Adaptation

What is adaptation, How many types of adaptation are possible discribe any one in detail.? or Describe the adaptation for the marine habitat.

Acc. to Darwin's natural selection theory, only most viable during the struggle for existence only most viable and adaptable species are survived Thus the adjustment of the species to its new environment becomes the main factar in the formation and conservation of species. other forms which are unable to chang themselves are perish during the course of time.

"Any characteristic that is advantageous to a perticular organism or population to adjust them to the changing environment is known as adaptation." Adaptation is the characteristic of livings.

Adaptation in different or related genera bring ~~ab~~ to the similar environment brings about the similar changes, such adaptation are called convergent adaptation (i.e; they all are converged to one habitat. while in divirgent adaptation (adaptive radiation) the closely related genera became adapted to the different kinds of environment.

Law of Adaptive radiation-

The convergence & divergence play a main role in evolution. The divergence of species from common stem to different adaptable lines brings about evolution. Lamark called it as embranchment, while Osborn called as adaptive radiation. Acc to Osborn's law "each isolated region, having variable topography

soil, climate, and vegetation, will give rise to diversified fauna. The larger the region and more diverse the environmental conditions, the greater the variety of animals will results.

Process of Adaptation.

Mutation, selection and genetic drift are the main forces which brings about the evolutionary changes. These forces upset the genetic equilibrium producing micro-evolutionary changes. i.e small changes in population.

By selection the nature sorts out some gene combinations and select others, that occurred due to mutation or recombination.

Genetic drift is another evolutionary force that fixes the non adaptive or neutral gene recombination in a population.

Thus micro-evolution produces changes in all populations from one generation to the other. It is also responsible for the differences produced between related population. Besides these forces some additional forces co-operate with mutation, selection and genetic drift to produce new populations from pre-existing ones and thus produce new population from pre-existing ones and thus the process of adaptation involved. The fragmentation and development of new population is called speciation.

Types of Adaptation ⟶

Structurally adaptations may be morphological (confined to the shape, size, and external features) or anatomical (visceral organs adapted according to its needs). These adaptation vary from individual to individual, depending on the environmental climatic conditions in which the organisms live.

According to Mathew adaptation are of following types —.

(2)

(1) Cursorial Adaptation (a) digitigrade, (b) Unguligrade.
(2) Fossorial "
(3) Scansorial " or Arboreall
(4) Volant "
(5) Aquatic "
(6) Cave "
(7) Deep-sea "
(8) Desert "

(1) **Cursorial** or terrestrial adaptation —
There are meant for fast locomotion, searching the food and for escaping their enemis.
Eg - Flightless birds, dinosaurs, kangaroo, rabbit, dogs, cat, leperds etc.
→ characterised by following changes —
① Streamlining of body contour — Spindle shaped body offer least resistance to air. ~~The~~ Thorax is compressed & ribs are flattened.
② less developed forelimbs — concerned with food gathering
③ Digitigradation in foot — The foot becomes digitigrade. The bones of wrist, palm, ankle and sole (carpals, metacarpals, tarsals, metatarsals) are raised from the ground. They~~are~~ are supported by pads muscular pads to sustain various shocks.
④ Unguligrade mode of progression — The mammals, for walk on modified nails or hoofs. The feets are provided with one or two pads.
⑤ Loss of digits — Plantigrade. Wrists and ankle are not raised from the ground. generally stout, eg - Bear, racoon, primates

⑥ Reduction in ulna & fibula - In horse represent by split bones.

⑦ Movements of limbs in one plane - to avoid interference between fore limbs during running.

⑧ Bipedal changes - Reduction in fore limbs in bipedal forms. (e.g. birds, marsupials, man etc) In semierect bipedal, tail is used as counterpoise. In kangroo & dinosaurs tail serves as third limb

Fossorial & Subterranean adaptation

~~Fossorial for digging habits. in~~

Fossorial ment for digging habits. Then animals usually live on surface, rarely goes to earth. While subterranean adaptations are adjustments occuring in underground forms.

Fossorial - e.g. - Sphenodon, Uromastix, limbless lizard, desert snakes, burrowing owl, monotremes, marsupials, mole, hedgehog, hares, otter etc. Fossorial animals are premitive, small, plantigrade & pentadactyle. with claws.

