator, mean sea level;

-as u go away from equator or away from mean sea level on either side, specie distribution decr, i.e, it can limit biodiversity;

this is coz temp can cause desiccation(drying out), chilling injuries and freezing injuries etc;

- if temp incr, relative hunidity also incr, which is measured by an instrument called Psychrometer;

for wind, we use Anemometer;

-temp based zonation of water bodies: thermal stratification in lakes-

\*epilimnion= vertical gradient of GRADUALLY decr temp from surface;

\*Metalimnion or Thermocline =short zone with RAPIDLY decr temp;

\*Hypolimnion= Deep Zone of cold temp, where no further gradient;

7. water-

-source of soil water = precipitation;

-form of precipitation - drizzle, rain, dnow, sleet, hail;

-on basis of water need, organisms can be classified as -

a. hydrocoles=water loving - aquatic animals needing large quantity of water like fish;

b. mesocoles= animals needing moderate amounts of water including most terrestrial animals; ex- man;

c. Xerocoles= terrestrial animals who can tolerate extreme dry conditions and can survive many days without water like camel and kangaroo rats etc;

Xero=DRY;

-Eury = loving = who can tolerate;

\*euryhaline = organisms who can tolerate wide range of salinity

\*eury thermal = organism who can tolerate wide range of temp;

-Steno=who cannot tolerate;

stenohaline= organism which can survive in limited range of salinity;

avg salinity in sea = 35 ppt;

-Halo Phytes= Salinity LOVING(not surviving) plants;

-neritic zone= shallow shore region of marine sea;

-ox bow lake= part of a water body which has been cut off from river;

-Estuaries= region where river enters ocean;

8. Soil-

-also known as Edaphic Factor;

-in general, soil has the composition of - minerals, water, air & other GASES, organic matter(innumerable organism);

But composition varies depending on Type of soil and locn of soil;

-pedogenesis= soil formation;

-pedology=study of formation of soil;

-LOAMY soil= here none of the component dominates the odr; it has 40% sand, 40% silt, and 20% clay;

It is best soil for growth of plants due to high water holding capacity, high aeration and root penetration;

-soil organic matter-

\*it conststs of freshly fallen plan or dead animals including detritus or litter;

\*partially decomposed incldues duff;

\*fully decomposed= humus;

\*3 types of organic matter= litter(fallen),duff(partially decomposed) and humus(fully decomposed);

-steps in formation of humus-

a. fragmentation = breakin of organic matter into small particales by detrivores like earthworms;

\*earthworms are also called farmers friend as they break down soil into smaller particles, and loosen the soil;

\*earthworms are also called detrivores as they feed on detritus;

b. leaching - water soluble nutrients move into deep soil, which is also called soil horizon;

c. catabolism - bacterial and fungal enzymes degrade comples molecules into simpler ones;

c. humification and mineralization -leads to formation of humus, then minerals and occurs during soild formation;

- Mor and Mull-

\*Mull = REAL humus i.e. fully developed humus;

\*Mor = raw humus; formed in acidic soil; so wants more decomposition;

-types of soil-

a. residual soil= here weathering and pedogenesis occur at same place;

weathering = breakdown of rocks;

pedogenesis= formation of soil;

b. transported soil= here weathering and pedogenesis occur at diff place;

these include - CAGE-GWSW;

C=Colluvial- brought by Gravity;

A-Alluvial- brought by Water;

G=Glacial- brought by Snow;

E=Eolian - brought by Wind;

-odr misc points abt soii-

\*Nutrient availibility depends on pH of soil;

\*Best pH of soil for growth ofplants = 5.5 to 6.5;

\*Excess Water logging causes salinity;

\*ALKALINE soil can be corrected by adding GYPSUM(CaSO4);

-main soil types in India are -

a. red

b. laterite and lateritic

c. black

d. Forest and hill soil;

e. Peaty and marshy soil;

f. desert soil;

g. saline soil;

h. alkaline soil;

---------------video 4-------------------------

1. red soil-

-lightly textured;

-porous and friable;

-absence of lime;

-neutral to acidic reaction;

-deficient in nitrogen, humus, phosphorus, and lime;

-since no lime - so no kankar and no free carbonates;

2. Laterite soil-

-crimson red in color;

-low in N,Humus,Phosphorus,,potassium;

-formed in-situ in period of alternate hot and dry period;

-rainfall leads to leaching;

-seen in entire India including along ghats;

3. Black soil

-also called inidan regur soil or black cotton soil

-result of vulcanism;

-dark brown color;

-suitble for growing cotton;

-accumulation of lime seen ;

-defeiceint in N,Humus,Phosphorus;

-but ->

* rich in Potassium;
* since accumulation of lime- so rich in calcium and magnesium;

4. alluvial soil-

-largest area covered;

-highly fertile;

-occurs along rivers, and represent materials deposited by rivers during flood;

-deficit in N, Humus, Phosphorus;

-also seen along valleys of rivers;

5. Forest or hill soil-

-occur at high or low altitude if the rainfall is sufficient to support trees;

-found in shallow, marshy areas less steeply inclined slopes and depressions also;

-infertile soil;

