

ZOO603 – FISH

BIOLOGY

FINAL TERM MOST IMPORTANT QUESTIONS

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GROUP LINK: <https://chat.whatsapp.com/BjC6W0jZx8o9yaC2lSh1Gu>

1. Define food web.

A food web is a complex network of interconnected food chains in an ecosystem. It shows how different organisms are related through what they eat and what eats them. Unlike a simple food chain, which follows a single path of energy flow, a food web illustrates the multiple feeding relationships among organisms, making it a more accurate representation of how energy and nutrients move through an ecosystem. Food web consists of producers, consumers (herbivores, carnivores, omnivores), and decomposers. It shows the interdependence of organisms. Also, it helps in understanding the balance of ecosystems.

2. Write classification of Romer.

The classification of vertebrates by Alfred Sherwood Romer, an American paleontologist and biologist, is a well-known traditional classification system used in vertebrate zoology. Romer's classification is based primarily on anatomical and evolutionary features. Romer divided the phylum Chordata into several major groups, focusing mainly on vertebrates:

Phylum: Chordata

► Subphylum: Vertebrata (Craniata)

Divided into two main divisions:

I. Agnatha (Jawless vertebrates)

They had no jaws, had cartilaginous skeleton and no paired fins. **Examples:** Lampreys, hagfishes.

II. Gnathostomata (Jawed vertebrates)

Divided further into:

A. Pisces (Fishes)

1. **Class: Placodermi** (Extinct armored fishes)
2. **Class: Chondrichthyes** (Cartilaginous fishes)
 - Examples: Sharks, rays
3. **Class: Osteichthyes** (Bony fishes)
 - Examples: Salmon, tuna

B. Tetrapoda (Four-limbed vertebrates)

1. **Class: Amphibia**
 - Examples: Frogs, salamanders
2. **Class: Reptilia**
 - Examples: Snakes, lizards, turtles
3. **Class: Aves (Birds)**
 - Examples: Sparrows, eagles
4. **Class: Mammalia**
 - Examples: Humans, dogs, whales

3. Write characteristics of Aquaculture.

Characteristics of Aquaculture:

- **Controlled Environment:** Aquatic animals and plants are grown under human-controlled conditions (like tanks, ponds, cages).
- **Cultivation of Aquatic Organisms:** Involves farming of fish, shrimp, crabs, oysters, seaweed, and other aquatic species.
- **Freshwater and Marine Systems:** Aquaculture can be done in both freshwater (rivers, ponds) and marine (seas, oceans) environments.
- **Increases Food Production:** Helps meet the growing demand for seafood and reduces pressure on wild fish populations.
- **Selective Breeding:** High-quality breeds of fish or shellfish are chosen to improve yield and resistance to disease.
- **Economic Importance:** Provides employment and income to millions, especially in rural and coastal areas.
- **Sustainable Resource Use:** If managed properly, aquaculture can be a sustainable way to produce protein-rich food.
- **Use of Technology:** Modern aquaculture uses aeration systems, automatic feeders, water quality monitors, etc.

4. Write characteristics of Chimaera.

Characteristics of Chimaera (Order: Chimaeriformes)

- **Cartilaginous Skeleton:** Chimaeras possess a skeleton made entirely of cartilage, like other members of class Chondrichthyes.
- **Elongated Body with Tapering Tail:** Their body is fusiform or compressed with a long, tapering tail that often resembles a whip.
- **Head with Large Eyes and Snout:** The head is large, with prominent, often reflective eyes adapted for deep-sea vision, and a conical or blunt snout.
- **Single Gill Opening Covered by an Operculum:** Unlike sharks, which have multiple gill slits, chimaeras have a single external gill opening on each side, covered by a soft operculum.
- **Tooth Plates Instead of Teeth:** They lack individual teeth and instead possess three pairs of large, flat tooth plates used for crushing prey.
- **Presence of Claspers in Males:** Males have a pair of pelvic claspers for internal fertilization, along with a unique retractable cephalic clasper on the head.
- **Lack of Spiracles and Scales:** Spiracles are absent, and the body is generally smooth, lacking dermal denticles (scales).
- **Venomous Spine:** The first dorsal fin is preceded by a sharp, often venomous spine used for defense.
- **Deep-Sea Habitat:** Chimaeras are mostly benthic and found at depths ranging from 200 to over 2,000 meters.
- **Electroreception:** Like sharks, they possess ampullae of Lorenzini for detecting electrical signals in the environment.