Fossorial grouped under three heads —

ⓐ animals which dig for food but live over ground & forelimbs modified for digging.

ⓑ animals which live under ground & feed over the ground.

ⓒ animals which live permanantly in termites

the ⓐⓔⓑ are partial while ⓒ is true fossorial adaptation.

Characters

① Spindle shaped body - greater diameter of body near the neck or shoulder, body offer least resistant to subterranean passage.

② Tapering of head — head tapers anteriorly, feed upon feeble prey such as insects.

③ Reduction of tail -

④ Loss of eyes — eyes are small or vestigial

– carnivorous, tetrapod, oviparous, [illegible]
– Neck & tail may be ↑↑ or absent

④ ~~loss of eyes~~ – as they are no use in dark habit.
In Geomyidae (pocket gopher) — eyes small,
Marsupial mole (Notoryctes) – functionless
Talpa – vestigial
golden mole – covered with skin.

⑤ Disappearance of pinnae – since they would be an obstruction in burrowing.
Geomyidae & other – small.
Monotremes (wholly fossorial forms) – lacking

⑥ Digging adaptation – For digging various changes occur.
– Snout well developed, upturned at the tip.
premaxal bone develop at the tip of the snout.
– Teeth (Incisor or canines) — forwardly directed
– Forelimb & hindlimbs are short. The forelimb is broad and stout with long claws; Development of extra bone falciform, which increases the breadth of palm; In golden mole (Chrysochloris) out four middle two are meant for digging. The proximal end of humerus bears ridges for insertion of powerful shoulder muscles and these help in rotating the hand. The olecranon process is large, short clavicles.
– In hindlimb, femur is weak, tibia & fibula partially fused & calcaneum prominent.

⑦ Girdles – The bones of pelvic girdle become elongated & lie parallel to vertebral column.

⑧ Vertebrae – The sacral vertebrae fused to give strength & firmness in pushing the animal through earth.

⑨ Hibernation → o

Scansorial (Arboreal) adaptation →

climbing trees.

These adjustments have evolved in animals which lives on trees or climb on vertical surface.

eg- climbing perch (Anabas), mud skipper — fishes. tree frog (Hyla), geckoes, chameleon, tree snakes, opossums, tree kangaroo, tree sloths, flying squirrels.

Categories of scansorial animals —

① Walk and rock climbers — Not tree inhabiting, but are well suitable for climbing. In them digits provided with sharp & recurved claws & bears adhesive discs. eg- wall lizards.

② Terrestro-arboreal forms — capable of climbing but rest at home, some time they form nests on trees. eg- various carnivores, rodents, insectivores etc.
Slath bear.
Indian giant squirrel

③ True arboreal forms — Perfectly tree living. according to mode of locomation ~~fall into~~ fall into three categories

(a) Branch runners — lemurs, chameleons etc.
(b) Hanging or suspended forms — Bat, sloths, flying lemurs. Bat hangs by claws of hind limbs & sloths by fore limbs claws.
(c) Swinging by the forelimbs (Brachiator) → eg- apes (primates)

Adaptation →

① Stoutness of body contour → Thorax is sub-circular & ribs are much curved. ribs are numerous giving support to viscera in their inverted position. Dorso-lumber vertebrae elongated and becomes increased in number from 19 to 25 as a response of arboreal need.

② Toughness limb girdles → Shoulder girdle is strong to support body weight. clavicle & scapula are well developed.

③ elongation of proximal limb segments → humerus long (eg. sloths) the gread apes length is directly related to the climbing power, in gibbon arms touch the ground

④ Syndactyly and zygodactyly in limbs — and limbs are the prehensile or grasping type. syndactyly (union of digits) is common. In marsupials (opossum) fourth hallux is offset to appose the fourth digit, the 2nd, 3rd bound together in a common integument. In reptiles syndactyly is occure in fore & hind limbs. The hand ~~out~~ Inner bundle formed by union of three finger while outer bundle formed by two finger. But in fore reverse syndactyly is present i.e. the outer bundle has three finger & inner bundle has two fingers. In scansorial birds outer toe is rotated in such a way that- 4th toes & hallux become opposed to 2nd & 3rd toes. This type of foot is called Zygodactylous.

⑤ Digital reduction – In soft & silk hand & 3 in feet, some lemurs lost the second digits.