-but carry timber and fuel, and so used in construction material;

6. desert soil

-sandy soil

-low rainfall;

-deficient in N, Humus, Organic material;

-rich in soluble salts coz of deposition;

-high pH value; so alkaline;

-very productive, but only constraint is lack of water and poor retention of water;

-often subjected in wind erosion;

7. saline and alkaline soils-

-similar to desert soil; but one diff is that they have encrustacean i.e. layers of salts of calcium, magnesium above soil;

-due to layer of salt at top, they have very poor drainage and are infertile soil;

8. peaty and marshy soil-

-also called Kari soil in Kerela;

-also found in coastal track of odisha, sunderban ;

-they have partially decomposed organic matter, and so acidic;

-infertile; but if properly drained, they can be fertile in growing rice;

9. **Soil Erosion-**

-soil erosion = removal, transport and deposition of soil from one locn to another;

-It leads to -

a. decr in productivity coz of loss of top soil;

b. desertification;

c. ecological collapse- coz species dependent on plant die coz plant perishes when soil is eroded;

d. eutrophication- coz top soil, rich in nutrients, get deposited in water, and so it leads to algal bloom etc;

-causes = natural - by wind and water; but accelerated by anthropogenic factors;

Water- = SGR (Sheet,Gully,Rill)

a. complete sheet erosion

b. gully erosion;

c. rill erosion;

Wind - =siltation, suspension and surface;

-Solifluction= a special phenomenon;

* also called soil flow-age;
* seen in Tundra;
* SoliFluction(water) + wind erosion = responsible for 84% of erosion of land;
* in tundra, coz of permafrost, water cannot percolate below; so it has saturated, saggy and heavy appearance;

-slip erosion = also known as Landslides; water and gravity combination moves large amt of soil down the slope;

-Steam Bank Erosion=rivers during floods splash their water along banks and cut thru them;

10. Methods of soil conservation-

a. agronomic methods -

\*contour farming;

\*mulching- etc seen in case of sugarcane, maize, and potato;

\*crop rotation- prevention of depletion of minerals by growing of alternate crops, usually leguminous crops;

\*strip framing=planting crops in strip and rows to prevent flow of water;

b. agrosto-logical methods-

\*related to grass; grass is used as protection methods like in Relay Farming;

**Light: 4th imp abiotic factor-**

-needed for photosynthesis;

-based on penetration of light there is stratification of lakes-

a. littoral zone- found near bank or shallow water;

b. limnetic zone- here light penetrates and is zone of major photosynthetic activity;

c. profundal or abyssal zone= very deep zone with no penetration of light;

-light intensity is measured in Candel using Luxmeter or photometer;

-Electromagnetic spectrum-

E=hv where h=planck constant and v=freq; or E=h(1/wavelength);

in order of DECR energy: Gamma> X-ray>UV>Visible>Infra Red>Tera Hertz>Micro Hertz>radio waves;

in order of DECR freq; same as above;

in order of INCR wavelength: above

- UV radiation can be distinguished into 3 parts- C,B and A - in order of incr wavelength;

carcinogenity of UV ray directly depends upon energy of ray; so inversely depends upon wavelength of ray;

C=100-280nm=absorbed fully by Ozone layer; most carcinogenic;

B=partially absorbed by Ozone;

A=not much absorbed by ozone; so it leads to most of the Cancer;

-visible radiation = 400-700nm; VIBGYOR; it is Photosynthetically Active Radiation(PAR);

-Albedo value of light-

\*also called reflection coefficient;

\*= (reflected value / incident value);

ex- if 100 units of sunlight is incident, and 80 is reflected back, then Albedo Value = 80;

* albedo value= 1 for perfectly white body;
* albedo value= 0 for perfectly black body;
* in reality it varies from 4%(charcoal) to 90%(snow);
* moon Vs Earth : **Earth has More ALBEDO than Moon**
  + albedo of earth = 0.3 due to clouds;
  + albedo of moon = 0.12 due to lack of atm;
* albedo of imp surfaces arranged in INCREASING order-
  + Asphalt: fresh asphalt<worn asphalt <
  + Forests: coniferous forest<deciduous forest<
  + Soil: Bare soil <Green grass<desert sand <New concrete<
  + Ice : ocean ice<fresh snow
* Highest Albedo = Fresh Snow; Lowest Albedo= fresh Asphalt(Charcoal);

**--------video 5-------------**

1. Str and fn of ecosystem-

-stratification of ecosystem= it is vertical distribution of diff layers of ecosystem like in forest trees occupy top layer(i.e. CANOPY), shrubs next layer, herbs after that and grasses lowest layer;

-components of ecosystem-

a. productivity;

b. decomposition;

c. energy flow;

d. nutrient cycling;

2. pond ecosystem-

-=natural self sustaining ecosystem;

-=micro ecosystem;

-Abiotic component in all ecosystem are mainly temp, soil, light and water;

-Factors that regulate functioning of ecosystem are -

* solar input;
* cycle of temp;
* day length and odr climatic fn;

-Types of species ->

a. Autotrophs are Phytoplankton( i.e. passive drifters);

