ECHOLOCATION IN BATS, CETACEANS AND SIRENIA

1.Enumerate the problems cetaceans encounter while echo locating and state how they solve these problems **(2016)**

2.What does a bat blunder against large obstacles if its larynx is damaged?

i)The bat **larynx** is typically mammalian. Situated just posterior to the **hyoid** bone. The central opening of larynx can be closed by one or two paired folds of tissue that oppose each other across tracheal opening. The deepest of these fold are the vocal cords, they have thickened edges and considerable associated musculature.

The **cricothyroid muscles** are strong that create great tension on the vocal cords. In horse-shoe bats (*Rhinolophus* sp) special resonating chambers and the face is modified like a nose-leaf to beam the sound forward.

ii)Sounds are produced by forcing air through the slit between these sheets of tissue.

iii)Modulation of frequency and loudness is accomplished by alteration of the tension on the vocal cords and entire **larynx**, the amount of air expelled per unit time through the structure and sometimes by extralayngeal resonating chambers.

iv)The production of such brief, rapidly repeated and precisely patterned sounds seems a Gargantuan task for the tiny muscles controlling the vocal cords, but large muscles would contract and relax too slowly to produce rapid pulses.

v)Sounds produced by the larynx emitted through the open mouth or the nose. Mouth calls have a wide angle of dispersion (180 degrees or more). The noses of these bats that use them to broadcast are complex structures.

vi)Noses have epidermal flaps and a nostril spacing that concentrates and focuses the sound in a narrow cone (less than 90 degrees) in front of the bat, much like a mega phone.

vii)The calls travel through the air in radially expanding waves at about 34 centimeters per millisecond. Because of the dispersion pattern, the amount of sound energy striking a target decreases as the square of the distance traveled.

AFTER MENTIONING THE IMPORTANCE OF LARYNX YOU NEED TO MAKE A BRIEF NOTE ON THE IMPACT OF DAMAGED LAYRNX ON THEIR ECHOLOCATION MECHANISM.

PROBLEM:

The returned sound despite its initial loudness—is exceedingly faint. Only those wavelengths in the emitted call that are approximately equal to or shorter than the diameter of the reflecting object will be returned.

viii)Character of the reflecting surface:

This is indicated by the character of the echo. A smooth, hard surface such as exoskeleton of a beetle returns a sharp echo, whereas a blurred echo indicates a rough surface like the body of a moth. The time required for an echo to return is directly proportional to the distance from the bat to the target and the change in return time between successive calls can indicate the relative movement of the bat and its target.

ix)As the bat approaches a target, the call repetition rate increases, giving the bat more and more precise information about the target's location.

SPECIAL TYPE OF MODIFICATION IN AUDITORY SYSTEM FOUND IN THE ECHOLOCATION OF BATS:

i)The tympanic membrane and ear ossicles are small and light and are easily set into motion.

ii)Contraction of the middle ear muscles briefly damps the sensitivity of the ear as each cry is emitted, thus the bat does not deafen itself.

iii)The cochlea contains the basilar membrane, a thin elongated sheet curled up like a snail. When sound waves vibrate the eardrum, this vibration is conducted to the basilar membrane, stimulating tiny hair cells on the membrane. The excitation is transmitted, via the spiral ganglion cells, along the auditory nerve fibres to the brain.

iv)A padding of blood sinuses, fat and connective tissue isolates the bony labyrinth of the inner ear from the rest of the skull and reduces direct bone conduction of sound into the inner ear.

DESENSITIZATION: Perception of the direction of a returning echo is aided by the large, complex pinnae and by a neural mechanism known as **contralateral inhibition**. Stimulation of cells sensitive to a particular frequency in the