⑥ Specialization of tail – Prehensile (e.g - Chameleon, spider monkey - S.A hand) & Non prehensile scales or spines present underneath of tail.

⑦ Development of accessory organs – spines or tubercles on the forearm in some lemurs. In Lemur catta there is a specific climbing organ.

⑧ Volant adaptation →

VOLANT ADAPTATION

- concerned with the flight
- Flight may be ⓐ passive or gliding type characterised by leaping (Jumping) - locomotive force is gravity
ⓑ True flight is the aerial flight caused by the action of wings

Ⓐ Adaptation for passive flight or gliding → eg - Draco, Exocoetus cestriches, lemurs, Rhacophorus etc -

Adaptation —

① Development of patagia → The patagium is formed by the skin folds. May be supported by ribs (Draco) It lies between fore & hind limbs. Patagium can be folded like a fan when not used. In flying lemur (Galeopithecus volans) patagium extends from side of neck to the tip of tail even including digits which are webbed as for aquatic life. In bats patagium supported by elongated fore limbs and 2, 3, 4 & 5th digits this first digits is free.

② Enlargement & high insertion of pectoral fins → In Exocoetus the pectoral fins becomes enlarged in the form of parachutes & are highly inserted on body. The lower lobe of tail is larger, helping in leaping

⑤ Webbing of feet → In flying frog (Rhacophorus) the feet are webbed & digits terminate into adhesive pads which help in leaps & adhesion to trees respectively. Rudiments of petagia are present b/w the limbs

2- Adaptation for true or active flight →

① Body contour → spindle or boat shaped for least air resistance, Neck mobile.

② Development of feathers → these are "nature's masterpiece". structurally it consist of a basal quill or calamus and distal rachis or shaft. The rachis bears a series of lateral barbs which further consists of double row of barbules connected with each other by barbicels. The barbs, barbules & barbicels form a short net, which help in flight.

③ Presence of wings → In birds fore limbs modified into wings, and are most specialized of all modern wings. The digits reduced to 3 in fused together to help in flight.

In bat wings humerus is well developed & ulna is weak. In microchiroptera 2 fused with 3rd to support the ant. margin of wings. while in Megachiroptera the 2 is free from 3rd clawed.

In pterodactyl's wing radius & ulna are equal.

Insect wings are membranous lateral folds having nervures - attached with thorax & help in flying.

④ Pneumatization of bones - add buoyancy during flight.

⑤ Presence of flight muscles & keeled sternum - Flight muscle connects limb bone with wing & keel for attachment of pectoral muscles.

⑥ Development of air sacs — act as air reservoir during respiration and air buoyant

⑦ Brain & sense organs specifically → Cerebrum & optic lobe well developed olfactory lobes reduced & eyes bear characteristic sclerotic plates to resist variable air pressure.

(A) Primary aquatic adaptations — These occurs in fishes, which never had terrestrial ancestry and thus adapted to water medium.

① Body contour — Stream-lined form, Head is cylindrical. There is no protuberance over the body which would retard the swift swift passage of the animal through water.

② Presence of fins

③ Respiratory organs - gill well suited for gaseous exchange in water.

④ Air bladder — In advanced bony fishes, function as accessory respiratory organ as well as hydrostatic organ

⑤ Lateral line System - ~~Rheoreceptors~~ Rheoreceptors

⑥ Skin → Protected with scales, rich in mucous gland.

(B) Secondary aquatic adaptation —

These are lung breathers which were return to aquatic life due to certain circumstances such as scarcity of food & place. Amphibious animals showing partial aquatic adaptation ~~there~~ eg. Turtles, crocodiles, duck, geese, Hippotamus, ~~etc~~ show dual habits.

① Stream-lined body — Neck constriction disappears and the tail enlarges eg. Cetacea, Sirenia

② Enlargement of Size — Water animals are larger in size because there animal use their extra energy in growth which is exhausted in gravitational forces

③ Shortening of neck — In whales cervical vertebrae fused into a mass of bone.

④ Disappearance of excrescences —

— Pinnae absent in water mammals

— External nostrils move towards apex

— Eyes become water adapted — shifting higher on the

face in hippopotamus. In truly aquatic forms eye do not [illegible] but adapted to aquatic vision by changing the curvature of lenses.