[note: planktons, nektons and benthos;]

eg - algae floating , submerged and marginal plants ;

b. consumers are Zooplanktons (they are also passive drifters), fishes(nektons- can swim in their won direction of choice);

c. benthos = bottom dwellers;

d. decomposers= fungi, bacteria, flagellate etc;

-Fn of pond ecosystem-

a. conversion of inorganic compound into organic compounds.

e.g. - conversion of carbon, nitrogen etc into carbohydrates, fats etc;

\*done by Autotrophs;

b. consumption of Autotrophs is done by hetrotrophs;

c. decomposition and mineralization of dead matter to release them into ecosystem is done by Decomposers;

d. energy flow = unidirectional; loss of energy in the form of heat to env and respiratory losses;

3. Biomass= mass of LIVING Biological organism in a given area at a given time; so it includes everything under the sun;

-it is usually measured in terms of Dry Weight or by the Organically-bound Carbon;

-Species Biomass= biomass of one particular specie in an ecosystem;

-community biomass= biomass of all the species(**LIVING** Plants and Animals) in a community in an ecosystem; while includes bacteria, microorganism, plants etc, its measure usually does not include bacteria coz biomass of bacteria itself runs into billions of tons;

it is measured either in term of dry weigth(so excludes water which a/cs for 60-80% weight) or in terms of Organically Bound Carbon;

-Standing Crop = total dried biomass of all the organism; in some defn it includes only autotrophs i.e. plants; so standing crop can be said to be total dried biomass of all plants in a given area;

4. Production and productivity-

-prodn = total amt of biomass per unit area;

* measured in grams per metre sq or Kcal per metre sq;

-productivity = rate of prodn;

* so measured in terms of grams per metre sq per year or Kcal per metre sq per year i.e. wt/energy per unit area per year;

-primary productivity = (primary prodn)/(time);

* So amt of biomass measured in dry wt over a unit area produced by plants during photosynthetic activity;
* It is expressed in terms of wt/area/time or energy/area/time;
* 2 types of primary productivity- gross and net
  + Gross primary Productivity =rate of prodn of organic matter(carbohydrates, fats and proteins) during photosynthesis;
  + Net Primary Productivity

= Gross - loss due to respiratory and heat/temp losses

= available for use to higher trophic levels like herbivores or decomposers;

-Secondary Productivity-

* + it is defined as Rate of formation of new organic matter BY consumers;
  + always less than primary productivity;

-Factors influencing **Primary** Productivity-

* + **plant species** -some can produce very fast while odr are not so efficient;
  + env factors – ex- temp - max in tropical region and min in colder tundra regions;
  + availability of **nutrients**
  + photosynthetic capacity of plants

-Net annual primary productivity of whole biosphere = 170 bn tonnes of dry wt of organic matter

= 104.9 giga tons of organically bound carbons;

* Of this 54% is a/ced by Terrestrial organism; remaining 46% is a/ced by Oceanic organisms;
* So productivity of Land is 3 times that of Oceans;
* Land productivity = 426 gm per metre sq per year for Carbon; ocean productivity = 140 gm / m sq/ yr;
* Max productivity on land = tropical rain forests;
* Min productivity in water = very deep lake, especially abyssal zones, which is also called as - pelagic or profundal or benthic or hadalic or aphotic zone;
* Highest productivity in oceans = coral reef;
* Limiting factor in - ocean = nitrogen; lakes = phosphorus; = **NO PL = NO iPL;**

**Decomposers**

-decomposer break down complex organic matters;

* inorganic substances include carbon dioxide, water, nutrients etc;
* organic substances or detritus include leaves, barks, fecal matter etc;

-Stage = Detritus (litter) to Duff to Humus;

-5 stages of decomposition:

Fragmentation->Leaching->Catabolism->Humification->Mineralization;

Fragmentation by Detrivores-

* detrivores are those who feed on detritus or litter;
* e.g. -earthworm which is also called farmers' friend as it loosens soil and breaks down organic matter into smaller parts i.e. Fragmentation;

-Leaching = water soluble nutrients go into lower layers of soil along with water and become UNAVAILABLE; this is called leaching;

-Catabolism = bacterial and fungal enzyme degrade complex organic matter into Simpler ones, which is called catabolism;

**All above steps (Fragmentation, Leaching and Catabolism) operate simultaneously;**

Below Steps Happen in Sequence: first humus forms and then it gradually Degrades to release nutrients into env;

-HUMIFICATION = accumulation of humus;

\*Humus = dark brown colored AMORPHOUS substance, which is a reservoir of nutrients and is highly resistant to microbial action;

-Humus is slowly degraded by some microbes and releases inorganic matter to env; = MINERALIZATION;

* Humus degradation is a Very Slow process coz of lack of Oxygen;
* Decomposition of Humus incr when –
  + presence of Nitrogen;
  + presence of water soluble substances like Sugar(carbohydrates), with
  + Warm(Heat),
  + Moist(Humidity) and
  + Airy(Oxygen) env;
* Decomposition of Humus decr when –
  + Detritus is a complex organic matter like Lignin & Chitin;
  + Low Temp,
  + Low Water/Humidity,
  + Lack of oxygen(Anaebeorosis);