5. What are the effects of more planktons in ocean?

Positive Effects:

- **More Oxygen Production:** Phytoplankton perform photosynthesis and produce over 50% of the Earth's oxygen, so more plankton can increase global oxygen levels.
- **Increased Food Availability:** Plankton form the base of the marine food chain, so their abundance supports more zooplankton, fish, and other marine organisms.
- **Carbon Dioxide Absorption:** Phytoplankton absorb CO₂ during photosynthesis, helping to regulate the global carbon cycle and mitigate climate change.

Negative Effects:

- **Harmful Algal Blooms (HABs):** Excessive growth of certain plankton species (like *dinoflagellates* or *cyanobacteria*) can lead to toxic algal blooms that harm marine life and humans.
- **Oxygen Depletion (Hypoxia):** When large amounts of plankton die and decompose, oxygen is consumed, leading to "dead zones" where aquatic life cannot survive.
- **Disruption of Ecosystems:** Sudden plankton surges can disturb natural food webs, favoring some species over others and reducing biodiversity.
- **Water Quality Issues:** High plankton concentrations can make water cloudy, reduce light penetration, and negatively affect coral reefs and submerged vegetation.

6. Write functions of bioelectric organ.

Functions of the Bioelectric Organ

1. **Defense:** The bioelectric organ helps protect the animal from predators. Some species, like electric rays and electric eels, can produce powerful electric shocks to stun or scare off threats.
2. **Predation:** Many electric fish use their electric organ to capture prey. A strong electric discharge can paralyze or kill small animals, making them easier to catch.
3. **Navigation:** In species that produce weak electric fields, the organ helps in detecting objects and movement in the surrounding environment. This is useful in dark or murky waters.
4. **Communication:** Some fish use electric signals to communicate with others of their species. These signals can convey information about territory, mating readiness, or identity.
5. **Environmental Awareness:** Electric fields generated by these organs allow fish to detect changes in water conductivity, temperature, and the presence of other living organisms.

7. Write characteristics of Holocephali.

1. **Cartilaginous Skeleton:** Their skeleton is made entirely of cartilage, lacking true bones.
2. **Single Gill Opening:** Unlike sharks that have multiple gill slits, Holocephali have a single external gill opening on each side covered by a soft operculum.
3. **Upper Jaw Fused to the Skull:** The upper jaw is firmly fused with the cranium, a unique feature among cartilaginous fishes.
4. **Tooth Plates Instead of Teeth:** They do not have individual teeth but possess three pairs of large, flat tooth plates used for crushing food.
5. **Long, Tapering Tail:** The body ends in a long, whip-like tail which is usually slender.
6. **Absence of Scales:** Their skin is smooth and lacks the dermal denticles (scales) typical of sharks.
7. **Presence of a Venomous Spine:** A sharp, venomous spine is present in front of the dorsal fin for defense.
8. **No Spiracles:** They lack spiracles, which are present in sharks and rays.
9. **Electroreception:** They possess electroreceptive organs (ampullae of Lorenzini) to detect electrical fields in water.
10. **Deep-Sea Habitat:** Holocephali generally live in deep or cold ocean waters, often near the seabed.

8. Name three economically important shrimps.

Here are three economically important shrimps:

1. ***Penaeus monodon*** (Black tiger shrimp)
2. ***Penaeus vannamei*** (Whiteleg shrimp)
3. ***Metapenaeus monoceros*** (Speckled shrimp)

9. Write three functions of ecosystem.

Here are three key functions of an ecosystem:

1. **Energy Flow**

Ecosystems facilitate the transfer of energy from the sun through producers, consumers, and decomposers, maintaining life processes.

2. **Nutrient Cycling**

They recycle essential nutrients like carbon, nitrogen, and phosphorus, making them available to living organisms continuously.

3. **Habitat Provision**

Ecosystems provide living space and resources necessary for the survival of diverse plant and animal species.