(5) Occurance of fins — Fin like expansion of the body wall in whales & ichthyosaurs which help in propulsion. Dorsal fin in killer whale, while absent in Balaena & Delphinapterus. Caudal fin is horizontal in marine mammals while vertical in reptiles & bone divides the tail into two parts rather than running into one lobe. In reptiles propulsion occurs by fin like limbs while in whales & sirenians propulsion occurs by tail because hind limbs become disappeared.

(6) Disappearance of hairs, skin, glands etc — ~~Hair thought~~ Fatty layer (blubber) is formed below the skin to compensate the hairless in mammals.

(7) Mouth ~~arming position~~ armament → Jaws lost their power of movment (except in odons & sea cows) because they are not used for mastication. Teeth are simplified & greater in number (present only in one jaw in sperm whale & absent in baleen whale)

(8) Modification of skull & V.C. —
cranium is shortened but become wider, zygomatic arch reduced or vestigial (Cetacea). In vertebral ~~Zygomatic~~ arch Zygapophyses become reduced as body weight is supported by water. Chest become cylindrical (aquatic type). Several processes become reduced in the trunk region, but elongated in tail to provide greater area for muscular attachment.

(9) Lightness of bones — light & spongy, in whales their interstices are filled with oil.

CAVE ADAPTATIONS

Caves are abandoned channels through which underground rivers flowed in past. The present mostly in limestone region since the limestone is soluble. ~~Lateral~~ Lateral channels are formed due to vertical movement of water & they are called ~~as~~ as CAVERNS.

Characteristic of the caves → Absence of light & uniform temperature. But, within mouth of cave and for a short distance inside the cave, the light penetrates & temprature also fluctuates ~~seas~~ seasonally. This region is called twilight or transitional region.

Degree of moisture is uniform in some parts of cave & may fluctuate in those caves through which water flows.

Hence the animal & plants will be adapted for lack of light, scarcity of food & uniform conditions.

Cave flora → Mostly fungus — Agaricus ~~Asp~~, Peziza & Mucor species are discovered from different caves.

Cave fauna →

ⓐ Temporary fauna – bats, ⓒ temporary visitors of caves.

ⓑ Permanent fauna – There is no parmanent cave-dwelling reptiles & Birds.

Amphibians – • Cave salamender (Speleerpes maculicauda) – Normal eye & live in twilight zones.

• Blind salamender – (Typhlotriton spelaeus) – forming parmanent cave fauna. – eyelids fuse & rods & cones of retina disappear.

• Proteus anguinus – totally blind, gill present –

Fishes • Cave fishes (Gronias ~~not~~ nigrilabris) – partial blind,

• Many fishes of family Amblyopsidae – paramar cave dwellers.

• Chologaster papilifesus, Amblyopsis etc. are blind fishes.

Cave adaptations –

① Loss of pigmentations –

② Degenerate eyes – either reduced or covered by other tissue

③ Tactile organs & sense of smell → Well developed. cave fishes & salamenders are sensitive to vibrations. Amblyopsis possesses taste organs scattered on heads, snout & lips

④ Slender body

⑤ Digestive organ – modified for complete utilizatio of food.

for PG Cl

Marine adaptation

The sea constitutes a major part of biosphere, covering about 65% of earth's surface. All the major groups of animals except amphibia are present in sea. The sea animals are usually large size because they are not required to support the weight of their body on substratum. ~~and~~ The higher density of sea water helps them to keep their body up, and reduces the weight of the body so that locomotion is very easy. Thus whale is the largest animal of world. Marine animals show different adaptations according to whether they are pelagic or deep sea forms.

Pelagic fauna —

This realm constitutes all superficial water upto the depth to which effective sun light penetrate. The depth upto which light penetrate is greater towards tropics & less towards poles. This region characterised by the presence of light & absence of substratum. Their is plenty of food, oxygen & light, pressure is not high as deep sea. Due to this condition animals of this region are small, active & predaceous. Their sense organs, swimming organs, organs of offence & defence are well developed. They are able to keep afloat by various devices. Some animals (eg. ctenophores) never sink to the bottom. Some have pelagic larvae while the adults are bottom dwellers.