**------------------video 6------------**

1. Sun is the only source of energy on ALL ecosystem on earth; there are some exceptions but they are negligible;

- But only 50% of solar energy is photosynthetically active i.e. can be captured in the form of solar radiation;

-out of all photosynthetically active radiation, only 2-10% is fixed into organic matter;

-Unidirectional flow of energy occurs from sun to autotrophs;

-beyond the fixing by autotrophs, 10% rule applies;

-note= around 1 mn joules of energy from sun is incident, of which 50% is photosynthetically active(i.e. 0.5mn); from this 2% is fixed by autotrophs into organic matter(i.e. 1 lakh joules); and beyond that 10% rule applies(so 10,000jules at next level, 1000 joules and so on);

-law of thermodynamics says energy cant neither be created nor destroyed; so rest of energy is dissipated to env in the form of loss of heat, and some into respiratory losses;

-Trophic level - derived from trophos which mean nourishment;

- as number of trophic level incr, the energy loss becomes more and more, and so food chain is generally consisting of 4-5 levels;

-Heterotrophs -anyone who is not autotroph, IS A Heterotroph; it includes both herbivores and carnivores; they are depended on plants directly or indirectly; human beings are also called heterotrophs;

-Herbivores= 2ndary producers or Primary CONSUMERS; they feed on plants and represent 2nd trophic level;

Molluscs in aquatic ecosystem are herbivores;

-carnivores=are 2ndary consumers or tertiary producers;

-omnivores= occupy the top most level; b like man;

-Note- vegetarian shud be having more energy than non-veg person;

2. Special points about biotic factors- i.e. Autotrophs and heterotrophs;

-they show nutrient mobilization;

3. Some imp posn in Food Chain –

* Whale = filter feeder; Here when whale consumes water, it filters out water, and consumes phytoplanktons and so is a **2ndary consumers**;
* Vulture=**not occupying traditional trophic levels**; Why -> coz it feeds on dead bodies, and so is a **scavenger**; and so help in **decomposition**;
* Insectivorous plants = double roles - **producers**(photosynthesis) as well as **consumers**(consumes insects);
* Man and Peacock= omnivores; so occupy multiple trophic levels;
* If one consumes milk and curd he is 2ndary consumers(i.e. 3rd Trophic Level);

3. Food chain-

-producers = green plants;

* In terrestrial ecosystem- these include vascular plants;
* in aquatic ecosystem it includes - phytoplanktons and algae;

They represent starting point for all food chains in the world, except for detrivorous food chain;

-food chain = linear sequence of links in a food web; it goes diff nutritious levels, and start with autotrophs; end with decomposers;

But death of any organism marks the beginning of detrituis food chain;

So in nature, food chain does not exist;

- Only food web exists in nature;

4. types of food chain-

a. grazing food chain-

-also called predatory food chain;

- dominant in aquatic ecosys, but also found in terrestrial ecosystem;

-it starts with phytoplankton-> zoo plankton-> small fish-> large fish;

-grass-> rabbit->fox->lion;

b. parasitic food chain-

-here pyramid of numbers is inverted;

-tree-> birds->parasites;

c. detritus food chain or saprophytic food chain or osmotrophic food chain-

-it can start in any food chain-

-it begins with dead organic matter; as soon as animal dies the food chain begins;

-it consist of decomposers like bacteria, fungi etc; which releases enzymes on dead remains so that they decompose; they are also called saprotrophs or osmotrophs;

* saprotrophs =means to decompose;
* osmotrophs - absorb nutrition osmotically, after digesting food outside the body; they convert complex organic matter into simpler ones and then absorb them osmotically;
* \*they also play imp role in biogeochemical cycles i.e. nutrient cycles;

-extremely dominant in terrestrial ecosystem;

-in it **energy flow is SLOW** but **MAGNITUDE is great** bcz death is huge;

-it can be **upto 8** levels;

--------------------video 7----------

1. Food web-

-it consists of all interconnected and overlapping food chains;

-each organism in an ecosystem is part of multiple food chains;

-every food chain is one possible path that diff organism MAY take;

-More the Complex a food web is, more the Stable the ecosystem is since diff organism take diff paths;

-so ecosystem with simpler food web is less stable, and vulnerable to collapse;

2. Negative feedback mechanism-

-it is a good term;

-positive feedback = vicious cycle;

-homeostatsis-

it says most of ecosys remain at DYNIMC equi, with help of Negtaive feedback mechanism;

\*in case of any change in one part of ecosystem, odr organism reacts accordingly;

-cybernetics-?