10. Write purpose of Aquaculture.

The purpose of aquaculture is to cultivate aquatic organisms such as fish, shellfish, and seaweed under controlled conditions to increase production and meet the growing demand for seafood. It aims to provide a sustainable source of food, reduce pressure on wild fish populations, create economic opportunities through employment, and support rural and coastal communities. Additionally, aquaculture can contribute to conserving natural ecosystems by minimizing overfishing and helping maintain biodiversity.

11. Differentiate between Bay and Estuary.

A bay is a broad, curved indentation along the coastline where the sea extends into the land. It typically has a wide opening to the ocean and contains mostly saltwater. Bays are influenced primarily by tides and ocean currents and usually have less sediment accumulation. They provide shelter for marine life but are generally less nutrient-rich compared to estuaries.

An estuary, on the other hand, is a partially enclosed coastal area where freshwater from rivers mixes with saltwater from the sea, creating brackish water. Estuaries are influenced by both river flow and tidal movements, leading to high sediment deposits. These areas are highly productive ecosystems that support a diverse range of species due to the mixing of nutrients from both freshwater and marine environments.

12. What is Brackish water aquaculture?

Brackish water aquaculture is the practice of cultivating aquatic plants and animals in water that has a mix of fresh and seawater, meaning it is saltier than freshwater but less salty than seawater. This type of aquaculture typically takes place in environments such as estuaries, mangrove swamps, and coastal lagoons where freshwater from rivers meets and mixes with seawater. Common species raised in brackish water aquaculture include shrimp, certain types of fish like milkfish, and shellfish such as oysters. This method is important because it allows the use of natural habitats that have moderate salinity levels, supporting species adapted to these conditions and helping to increase seafood production.

13. Differentiate between lake and lagoon.

A lake is a large inland body of freshwater or saltwater, completely surrounded by land. It usually has a stable water level and is often fed by rivers, streams, or rainfall. Lakes can be natural or artificial and support diverse ecosystems with various plants and animals.

A lagoon, however, is a shallow body of water separated from a larger body of water, such as the sea, by a barrier like a sandbar, coral reef, or barrier island. Lagoons often have brackish water due to the mixing of seawater and freshwater. They are typically found along coastlines and can change in size and salinity depending on tides and weather conditions.

14. Write characteristics of Cephalaspidomorphi.

Here are the characteristics of Cephalaspidomorphi (commonly known as lampreys and their relatives):

1. **Jawless Vertebrates:** They lack jaws, possessing a circular, sucker-like mouth instead.
2. **Cartilaginous Skeleton:** Their skeleton is made of cartilage rather than bone.
3. **Seven Pairs of Gill Pouches:** They have seven pairs of gill openings called gill pouches instead of separate gill slits.
4. **Eel-like Body:** Their body is elongated and cylindrical, resembling an eel.
5. **No Paired Fins:** They do not have paired fins (pectoral or pelvic fins), only median fins.
6. **Oral Disk with Teeth:** The mouth is an oral disk lined with horny teeth used for attaching to other fish and sucking their blood or tissues.
7. **No Scales:** Their skin is smooth and scaleless.
8. **Notochord Present:** The notochord remains throughout life as their vertebral column is poorly developed.
9. **Larval Stage (Ammocoetes):** Their larvae live buried in sediment and are filter feeders for several years before metamorphosing into adults.

15. Write some methods to reduce turbidity.

Here are some common methods used to reduce turbidity in water:

1. **Sedimentation:** Allowing suspended particles to settle naturally by slowing down the water flow in settling tanks or ponds.
2. **Filtration:** Passing water through filters made of sand, gravel, or other materials to remove suspended solids.
3. **Coagulation and Flocculation:** Adding chemicals called coagulants (like alum) that cause small particles to clump together into larger flakes (flocs), which then settle out more easily.
4. **Use of Settling Basins or Clarifiers:** Constructing basins where water is held long enough for suspended solids to settle before further treatment.
5. **Vegetative Buffer Strips:** Planting vegetation along waterways to trap sediment and reduce soil erosion entering water bodies.
6. **Reducing Runoff and Soil Erosion:** Implementing soil conservation practices such as terracing, contour plowing, or cover crops to prevent sediment from washing into water sources.

