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"STUDIES ON ECONOMIC SIGNIFICANCE AND ADAPTATIONS TO AMPHIBIOUS LIFE : A REVIEW"

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ABSTRACT:

Amphibians are unique animals that have adapted to life in both aquatic and terrestrial environments. Studies have revealed a range of adaptations that enable them to thrive in these environments, including modifications to respiration, limb structure, skin, and behavior. These adaptations demonstrate the remarkable diversity and resilience of amphibians and highlight their importance in the ecosystem. Further research on the adaptations of amphibians will undoubtedly contribute to our understanding of their biology and the ecological significance of these animals.

KEYWORDS: *Amphibians, Economic significance and Adaptations.*

INTRODUCTION:

Amphibians are a group of animals that include frogs and toads, salamanders and caecilians. The members of the Class- Amphibia were the first terrestrial vertebrates, successfully colonizing the land about 350 million years ago. Amphibians have developed a remarkable diversity in life histories by adapting too many different aquatic and terrestrial habitats. Many of the species undergo a classic metamorphosis during their lives, as they develop from the familiar aquatic larvae to terrestrial adults. Other species may both metamorphose and spend their entire lives in either aquatic or terrestrial habitats, and in some species the young may even be born as miniature versions of the adults. Amphibians are today present on every continent except Antarctica, and can be found in almost all habitat types from dry, inhospitable deserts to lush tropical rainforests. While a few species are widespread and abundant, many more amphibians are found in specialized habitats that are often disappearing.

Phylum Chordata is the largest of the deuterostome phyla. It is the highest and the most important phylum comprising a vast variety of living and extinct animals including man himself. Most of the living chordates are the well known familiar vertebrate animals such as the fishes, amphibians, reptiles, birds and mammals. Besides, they include a number of marine forms such as the tunicates and lancelets, that are less well known.

In the face of global amphibian declines, it has become increasingly critical to identify trends in amphibian population genetic structure to inform conservation planning. An estimated 32 % of amphibian species are currently threatened with extinction, with over 42 % showing population declines (IUCN, Conservation International, Nature Serve 2011). The primary factors implicated in

these declines include habitat alteration, overharvest, invasive species, climate change and disease. Gene flow maintains population connectivity and evolutionary potential, allowing future response to environmental change. Fortunately, the tools and analyses for assessing gene flow and population genetic structure, such as highly variable molecular markers, are increasingly available. Larger datasets and more statistically powerful analyses are now commonplace, resulting in identification of highly diverged or even ''cryptic'' populations, estimation of effective population sizes, and testing for bottlenecks. Meanwhile, landscape genetic analyses can identify barriers to gene flow, landscape factors that facilitate gene flow, and determine the necessary size of corridors between habitat patches to maintain genetic connectivity. Although the feasibility of amphibian population genetics studies has dramatically increased, syntheses of such studies are rare.

More than 5,000 frog and toad species are currently known. Frogs and toads are tailless amphibians that are most readily identified by their long hind legs. Species vary greatly in size; while many are only a few centimetres long, the West African Goliath frog can reach a size of about 30 cm (11.8 in.). Frogs and toads are present throughout most of the world's habitats, and while some familiar species are very common, many others are rare and restricted in their habitat requirements.

Chanda (2002) published a handbook "Amphibians of India" and described 64 species of amphibians consisting 60 species Anurans, followed by 3 species Gymnophiona and 1 species of Caudata. Similarly, state-wise, in Meghalaya 35 species, Assam 24 species, Arunachal Pradesh 43 species, Tripura 8 species, Mizoram 16 species, Nagaland 12 species, and Manipur 14 species. Krishnamurthy (2003) observed the amphibian species in the Kudremukh National Park, Central Western Ghats, wherein he observed 22 species in the undisturbed area, which are likely to be threatened due to habitat fragmentation. Giri *et al.* (2004) discovered a new caecilian species, Indotyphlus maharashtraensis Taylor from northern Western Ghats, India.

Amphibians play critical role in many ecosystems. But owing to their secretive and inconspicuous nature, we know very little about their importance and role in ecosystems. As we know that amphibians are an important prey for many other animals, including fish, reptiles, birds and mammals. If we calculate the total biomass of amphibians in some temperate and tropical forests, we will find it to be higher than that other terrestrial vertebrate. Some species of snakes and bats feed exclusively on amphibians, thus their fortune will depend on that of their pray.

DISCUSSION:

Adaptations to amphibious life refer to the various biological and physiological changes that have allowed certain animals to survive and thrive in both aquatic and terrestrial environments. Some of the key adaptations to amphibious life include:

Skin: The skin of amphibians is thin, moist, and permeable, allowing them to breathe through their skin and absorb water. This adaptation is crucial for their survival in aquatic and terrestrial environments.