3. Ecological pyramids-

-Straight ecologic pyramid- trophic pyramid which can be a pyramid of number or biomass or energy;

-so help us simplifying food web;

a. Pyramid of numbers-terrestrial ecosystem like in savanna;

Usually upright, but inverted in 2 cases-

* tree ecosystem(1 tree, lakhs of insects, some bird feed on insects--so neither inverted nor upright but a mix type of ecosystem) and
* Parasitic Ecosystem(Dog, Fleas, Protozoas);

b. Pyramid of biomass-

\*usually upright;

\*exceptions = inverted in case of aquatic ecosystem- phytoplankton->zooplankton->small fish-> large fish;

c. Pyramid of energy - always upright why upright-coz of flow of energy is unidirectional;

-Limitation of ecological pyramid-

\*does not accommodate food web;

\*does not take into a/c same species belonging to diff level;

\*saprotrophs don’t get any place in this; i.e. no place to decomposers like bacteria;

4. Imp rules-

a. as the mammals in cold env lose heat rapidly , so the extremities are very small in colder region and large in warmer region;

* found usually in birds and mammals; why- coz they are URITHERMAL-i.e. they are able to regulate their body temp; they maintain their body temp in a range.eg- human=32-36.5 degree;
* in colder regions extremities tend to be small;

b. Size of Species & Temp-> species of larger size are found in colder environments, and species of smaller size are found in warmer regions

\*why- as body size decr, so does body volume, and so less mass available to burn by body to maintain body temp in colder regions;

c. Skin Color and Temp - mammals and birds darker in hot areas;

d. Fishes of colder water possess More number of Vertebra;

e. birds in hot region have broad wings, and narrow wings in cold areas;

So If Temp is High then you will have ->

* More Extremities
* Smaller size
* Darker Skin Color
* Broad Wings( If Bird)
* Less no. of vertebrates (If Fish)

**-------------------video 8 -------------------**

1. Shelford law of tolerance-

-max organism in zone of optimality;

-beyond that on either side, we have zone of Stress;

-beyond zone of stress, we have zone of intolerance;

-so structure->

zone of Intolerance->zone of stress->zone of optimality<-zone of stress<-zone of intolerance;

-it represents an inverted U-shape curve;

-Law holds for all types of entities- height, income, weight etc;

2. Bio geo chemical cycle or nutrient cycle-

-Various nutrients covered- carbon, hydrogen, nitrogen, phosphorus, etc;

-it is called mvt of nutrients across the ecosystem, passing thru various components;

-**bio**=living items; **geo**=rock, sand etc; **chemical**=mineral state; **cycle**=coz occurs in loop;

-standing state=amt of nutrient(C,H,N etc) present in a soil at any point;

-standing crop= amt of autotrophs-plants, algae, fungi etc- present; = dry weight of biomass of autotrophs;

-2 types of BCG->

* gaseous(related to gases- Carbon, hydrogen, nitrogen, oxygen etc) and
* sedimentary cycle(sedimentary=sedimentation = deposit which occur in earth curst- phosphorus, sulphur, calcium etc);

3. Carbon Cycle-

--it contains 49% of dry wt of carbon;

-oceans contain 71% of total carbon present on earth inn doissolved form, but it does not act as reservoir; amt contains 1% of carbon, and that is responsible for climate change and hence is of relevacne;

-atmospheric carbon is impacted by carbon in oceans;

-<hear video: time 6 min onwards->

4. nitrogen cycle--why need Nitrogen cycle, when atm has 70% NItrogen? coz plants can absorb Nitrogen only in form of NItrate;

Step 1: Nitrogen Fixation

-fixation can be done by bacteria(azospillirum, clostrodium, rhizomium, anabaena);

\*also by blue-green algae(anaebena , nostoc);

\*also by azola fern(pterophytes);

-5 categories of plants-

\*algae;

\*bryophytes(mosses);

\*pterophytes(ferns);

\*gymnosperms-no flowers, and naked i.e not covered by capsules;

\*angiosperms;has flowers and seeds

-azola is a fern which has been used in rice cultivation as it incr rice productivity singnificantly; this is coz azola fern harbours anaebena, which is a kind of ablue green algae that fixes nitrogen, and so incr productivity;

-azatobacter- aerobic bacteria;

-clostridium- anaerobic bacteria; this bacteria is of same genus taht causes tetanus, botulism, food poisings; Botox is also derived from Clostridium;

\*Botox is used in facial muscles strenthening, that gives younger look to face;

-associative symbiosis- this is how atmoshperic nitrogen fixed; it is done in root of leguminious plants;

-roots of planst have leghaemoglobin, which is red in color; leghaemoglobin transfers oxygen and decreases oxygen concentration so that bacteria in roots of plants can SURVIVE and do nitrogen fixation;

Step 2: Nitrification

-nitrification- by nitrosomonas or nitrococcus or nitorbacter;

-involves conversion of NH3(Ammonia) to NO2-(Nitrite) to NO-(Nitrate); so done in 2 steps;

Step 3:Nitrogen assimilalation-

\*done by plant roots;

\*NItrogen present in nitrate form, which is abrosrbed by plant roots along with water from Soil;

\*here NItrate is converted into Organic Matter by plants;

Step 4: Ammonification-

-once plants dies, its ogranic matter becomes litter;

-litter is converted to duff and then to humus and ammonia finally;

-done by Bacillus;

Step 5-Denitrification-

-here removal of nitrogen from ammonia takes place;

-Ammonia , nitrates, n nitrite are converted into free nitrogen;

-done by psuedomonas bacteria;

5. phosphorus cycle-

-major reservoir is Rocks or earth crusts ; so Sedimentary cycle;