16. Write names of edible fishes.

Here are some common edible fishes:

Catla (*Catla catla*), Rohu (*Labeo rohita*), Hilsa (*Tenualosa ilisha*), Sardine (*Sardinella spp.*), Mackerel (*Rastrelliger kanagurta*), Salmon (*Salmo salar*), Tuna (*Thunnus spp.*), Pomfret (*Pampus spp.*), Tilapia (*Oreochromis spp.*), Carp (*Cyprinus carpio*).

17. Explain adaptations in gills.

Fish gills are specially adapted to extract oxygen from water, which contains much less oxygen compared to air. One major adaptation is their large surface area. Gills have many thin, feather-like structures called filaments, and these filaments are covered with tiny folds called lamellae. This greatly increases the surface area available for gas exchange.

Another key adaptation is the thinness of the gill membranes. The walls of the lamellae are extremely thin, allowing oxygen and carbon dioxide to diffuse easily between water and blood.

Fish gills also have a counter-current exchange system where blood flows in the opposite direction to the water passing over the gills. This system maintains a concentration gradient that maximizes oxygen absorption from the water.

Additionally, gills are well supplied with blood vessels (capillaries) that quickly transport oxygenated blood to the rest of the body and bring carbon dioxide back to the gills for removal.

Finally, the structure of gills allows them to remain moist and efficiently filter oxygen even in water with low oxygen levels, which is crucial for the survival of fish in diverse aquatic environments.

18. Write steps involved in measuring fish length for taxonomic studies.

Here are the steps involved in measuring fish length for taxonomic studies:

1. **Select the Fish Specimen:** Choose a properly preserved or fresh fish specimen that is intact and free from damage.
2. **Place the Fish on a Flat Surface:** Lay the fish flat on a measuring board or ruler, ensuring it is straightened without stretching or bending.
3. **Align the Fish Properly:** Position the fish so that its mouth is closed, and the body lies flat with the dorsal (top) side facing upwards.
4. **Measure the Total Length (TL):** Measure from the tip of the snout (mouth closed) to the tip of the longest caudal (tail) fin ray. This is the total length.
5. **Measure the Standard Length (SL):** Measure from the tip of the snout to the base of the caudal fin (the end of the vertebral column or hypural plate), excluding the tail fin.
6. **Record the Measurements Accurately:** Use a ruler or measuring tape marked in centimeters or millimeters and note the length precisely.
7. **Repeat if Necessary:** Take multiple measurements for accuracy and calculate an average if needed.

19. What are the factors that affect water quality?

Several factors affect water quality, including both natural processes and human activities:

1. **Physical Factors:** Temperature, turbidity (cloudiness), color, and suspended solids influence water quality. For example, higher temperatures can reduce oxygen levels.
2. **Chemical Factors:** Levels of dissolved oxygen, pH, salinity, nutrients (like nitrogen and phosphorus), heavy metals, and pollutants affect water quality. Excess nutrients can cause eutrophication, while pollutants can be toxic to aquatic life.
3. **Biological Factors:** Presence of microorganisms, algae, aquatic plants, and animals influence water quality. Pathogenic bacteria and algae blooms can make water unsafe.
4. **Human Activities:** Industrial discharge, agricultural runoff, sewage disposal, and urbanization introduce pollutants and sediments that degrade water quality.
5. **Geological Factors:** The natural composition of soil and rocks in a region can affect mineral content and acidity of water.
6. **Hydrological Factors:** Flow rate, water source, and mixing of freshwater and seawater influence the chemical and physical properties of water.

20. Write characteristics of common Carp.

Here are the characteristics of the Common Carp (*Cyprinus carpio*):

1. **Body Shape:** The common carp has a deep, elongated, and laterally compressed body covered with large, thick scales.
2. **Color:** Its body color ranges from golden yellow to greenish-brown on the back, with lighter shades on the belly.
3. **Mouth Structure:** It has a protrusible mouth located at the tip of the snout, equipped with two pairs of barbels (whisker-like organs) on the upper jaw that help in sensing food.
4. **Fins:** The dorsal fin is long and contains a strong, serrated spine at the front. The tail fin is slightly forked.
5. **Habitat:** Common carp are freshwater fish that prefer slow-moving or still waters like ponds, lakes, and rivers with muddy bottoms.
6. **Feeding Habits:** They are omnivorous bottom feeders, consuming a variety of plant material, detritus, insects, and small invertebrates.
7. **Reproduction:** They spawn in warm, shallow waters, laying thousands of eggs that stick to aquatic plants.
8. **Economic Importance:** Common carp is widely cultivated in aquaculture due to its fast growth, adaptability, and high market demand.