* Floatation mechanisms in the pelagic Animals —

The capacity to float depends upon various factors & increased by reducing the specific gravity. The reduction in specific gravity — affected by following factors —

(1) By using little skeletal parts — Reduction in hard parts occurs in pelagic animals eg. Foraminifera have thin shell. $CaCO_3$ reduced in thin shell & size of pores & opening of shell enlarged.

② By having uncalcified or weakly calcified shell —
Crustaceans — uncalcified or weakly calcified shell
Cephalopods — small calcified internal shell.

③ By taking up large amount of water — Large amount of water taken in the connective tissue producing transparent, jelly like material as in medusa.

④ By storing less fat or air or saline water —
vacuoles containing fluid of low specific gravity (e.g. - Ctenophore) & Fat globules (e.g. Radiolaria) are present in some animals. The eggs of fishes float due to the presence of oil drops in them. Air sacs full of gas are present in many Siphonophores (e.g - Physalia, Vellella). The Turtles, sea-snakes, whales, & seals ~~and is achieved~~ the lungs serve the same purpose as the air bladder in other fishes.

⑤ By changing the form —
This method is effective only in small animals and is achieved by flattening the body.

⑥ By having cilia — Are not very effective due to their small size and are present only in Protozoans.

⑦ By producing a stream of water → By constriction of tube shaped body. The ejected water drives the animals forwards.

Deep-Sea Fauna → The animals population grows thinner at greater depths. The abyssal realm is that portion of the water where light fails to reach. It includes animals from the Protozoa to fishes. The following condition exist in deep sea —

① Absence of light —

② Low temp. — temp is constant and is at the freezing point.

(III) Enormous pressure → One atm increases with every ten meter.

(IV) Calmness of water → The water is calm at greater depths and there are no waves or storms.

(V) Absence of light → Due to absence of sun light- there is no plant life, Bacteria are also absent in this region.

(VI) Scarcity of food → Due to absence of ~~plant~~ light there is a complete absence of food. The food consists of the animals and plant falling from above.

(VII) Dead animals do not decompose → Due to extremely low temp. and the absence of bacteria, the dead animals do not decompose.

(VIII) The substratum is composed of soft mud.

Requirements of the deep-sea animals →

An enlargement of body surface and a distribution of the weight to widely separated parts are adaptation for this life. These animals are always at the risk provided with long legs so that- when walking, the body is kept high above the muddy water. These animals are adapted to face prolonged starvation & high pressure.

Adaptations to deep sea fauna →

(I) Food & feeding adaptations → The deep sea animals obtains the food by (i) hunting (ii) from the bodies of surface plant & animals which sink to bottom and (iii) the falling excreta of the surface animals food falls like a gentle rain from the above. The abyssal animals living on this food have an elongated digestive tract, their radula is reduced and they have an elongated excretory tube to carry excreta away from the feeding ground. Predacious animals have powerful jaws, strong teeth & sometime large mouth. The distensible stomach contains some time contains prey larger than themselves. Smaller animals (eg. Protozoan, sponges) take their food directly from water.

(2) Colour - due to absence of light, the colour of animals is uniform, red predominates, but brown, violet, black blue are also present

(3) Body form & skeleton → slender, long & stalked bodies are very common, the skeleton is weak, fragile & non-calcareous. Most deep sea fishes have unealcified skeleton e.g. Chimaera

(4) Bioluminescence → the production of light by deep-sea animals is regarded as adaptation to the absence of sun light. Luminescent organs are found either over the entire body or on the belly or localized on highly modified organs. Some pelagic animals also produce light. Many coelenterates, some Crustaceans Stenopus, annelids & a large number of fishes produces light. Luminescence is useful for the recognition of sex and for attracting the prey.

(5) Eyes → most deep-sea animals are blind or have reduced eyes eg. Peelen, Fascus, some crustaceans. Among fishes & cephalopods complete degeneration of eyes is rare. Size of eye decreases with depth. Some animals have telescopic eyes in which instead of the eye the lens is very much enlarged.

Other sensory organs → For compensation of loss of vision deep sea forms possess long feelers and slender attenuations of the fins. In Bathysaurus one fin ray of pectoral fin & in Stylophorus caudal fin is produced into long filament which is sensory. Crustaceans possess long tentacles.