-it forms main constituent of - protoplasm, cell membranes, bones, nulciec acid i.e.DNA/RNA(they have phosphate backbone), celluar energy transfer apparatus(i.e info ATP- adenosine triphosphate);

-excretory material of birds on rocks is known as guano, and is source of phosphorus, and so especially seen in coastal areas, like in south america- ecuador, chille ;

-it has neglibgible presence in atm;

-major source = rock which have PHOSPHATE;

-weathering of rocks leads to release of Phosphorus, and its absorption occurs in plant roots;

once inside plants, it gets transferred to higher trophic level, and there once they die, it converts to litter, and then duff and humus, and finally, mineral phosphate;

env n ecology 9

1. imp facts-

-ramdev mishra is father of ecology in india;

-ecology = cientific study of interactions and interrelationship bw organism and its env;

-env = sum total of all conditions and infleunce the dev of organism on earth; broader term and includes habitat;

-popn- includes all organism of One speices; local organism are called Demes;

-Community=group of organism of diff species; so it includes MANY popln;

-Biological hierarchy -

DNA/RNA->Cell->tissue->organs->individual organism;

-Ecological Hierarchy starts where Biologial Hierarchy ends;

Individual organism->popln->community->ecosystem(=community along with its env)->Biomes(Huge ecosystem are called Biomes)->Biosphere(entire earth);

-organism = smallest and most basic unit of study; it can be small, large, multi/uni cellular;

2. diff ways of Adaptation-

a. natural cryopreservation-

-water of cells dnt freeze even if outside temp is below 0 degree.

-this is due presence of sugar trehlose, anti-freeze glycoproteins n peptides;

b. mimicry- to mimic appearance or behaviour of odr species;

mimics- appearance of distasteful or poisonous species;

-ex- baetesian mimicry;

c. behavioural response-

-desert lizards - bask in sun as they cannot regulate their body temp; they abrosb heat when body temp drops; when outisde heat starts incr, they move into shade;

-desert burrows - they burrow downwards to escape heat;

3. tiger cesnus under project tiger done thru Pugmarks and faecal pallets;

4. ecotone n edge effect-

-ecotone=transition area bw 2 biomes; has sharp boundary line; ex- bw beach and ocean;

-edge effect=incr biodiversity in ecotone is called Edge Effect. It refers to changes in species compostiion n str that occurs in zone of transition bw 2 biomes/habitats;

ex- ESturary(2 types- river with mouth opening into sea; or partially enclosed coatsal body connected to sea);

5. Eco-Cline

- it is a zone of physical transition bw 2 systems.

-it can be any of the following-

\*thermocline(temp gradient),

\*chemocline (chemicals),

\*halocline (salinity gradient),

\*picocline (density gradient)'

6. biological( phytoclimatic) spectrum-

-it is % distribution of diff life forms in any plant communities;

7. biotic potential-

-it is max reproductive capacity of any species;

-it can never b realized in reality, n is constrained by env factors like limited resoucres, and competition from odr species;

-if allowed to fully realize, that can lead to rapid depletion of resources on earth;

8. biological hierarchy-

-To Learn: Dumb Kids Prefer Candy Over Fresh Green Salad

-It constsists of Domain,Kingdom,Phylum,Class,Order,Family,Genus,Species;

-ex-

Species = Sapiens;

Genus=Homo;

Kingdom=animalaia,

Phylum=cordata,

Class-mamalia,

Order=homonedy,

Genus=homo,

Species=spaiens.

9.Altruism-

-behaviour of individual that incr chances survival of other of SAME speices. Ex- Spotted Deer

10. Communication bw speice occurs via-

-chemical signals- phermones are hormones secreted by the individual of a species; they are detected by other individual of same speices; olefactory signals(smell);

-tactile signals(contact);

-visual signals- eyes;

-auditory signals - ears;

11. speciation-process of creation of new species; done by seperation of popln of planst and animals till they are no longer able to interbreed, and are forced to undergo diff way of reproduction to create new kind of species i.e. independent evolutionary units;

-speceis = largest group of organism, capable of interbreeding and producing off spring; they belong to same genetic pool, and have similar structure;

12. Endemic species- endemism means local, and so found in a particular area;

- 2 hotspots of endemic speice in india- \*Himalayas including indo burma region in NE and

\*western ghats

13. keystone specie-

-these species have Disproportioanetly large impact on its community character relative to its numeric strength;

-it plays a critical role in determining types and number of diff species in their community;

-in their absence, entire ecosystem collapses;

-But low in number and biomass;

-example-

\*predators like jaguar(south and central america; can eat 87 diff species and so prevent herbivores species from eliminating plant species), sea Otters (eats sea urchins who odrwise feed on coral reef and kelp roots;kelp roots provide thousands of species habitats and nutrition, as well as incr productivity );

\*pollinators like honeybee(most imp)

\*fungi mycorrhizae; = microscopic specie;

\*elephants in savanna; when they move, they destroy trees, and convert it into grasslands, and so help in maintaining Savanna Ecosystem; in their absence, the savanna will convert into forests;

14. ecosystem engineers-

-ex- prarie dogs, beaver;

-prarie dogs- they burrow, which provide habitat for odr speice,s allow for water drainage, precent soil erosion; they also incr aeration of soil, and decr grass size; they reverse soil compaction which help in cattle grazing;