21. What are Piscivore?

Piscivores are animals that primarily feed on fish. The term comes from Latin—*pisci* meaning fish, and *vorare* meaning to devour. Piscivores can be found in various groups including fish, birds, mammals, and reptiles. Examples include predatory fish like pike and barracuda, birds such as kingfishers and herons, and mammals like otters and seals. These animals have adaptations like sharp teeth, strong jaws, or specialized hunting techniques to catch and consume fish efficiently.

22. What is Gill Raker?

A gill raker is a bony or cartilaginous structure located along the inner edge of the gill arches in fish. Its primary function is to protect the delicate gill filaments by filtering out large particles, debris, and food from the water as it passes over the gills. Gill rakers also help in feeding by trapping plankton and small organisms, especially in filter-feeding fish. The size and spacing of gill rakers vary depending on the fish's diet and feeding habits—fish that feed on small particles have long, closely spaced gill rakers, while those that eat larger prey have shorter, more widely spaced ones.

23. Differentiate between Freshwater ecosystem and Marine ecosystem.

A freshwater ecosystem is found in bodies of water with low salt concentration, such as rivers, lakes, ponds, and streams. These ecosystems support plants and animals adapted to environments with little to no salt, and they usually have a higher variety of species that cannot tolerate salty conditions. Freshwater ecosystems often have variable temperatures and water flow, depending on the season and location.

A marine ecosystem exists in saltwater environments like oceans, seas, and coral reefs. Marine ecosystems cover a much larger area of the Earth and contain higher salt concentrations. Organisms in marine ecosystems are adapted to survive in saline water and often experience more stable temperature ranges compared to freshwater systems. Marine ecosystems generally support a wider diversity of life due to their vast size and complex habitats.

24. What are different types of caudal fin in bony fishes?

Different types of caudal fins (tail fins) found in bony fishes are classified based on their shape and structure. The main types include:

1. **Heterocercal Caudal Fin:** The upper lobe is larger than the lower lobe, and the vertebral column extends into the upper lobe. This type is common in primitive fishes like sharks but rare in bony fishes.
2. **Homocercal Caudal Fin:** Both the upper and lower lobes are about equal in size, and the vertebral column ends near the base of the fin. This is the most common type in modern bony fishes and provides efficient forward propulsion.
3. **Protocercal Caudal Fin:** This is a simple, cone-shaped tail without distinct lobes, seen in larval stages of some fishes.
4. **Dipercal Caudal Fin:** The vertebral column extends into both the upper and lower lobes symmetrically.
5. **Emarginate Caudal Fin:** The tail fin is slightly indented or notched in the middle but lobes are nearly equal.
6. **Forked Caudal Fin:** The fin is deeply forked, with two distinct lobes, aiding fast swimming.
7. **Lunate Caudal Fin:** The fin is crescent-shaped with narrow lobes, typical of fast, open-water swimmers like tuna.

25. Write name of parts of brain in fishes.

Here are the main parts of the brain in fishes: Forebrain (Prosencephalon), Midbrain (Mesencephalon), Hindbrain (Rhombencephalon), Cerebellum, Medulla Oblongata.

26. Write ecological role of cartilaginous fishes.

The ecological role of cartilaginous fishes, such as sharks, rays, and skates, is very important in maintaining the health and balance of marine ecosystems. They often act as top predators, controlling the population of prey species and preventing any one group from becoming too dominant. This helps maintain biodiversity and the stability of food webs.

Cartilaginous fishes also contribute to the health of coral reefs and seagrass beds by preying on species that might otherwise damage these habitats. By scavenging on dead or weak animals, they help in nutrient recycling and keep the marine environment clean.

Additionally, they serve as indicators of ocean health because their presence and population trends reflect changes in marine ecosystems caused by pollution, overfishing, or climate change. Overall, cartilaginous fishes play a crucial role in shaping marine communities and supporting ecosystem functions.