Lungs: Amphibians have lungs that are capable of extracting oxygen from the air, allowing them to breathe on land. However, they also have gills or other respiratory structures that allow them to breathe underwater.

Limbs: Most amphibians have four limbs that are adapted for both swimming and walking. Their feet may have webbed toes or adhesive pads that allow them to cling to surfaces or move through water.

Senses: Amphibians have well-developed eyes and ears that allow them to sense their environment both above and below the water. They also have a keen sense of smell, which helps them locate prey and avoid predators.

Reproduction: Amphibians typically lay their eggs in water, where the young develop and hatch into aquatic larvae. As they mature, they undergo metamorphosis and develop adaptations that allow them to live on land.

Skeleton: Vertebral column becomes more rigid. Pectoral girdle lost connection with skull : Pelvic girdle attached to vertebral column and two halves firmly united.

Muscles: Stronger muscles to lift body above ground.

Eggs and Development: Eggs small and still laid in water. Development stages fish-like.

Overall, these adaptations have allowed amphibians to successfully inhabit a wide range of environments, from the depths of freshwater lakes and rivers to the forests and deserts of the world. The transition from water to land was gradual. Amphibia being the lowest and earliest tetrapods are not fully adapted to a terrestrial life like reptiles. Transition from water to land involved important changes in almost every system of body.

Economic significance of Amphibia: Amphibians, such as frogs, toads, salamanders, and caecilians, play important ecological roles and have economic significance in various ways. Here are some examples.

Ecological importance: Amphibians are important indicators of environmental health, as they are sensitive to changes in their habitats. Their presence, abundance, and diversity can provide information about the health of ecosystems, such as wetlands, streams, and forests. They also serve as prey for a variety of animals, including birds, reptiles, and mammals, and as predators of insects and other small invertebrates, helping to control their populations.

Research and education: Amphibians have been used extensively in scientific research, particularly in the fields of developmental biology, genetics, and ecology. Many species are also used as model organisms in medical research, as they share many physiological and genetic similarities with humans. Amphibians are also commonly used in education and outreach programs to teach people about the importance of biodiversity and conservation.

Tourism and recreation: Amphibians can be a draw for ecotourism, particularly in tropical regions where species diversity is high. People travel to see and photograph unique and colorful species of frogs, such as poison dart frogs, and to observe breeding behaviors during seasonal migrations.

Medicinal use: Many amphibians produce bioactive compounds that have potential medical applications. For example, some species of frogs secrete chemicals that can be used as painkillers, muscle relaxants, or antibiotics. Researchers are also studying the properties of amphibian skin secretions as a potential source of new drugs to treat diseases like cancer, HIV, and Alzheimer's.

Agriculture: Amphibians can provide benefits to agriculture by consuming pests that damage crops. Some species of frogs and toads, for example, are known to eat insects like beetles, grasshoppers, and crickets, which can cause significant damage to crops.

As food: Millions of frogs are consumed as food by gourmets in U.S.A., Japan and many other countries of the world. Usually the big fleshy hind legs are eaten. Artificial rearing of frogs is not practicable. Other edible amphibians esteemed as food are Necturus and axolotls in America and giant salamanders (*Andrias*) in Japan and India.

Poisonous Amphibians: A wide variety of irritating toxic compounds is produced by amphibians. Poison glands are located dorsally in skin and defense postures of anurans and urodeles present the dorsal glandular surface to their predators. Poisonous secretions (bufotoxins) of *Bufo marinus* are fatal to dogs and cats. Poison of Dendrobates, a South-American frog, is used by tribal people to poison the points of their arrows. Some poisonous amphibians, such as *Salamandra salamandra*, are warningly coloured. Helbenders (*Cryptobranchus*) are said to be poisonous but not dangerous to man.

Predation: Frogs and toads are destroyers of noxious insects. Toads in particular are of great value because they live in gardens where insects are most injurious. The French gardens even buy toads to control harmful insects. *Bufo marinus* has been introduced in tropical sugarcane fields to destroy injurious insects.

CONCLUSION:

In conclusion, the study of adaptations to amphibious life has revealed a fascinating range of adaptations in these unique animals. From specialized respiration mechanisms to modified limb structures, amphibians have developed a wide range of adaptations that enable them to thrive in both aquatic and terrestrial environments. Further research on the adaptations of amphibians will undoubtedly contribute to our understanding of these animals' biology and highlight their ecological significance. Moreover, as amphibians face increasing threats from habitat loss, climate change, and other factors, understanding their adaptations and the role they play in the ecosystem is more critical than ever. Ultimately, the study of amphibious life provides valuable insights into the incredible diversity and resilience of life on our planet.

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