15 indicator spece-

-also called Sentinal organism;

-define a trait or char of an env; act as early warning mechanism for pollution, disease outbreak etc;

-ex-

\*lichen (AIR pollution)- they die in polluted air;

\*stone fly(sensitive to water pollution)- if present in water, means water is not polluted(i.e. water has low oxygen conc, which means high BOD),

\*Molluscs(water pollution)

16. exotic speceie or or alienspecies or non-indigenous species- not found naturally in a given ecosys;

-it is introduced outside its DISTRIBUTIONAL range due to Anthropogenic activities;

17. Invasive specie-

-if exotic specie has negative effect on ecosys, then it is case of Invasive specie; they compete with local specie for natural resources of ecosystem. and in process wipe out local species;

-ex-

\*Nile Perch(its intro in lake victoria led to extinction of 200 species),

\*carrot grass(parthenium),

water hyacinth(terror of bengal or Eicchornia),

Lantana(in Himachal Pradesh),

Clarias(african catfish- intro illegally in india for better aquaculture and is threatening our own catfishes);

-cause widespread env damage;

18. flagship specie or Umbrella spcies-

-these species are protected under special effort. ec- tiger, giant panda, african elephant;

-if flagship specie protection involves protection in its env/habitat, such that other species also protected, then case of Umbrella Species;

-project tiger = saving tiger and its habitat;

env 10: series 2.1

env n ecology 10(2.1 series)

1. Bio diveristy at 3 levels-

-biodiversity = degree of variation of life;

It is totality of species in a region;

-it includes genetic and species diversity;

-genetic diversity- within same speice;

-specie diversity- effective no. of speice in a given region;

specie richness(no. of diff species in an area, OR, simple COUNT of Specie);

specie evenness(it quantifies the equalness or abundance of specie);

-ecological diversity-as many biomes or ecological sys present in a given region; there are 17 countires designated as mega-diverse countries;

-lotic(running ecosys) has more Biodiversity than Lentic(stagnant) ecosys due to greater mixing of nutrient, sunlight etc in lotic ecosystem;

2. ecoSphere=includes all sphere including biosphere;

-biosphere is a point where atmosphere, lithosphere, hydrosphere interact to give rise to life;

3. bio-piracy->

-negative term;

-u do exploitation of resource, but neither give compensation nor recognition to locals, who had this knowledge for past 2000 years;

4. bioprospecting->

-positive term;

-=process of discovering and Commercializing of new products, based on biological resources;

-It incorporates indigenious knowledge, gives them compensation n recognition;

5. BD hotspots-

-area of High BD + under Threat;

-total 25 areas classified as BD hotspots in earth;

-3 conditions to b fulfilled-

\*high species Diversity;

\*high specie endemism(i.e. specie found only in that area and no where else in the world) ; it must contains =min(0.5%,1500 speice) of vascular plants; vascular plants includes xylem and phloem and so they must be gymnosperm, etc;

\*rapid loss of BD;lost atleast 70% of its primary vegetation;

-vascular plants-have xylem n phloem;

-India has 2 Hotspots-

Indo BUrma, includes NE and MYN;

W ghats - includes SL;

6. Mega Biodiverse Countries-

-they have majority of earth specie;

-mostly tropical and sub-tropical; no european;

-India is one of the 17 Mega Biodiverse countries;

-odr countries are -

a. US

b. Mexico

c. brazil

d. venezuela - only countries in world that has 2 borders- one with atlantic coean and odr with Pacific ocean;

e. ecuador- near equator;

\*note in south american continent- 12 countries are soveriegn + 2 non-soveriegn regions(french guyana, falkland island);

f. DRC

g. Madagascar

h. South Africa

i. Lesotho- sourrounded completely by Land; similalry vatican city and swaziland;

j. swaziland

k. India

l. China

m. philippine

n. indonesia

o. papa new guinea

p. malaysia

q. australia.

7. specie

-total number of specie on record - 1.9 mn of which 20% are same, and so in effect 1.5mn species recorded;

\*of this, 70% recorded are animals, and around 30% are plants; rest are grey area like fungus and prokareotes etc, which fall in neither zone;

\*among animals, almost 90% are insects; so approximately 50% of all recorded speice are insects;

\*total no. of fungus > total no. of (amphibians+mammals+reptiles);

-total estimated (eukaryotic) specie = 8.74mn and so at most 20% specie have been discovered, and 80% are yet to be discovered; it does not include prokaryote and bacteria;

-in india 22% have been discovered;

-india has 2.4% world land area(3.28mn km sq);

India has 8.74% of world biodiversity, and since only 22% have been recorded, greater efforts are needed in this context;

-it is also to be noted that 99.4% of all species that ever existed on the earth are extinct;

7. No. of species is affected by-

-speciation=process of creation of new species

-extinction=process of removal of species;

-99% of specie ever existed on earth are said to have become extinct;

-on22% of specie have been discovered; of these around 50% are insects;

- majority specie discovered are animals(70%, includes animals); only 30% of specie discovered are plants;

-we don’t include prokaryotic bacteria while counting species;