27. What is Biological rhythm?

Biological rhythm refers to the natural, regular cycles or patterns of biological activities in living organisms. These rhythms help organisms adapt to the predictable changes in their environment, such as day and night or seasonal variations. Examples include the circadian rhythm, which is a roughly 24-hour cycle governing sleep and wakefulness, feeding, and other bodily functions, and seasonal rhythms, which influence behaviors like migration, reproduction, and hibernation. Biological rhythms are controlled by internal biological clocks but can also be influenced by external cues like light and temperature.

28. Write a note on Nictating membrane in Fish eye.

The nictitating membrane in fish is a thin, transparent or translucent third eyelid that can move across the eye. Its main function is to protect the fish's eye from damage, debris, and parasites while still allowing some vision. It also helps keep the eye moist and clean, especially in species that live in environments with sand, strong currents, or rough substrates. Not all fish have a well-developed nictitating membrane, but in those that do, it acts like a built-in protective shield, enhancing the fish's ability to see clearly while safeguarding their eyes during feeding or when escaping predators.

29. Write role of fish museums in biodiversity conservation.

Fish museums play a significant role in biodiversity conservation by serving as centers for research, education, and preservation of aquatic life. They collect, preserve, and display various fish species, including rare, endangered, and commercially important ones, which helps scientists study fish diversity, evolution, and ecology. These museums maintain reference collections that are vital for identifying species and monitoring changes in fish populations over time.

By educating the public about the importance of fish and aquatic ecosystems, fish museums raise awareness about threats such as habitat destruction, pollution, and overfishing. This promotes conservation efforts and responsible practices.

Additionally, fish museums support conservation by collaborating with researchers and policymakers to develop strategies for protecting fish habitats and managing sustainable fisheries, ultimately helping to preserve aquatic biodiversity for future generations.

30. Write functions of Pyloric caeca and stomach in the digestive system of the fish.

Stomach:

- The stomach serves as a primary site for food storage and digestion.
- It secretes digestive enzymes and gastric juices that help break down proteins and other nutrients.
- The stomach also mechanically churns the food to mix it with digestive secretions, preparing it for further digestion and absorption in the intestines.

Pyloric Caeca:

- These are finger-like projections located near the junction of the stomach and intestine.
- Pyloric caeca increase the surface area for digestion and absorption.
- They secrete digestive enzymes to aid in breaking down food further.
- They also help absorb nutrients efficiently, enhancing the digestive process.

31. Name the causative agents of furunculosis.

The causative agents of furunculosis are bacteria belonging to the genus *Aeromonas*, primarily *Aeromonas salmonicida*. This bacterial infection affects fish, causing boils or furuncles on their skin, leading to significant losses in aquaculture.

32. Name some prey that a fish consume like food.

Here are some common prey items that fish consume as food:

1. Plankton (both phytoplankton and zooplankton)
2. Insects and insect larvae
3. Small crustaceans (like shrimp, copepods, and amphipods)
4. Worms (such as annelids and nematodes)
5. Small fish or fish fry
6. Mollusks (like snails and small clams)
7. Algae and aquatic plants (for herbivorous fish)

33. Define respiration in Hag fish.

Respiration in hagfish occurs through gill pouches located along the sides of their body. Water enters through a pair of nostrils on the head, passes into the pharynx, and then flows over the gill pouches where gas exchange takes place. Oxygen from the water diffuses into the blood, and carbon dioxide is expelled. Hagfish have multiple gill pouches (usually 5 to 16 pairs), and unlike most fish, they don't have a true gill chamber; instead, each gill pouch opens individually to the outside. This unique respiratory system allows hagfish to breathe efficiently even while burrowing in low-oxygen environments like muddy sea floors.