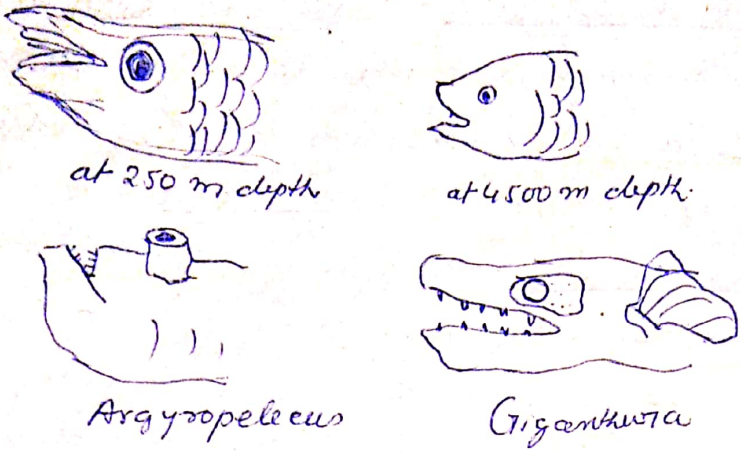


Fig- Eyes in some deep sea fishes

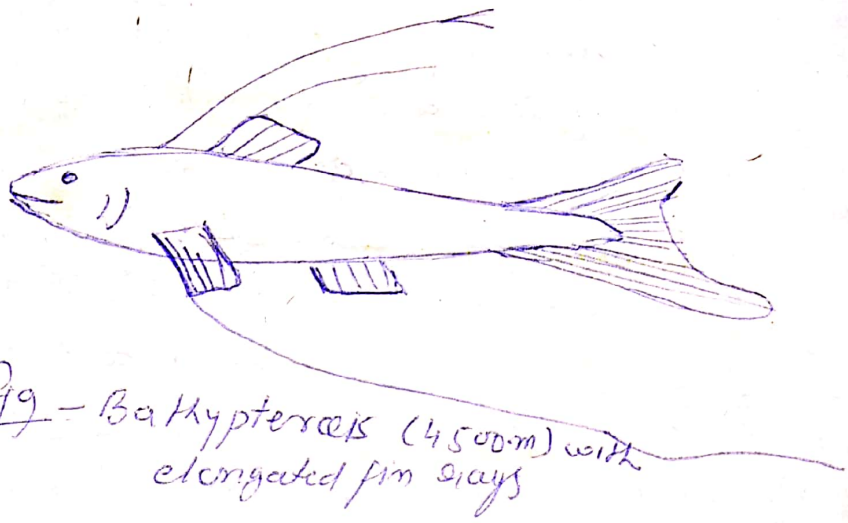


Fig - Bathypteroids (4500 m) with elongated fin rays

⑦ Loss of power of mastication — Many deep sea fishes loose the masticatory power since they feed on decaying ooze. Most deep sea fishes have very large mouth, sharp teeth, and enormous stomach capable of eating large animals.

⑧ Sexual dimorphism — In the abyssal zone it is difficult to search the male or partner. In angler fishes male are attached to a process on head of female.

⑨ Uniformity of Abyssal fauna — The conditions of deep sea are uniform — uniformly cold without motion, light, cracks & holes. Still there are faunal differences among animals and specialization takes place. The differences are increased by the presence of barriers of which temp. is most important.

Deep Sea fauna →

Archaic forms in deep-sea →

In deep-sea, the struggle with physical environmental forces is very much increased hence competation between the species is reduced. Hence ancient forms maintain themselves in deep-sea e.g- Amphioxus, Limulus, Lingula etc. So we can say that- abyssal fauna is characterised by uniformity & changelessness. The fauna, although rich in species, is poor in individuals

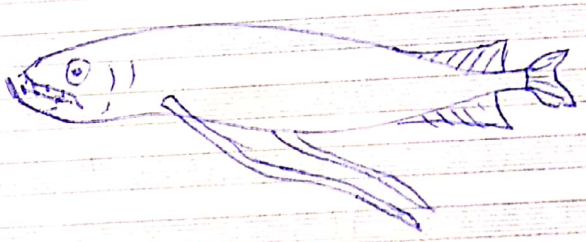
→ Invertebrates form in deep-sea —

Sponges, corals, hydroids, brittle star, holothurians, starfish, tube dwelling annelids, bryozoa, brachiopods, pelecypoda, crabs, shrimps, lobsters etc.