-distribution of vertebrate-

* Fish=50%
* mammals=9%
* birds = 16%
* reptiles=16%
* amphiobians = 11%

**-----Video 2.4----**

Coral Reefs and Ecotourism

1. coral reefs-

-formed from Polyps, belonging to same Phylum as jelly fish and sea anemone;

-diverse and variedecosysttem in coral reefs, which is characterized by formation of Ridge or moulds in sea, and are formed of Calcium carbonate;, which is excreted by corals, juts like Diatoms(dino flagellates);

-called as rain forests of sea; occupy less than 0.1% of ocean surface and a/c for 25% of marine species;

-best grow in warm, shallow, clear,sunny,agitated(constantly mising, not still) water;

2. distribution-

-occupy just 0.1% of sea surface area;

-majorly in indo-pacific region;

-red sea, indian ocean, south east asia and pacific;

-bw 30 N to 30S latitude;

-found in region with temp of 26-27 degree; not below 18 degree; but in persian gulf reef they tolerate very high temp range of 13-29 degree celsius;

-deep and cold water corals Do occur but they are very Rare;

-surprisingly water sorrounding them is LOW in Nutrients;

-color occurs due to combination of - Brown Hue(from Zoo Xanthele) and Pigmented proteins of Corals;

-Corals are Rare of WEST Coast of Africa and America;this is coz water is not very warm- why coz upwelling in these regions; it is only in el nino that warm water is here, other wise water is Cold and so not suoitable for growth of corals;

-imp reefs-

a. great barrier reef;

b. Meso American Barrier Reef Sys- 2nd largest; in Central America, especially in country Bellies;

c. New Caledonia- french territory, found in South West Pacific Ocean, and is 1200km east of pacific ocean;

d. Andros- Baham Barrrier Reef-found near Florida(US), and Cuba;

e. Red Sea- contain 600 year old sreef;

3. Types of reefs-

a. Fringing Reef-

-no shallow back reef zone;or has a shallow lagoon;

--common in bahamas;

-grow to huge extent and have bak reef areaswith interspersed seagrass, meadows and pacth reefs;

-eg - carribean and red sea;

b. Atolls-

--Ring shaped coral reefs, which includes a coral ring, that encircles a lagoon, partially or completely;

-more or less circular, and extend all the way around lagooon, and there is NO CENTRAL ISLAND;

-coral will persist if rate of erosion of caldera/base is less than rate of formation of coral;

c. Barrier Reef-

-seperated from coast by a shallow lagoon;

4. threat - coral bleaching-

-when corals lose their color, it is called coral bleaching;

-release of coral symbiotic zzooxaxanthele;

-corals are extremely fragile ecosystem, and are sensitive to 5 conditions -warm, shallow,agitated, clear and sunny water conditions;

-cause-

a. climate change- sea temp, sea level rise;

b. climate change- oceean acidifctaion;

c. blast fishing- use of blast stuns fish, and use of cyanide which is harmful;

e. agr surface run off- eutrophicatoipn;

e- suncream - contain titanium which is harmful;

f- pollution;

g. cyanide use in aquarium fish;

h. exploitation of reef resources;

i. invasion of exotic species in coral regoins-

-----------ECO TOURISM--------------

1. imp feature-

-eco- means ecology- so it is an ecologically responsible ; profit generating tourism; but ecological responsibility comes 1st and profit comes 2nd, and sustainability is key feature;

-imp feature-

\*it is responsible travle to natural areas which conserves the env and improive well being of local people;

\*future generations shud experience destinations which are relatively untouched by human interventoins;

\*involve visting FRAGILE, Pristine(beautiful) and relatively UNDISTURBED areas; why - to have appreciation of flora, fauna, and cultural heritage;

-it is intended as Low Impat, small sclae alternative ton standard commercial mass-scale tourism;

it tries to generate local employment and earn foreign exchnage;

-union of 3- Conservation, Locals and Profits;

-benefits-

a. educate the traveller;

b. help in political empowerment of locas;

c. provide funds for conservation of nature;

d. it will help develop respect for distinct culture of locals;

e. it will help in socially responsible travel and personal growth of individual. it MINIMIZES negative aspects of Conventional Tourism which gives more imp to profit over planet and people; so here we have planet then people and finally profit as order of decr importance;

i. it promotes water conservation, energy efficiency and recycling

2. principles of Eco tourism-

a. trinity of conservation, Community Welfare and Sustainable Dev;

b. Minimize Impact;

c. Build env local traditions and cultural awareness;

d. provide direct financial benefit - for empowerment, local dev and conservation;

e. support - human rights, democratic mvt, and raise sensitivity to socio-political and env wrongs;

4. criticism-

a. definition of ecotourism is vague, and have multiple interpretation- it is hard to interpret, difficult of imple,ment, and uncertain in effectiveness;

b. In the name of ecotourism, mass tourism, mass construction of hotels, resorts and mass activity are carried out in fragile ecosystem;

c. since it is not very well regulated, it may lead to -

\*destruction of local resources;

\*direct env impact by overpopln and promotion of industrialization, and

\* lead top destruction of very local culture on which ecotourism relies;