34. Write characteristics of Lobsters.

Here are the characteristics of lobsters:

1. **Body Structure:** Lobsters have a hard, segmented exoskeleton made of chitin that provides protection and support.
2. **Body Parts:** Their body is divided into three main parts: the head, thorax (often fused as cephalothorax), and abdomen (tail).
3. **Antennae:** They have long, prominent antennae used for sensing their environment.
4. **Claws (Chelipeds):** Lobsters possess large, powerful front claws used for defense and capturing prey. One claw is usually bigger and stronger (crusher claw), while the other is sharper (cutter claw).
5. **Legs:** They have five pairs of walking legs attached to the thorax.
6. **Habitat:** Lobsters are mostly marine and live on rocky, sandy, or muddy ocean floors, often hiding in crevices.
7. **Diet:** They are omnivores and scavengers, feeding on fish, mollusks, plants, and dead animals.
8. **Movement:** Lobsters move slowly walking on the ocean floor but can swim backward quickly by flexing their tail.
9. **Respiration:** They breathe through gills located under the carapace.
10. **Economic Importance:** Lobsters are highly valued as seafood and support important fisheries worldwide.

35. What is PUFA?

PUFA stands for Polyunsaturated Fatty Acids. These are types of fatty acids that have more than one double bond in their carbon chain. PUFAs are essential fats that the body cannot produce on its own, so they must be obtained through diet. They play crucial roles in maintaining cell membrane structure, supporting brain function, and reducing inflammation.

Common examples of PUFAs include omega-3 and omega-6 fatty acids, which are abundant in fish oils, nuts, seeds, and some plant oils. In fish nutrition and aquaculture, PUFAs are important because they contribute to the health and growth of fish, as well as the nutritional quality of fish for human consumption.

36. What is the law of tolerance?

The Law of Tolerance states that the existence, abundance, and distribution of a species are determined by the degree to which environmental factors fall within the range tolerated by that species. In other words, for any environmental factor (such as temperature, light, or salinity), organisms have minimum and maximum limits beyond which they cannot survive or reproduce. Optimal conditions within these limits allow for the best growth and survival. If the factor falls outside the tolerance range, the organism may become stressed, weakened, or die. This concept helps explain why certain species are found only in specific habitats and not others.

37. Define lateral line system function.

The lateral line system in fish is a sensory organ that detects water movements and vibrations around the fish. It consists of a series of specialized sensory cells called neuromasts, located in canals or grooves along the sides of the fish's body and head.

Function:

The lateral line system helps fish sense nearby objects, predators, prey, and changes in water currents, even in dark or murky environments. This ability is crucial for navigation, hunting, schooling, and avoiding obstacles or threats in their aquatic habitat.

38. Write scientific name of Tiger Prawn.

The scientific name of **Tiger Prawn** is **Penaeus monodon**.

39. How fisheries has become employment of poor people in whole world?

Fisheries have become a significant source of employment for poor people worldwide due to several reasons:

1. **Low Entry Barriers:** Fishing often requires relatively low initial investment compared to other industries, making it accessible to people with limited resources. Small boats, nets, and basic equipment can provide livelihoods.
2. **Abundant Resources:** Many coastal and inland communities live near abundant fish stocks in rivers, lakes, and oceans, offering a natural source of income and food.
3. **Traditional Occupation:** In many cultures, fishing is a traditional skill passed down generations, enabling communities to continue the practice with minimal formal training.
4. **Diverse Opportunities:** Fisheries include various activities such as fishing, processing, marketing, and boat building, providing multiple job options for people at different skill levels.
5. **Food Security:** Fisheries provide not only employment but also a vital source of nutrition, which supports the health and well-being of poor communities.
6. **Global Demand:** The growing demand for fish and seafood products worldwide has expanded markets, creating more job opportunities, including export-oriented fisheries.

40. How to catch juvenile fish?

1. **Using Fine Mesh Nets:** Juvenile fish are smaller, so nets with very fine mesh sizes (like seine nets or cast nets) are used to prevent them from escaping.
2. **Traps and Fish Pots:** Small traps placed in nursery areas such as shallow waters, mangroves, or estuaries can catch juvenile fish moving around for food or shelter.
3. **Electrofishing:** This method uses electrical currents in freshwater to temporarily stun fish, making it easier to collect juveniles without harming them.
4. **Light Fishing:** Some juvenile fish are attracted to light, so fishermen use lamps at night to gather young fish near the surface.
5. **Fishing in Nursery Grounds:** Juveniles often inhabit shallow, protected waters like estuaries, seagrass beds, or mangroves. Targeting these areas increases the chances of catching juveniles.