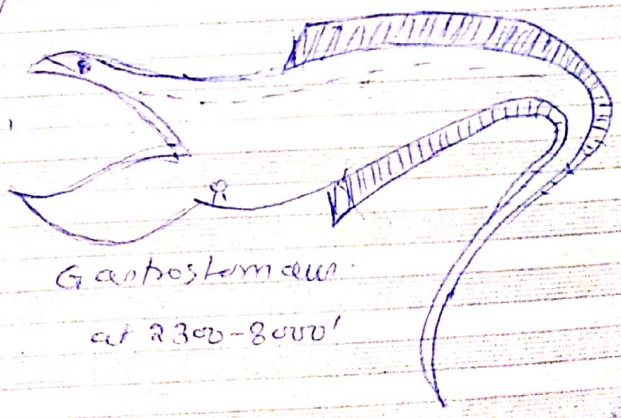
→ Vertebrates in deep-sea —

Lumpsaw shark (Spinax niger) Silver sharks (Chimaera, Callorhynchus), Scopeliformes group of teleost fishes. (Cetomimus, Ipnops) Anguilliformes (Leptocephalus, Gastrostomus)

Deep sea Crab.



Photostomias at 3500'



Gastostomeus at 2300-8000'

Deep sea Isopod.

Fig. Some deep sea animal.

Desert adaptation

Nearly 1/3 of the entire land area of world is desert & found almost all countries e.g. Indus valley in Pakistan Gobi in china, Sahara & kalahari in Africa, etc.

Desert consist of land devoid of vegetation except certain places. Desert has rainless or nearly rainless climate, where draught remain almost continous. The average rainfall is not more than 10-15 inches in a year. Therefore the fauna & flora peculiarly adapted to their conditions. The main requirment of desert life are getting moisture, conservation of water, defence against physical & organic environments & obtaining food.

① ~~Moisture getting~~ →

① Water → water is the most important problem of desert life. Hence, animals obtain moisture by various methods & effectively conserve it. The only source of water is juice of plants or the blood of prey. Most of desert animals are adpted to live on their sources only and do not drink water even when it is available.

Example →

Plant → Oak palm having long, deep, horizontally spreading roots. presence of hairs on leaves.

Animals → Few animal absorb dew drops along with vegetation food.

Molach having hygroscopic skin and absorbs water like blotting paper. Its surface covered by thorny scales.

Desert rabbit, turtles, woodrat eat succulent plants; Kangaroo rat (Dipodomys), Pocket mouse and other desert rodents eat dry seeds; predators eat prey for their water requirments.

Conservation of water & moisture is also important for desert fauna & flora.

Examples —

~~Plant~~ Flora → Desert plants (e.g. cacti) contain large masses of watery pulp, small leaves or no leaves, & when occur fold themselves to avoid evaporation of water.

Fauna → Camels are able to store water in the rumen of the stomach in where as all special water cell are present. stored water in cell sufficient for several days, Molach have thorny skin, Horn toad has hard & rough skin. Desert animals also have thick skin to avoid loss of water by perespiration.

Desert insect are wax proof. To conserve water animals remain in burrows during day time & come outside during night when the percentage of moisture in their burrows and outside is equal. Certain animals plug the mouth of their burrows during day time. Dromatix store water in large intestine.

Defence → For self defence from extreme temp., arid climate, the animals adopt themselves as follows—

→ In burrowing animals the nostrils are directed upwards instead of forward. In snakes nostrils are protected by valves or are reduced to fine apertures.

In Typhlops (desert snake) eyes are protected by sheath.

In camles eyes are protected by long eyelashes and are kept high above the sand by long neck. The same is true for ostrich.

→ The ear openings are also well protected by hairs or scales

Protection against the natural enemies is achieved through colouration or spiny covering. Desert animals show protective & warning colours. Some insects and lizards possess a hard or spiny covering for protection e.g. moloch, phrynosoma. Presence of venom is another desert adaptation for self defence. Almost all reptiles, spiders, scorpions of desert are poisonous. They can run fast to protect themselves from enemy or to hunt the prey. Desert animals possess long limbs and padded feet to run on sand. The

Sense organs of sight, hearing & smell are highly developed to help the animals in offence & defence.

Due to scarcity of food animals are adapted for scarcity.