41. Write functions of pneumatic sacs in osteichthyes.

The pneumatic sacs in Osteichthyes (bony fishes) primarily function as swim bladders and serve several important roles:

1. **Buoyancy Control:** Pneumatic sacs help the fish maintain neutral buoyancy in water, allowing it to stay at a desired depth without constantly swimming. By adjusting the amount of gas in the swim bladder, the fish can rise or sink effortlessly.
2. **Respiration:** In some primitive bony fishes, the pneumatic sac can also function as a lung, allowing the fish to gulp air and extract oxygen directly, especially in oxygen-poor water.
3. **Sound Production and Reception:** The pneumatic sac can help amplify sounds or detect pressure changes, aiding in communication and environmental awareness.
4. **Balance and Stability:** By regulating buoyancy, the pneumatic sac helps the fish maintain balance and stability while swimming.

42. Differentiate between Diencephalon and Telencephalon.

The telencephalon is the anterior part of the forebrain and is primarily responsible for higher brain functions such as voluntary movement, sensory perception, learning, and memory. It contains important structures like the cerebral hemispheres and olfactory bulbs, which are involved in processing smells. In contrast, the diencephalon lies just behind the telencephalon and acts as a relay center, connecting different parts of the brain. It contains vital structures such as the thalamus, hypothalamus, and epithalamus, which regulate functions like sensory information processing, hormone control, temperature regulation, and maintaining homeostasis. While the telencephalon manages complex behaviors and sensory interpretation, the diencephalon is more involved in integrating sensory input with autonomic and endocrine responses.

43. When Greek invasion of lamprey took place, how it affected the native species?

The Greek invasion of lamprey refers to the introduction or spread of certain lamprey species (particularly the sea lamprey) into new areas, such as the Great Lakes in North America, often via man-made waterways or shipping routes. When these invasive lampreys entered new ecosystems, they had a significant negative impact on native fish species.

Lampreys are parasitic—they attach to other fish and feed on their blood and body fluids, often weakening or killing their hosts. This parasitic behavior led to severe declines in native fish populations, including economically important species like trout and whitefish. The invasion disrupted the local aquatic food webs, reduced biodiversity, and caused economic losses to fisheries dependent on native fish.

44. Write names of scales of fishes.

Here are the names of different types of scales found in fishes:

1. Placoid Scales
2. Ganoid Scales
3. Cycloid Scales
4. Ctenoid Scales

45. Write characteristics of class Myxini.

Here are the characteristics of Class Myxini (hagfishes):

1. **Body Structure:** They have elongated, eel-like bodies without paired fins.
2. **Skeleton:** Their skeleton is made entirely of cartilage; they lack vertebrae, so they are considered agnathans (jawless fish).
3. **Mouth:** They possess a circular, jawless mouth with tooth-like structures made of keratin.
4. **Skin:** The skin is slimy and scaleless, producing large amounts of mucus as a defense mechanism.
5. **Respiration:** They breathe through multiple pairs of gill pouches (usually 5-16 pairs) that open individually to the outside.
6. **Sensory Organs:** They have poorly developed eyes covered by skin, relying more on other senses like smell and touch.
7. **Feeding:** Hagfishes are scavengers, feeding mainly on dead or dying fish and marine animals.
8. **Habitat:** They are marine and mostly live in deep-sea environments, burrowing into soft substrates.
9. **Reproduction:** Reproductive habits are not well understood; they lay eggs, but lack distinct larval stages.

46. Define morphology of fish.

Morphology of fish refers to the study of the external form, structure, and shape of fish. It includes examining features such as body shape, fins, scales, mouth position, coloration, and other physical characteristics. Understanding fish morphology helps in identifying species, studying their adaptations to different environments, and analyzing their behavior and movement. Morphology also plays a key role in taxonomy, ecology, and evolutionary biology of fishes.

47. Name some of the herbivore fishes.

Here are some examples of herbivorous fishes:

1. Tilapia
2. Grass Carp (*Ctenopharyngodon idella*)
3. Rabbitfish (*Siganus* spp.)
4. Parrotfish
5. Surgeonfish (*Acanthurus* spp.)

Disclaimer:

For best results, it is advised NOT to rely on this file only. Go through video lectures, handouts and other sources as well.

Regards,

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