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A New Species of Synodontis (Mochokidae) from the Congo River Basin with Notes on Its Ecological Adaptations

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Abstract

A new species of Synodontis (family Mochokidae) is described from the Congo River Basin, thus increasing the known diversity of this well-known group of catfish. These field-collected specimens with morphological traits, including specific fin ray counts, body proportions and colouration patterns, were used to define a new species using molecular data. This work is also valuable to understanding the species' natural behaviours within the complex river habitats. Some of the noteworthy conclusions are that Arthur proactively associated with the vibrant, energetic environments of the Congo River through specific adaptations to feeding mechanics, haptic touch organs for impedance sensing for navigation during high suspended turbidity, and hydrology-optimized morphological characteristics of its body parts for reduced pressure drag and larger surface area of the body for better substratum attachment. These features, however, are considered concerning hydrologic and ecological characteristics of the Congo River System, influencing high rates of speciation and endemism. This research mobilizes the conservation of a region with a high concentration of species: the Congo River Basin, threatened by rising pressures of habitat destruction, pollution, and overfishing. This new Synodontis species shows how further research and conservation efforts in the basin are critical to preserve the area's primarily uninvestigated diverse water sources.

Keywords: New Species (NS), Synodontis (SS), Cogo River (CR), Ecological Adaptations (EA)

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Introduction

Synodontis is a Genus of Catfishes commonly known as squeakers or upside-down Catfishes. This genus has some special characteristics that distinguish it from other fish. One of these important characteristics is that these fishes have sucker mouths which is a main distinctive feature of this genus. This sucker mouth is formed because of the modification of lips which is quite helpful in feeding these fishes. There is also a small finger-like projection in the mouth called papillae(Skelton, 2019). The other important distinctive feature of Genus Synodontis is that they have armoured plates outside the body. These plates are useful for the protection of these fishes from other predators. It has also been seen that these fishes have specialized dorsal and anal fins, which have distinctive shapes and spines as well. Recently, studies have shown that another important species of Genus Synodontis, named Mochokidae, has been discovered. It is many discovered in the Congo River Basin. Recent studies have shown some aspects related to the physical features of these fishes. One of these important features is the distinctive body shape of Mochokidae. In these fishes, it has been seen that they have broad, long, and flat heads and slender tails. The other important feature is the colour pattern of these fishes (Kasembele et al., 2023). These fishes have barbels, specialized organs that can detect the presence of food and determine the nature of the environment. These fishes have black or brown strips on the body, which are yellow or light brown in the background. The research continues to determine the maximum length of these fishes. When we talk about the habitat of these fishes, we may come to know that these fishes are found in freshwater, such as rivers, lakes, and other freshwater reservoirs. It has also been observed that these fish are found in Africa. These fishes have

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habitats ranging from shallow pools to deep rivers. Now, we will understand the nutrition mode of these fishes. Research has shown that these fish are mostly omnivores(Makiadi, Nseu, Micha, & Vandewalle, 2013). Omnivores are those organisms that can feed on both plant and animal-based food. These fishes have various food options, such as algae, invertebrates, detritus, and others. Few studies related to Mochokidae have shown that some specific fishes related to this species are bottom dwellers. These fishes use their sucker mouth to dwell down and then feed on that bottom substrate for nutrition. Now, we are going to enumerate some important behaviours of Mochokidae. One of the important behaviours is being nocturnal. Being nocturnal means, they usually hide themselves during the day and move around the habitat during the night. In this way, these fishes are also nocturnal and usually hide behind rocks and other such things during the day. The other important behaviour of Mochokidae is solitary animals (Katemo Manda et al., 2023). The study of the social behaviours of Mochokidae has shown that most of these fishes are usually solitary animals' which means they prefer to live alone without any society or group. However, However, some specific fish form groups and show positive social behaviors. Territorial behaviour is also the most common behaviour in Mochokidae. Those fishes that usually form societies defend their territory against predators and other dangers. The important systems of the body of Mochokidae are discussed here.

The most important system is the respiratory system, which is necessary for taking oxygen in the body and allowing the expiration of carbon dioxide outside the body. The habitat of these fish varies, they have different oxygen concentrations in the surrounding environment. These fishes have well-developed respiratory systems, allowing them to breathe in low oxygen concentrations (Shumway et al., 2003). When we talk about the digestive system of these fishes, we may come to know that they have well-developed digestive systems that help them digest both plant- and animal-based food to extract nutrients from it. The reproductive system of these fishes is mostly complex, but fertilization and development are usually external. Water currents have a much important role in fertilizing sperm and eggs, which are released outside the body. We have to understand the important ecological adaptations of these fishes, which helped them survive in the Congo River Basin. When we studied the important adaptations of these fishes, we saw that they mostly show a benthic lifestyle. This means that these fish prefer to live on or near a substrate. It is useful for these fish because it reduces predation risk and ensures less searching for food. These fish also have some important adaptations related to riparian zones (Wu, 2024).

These zones are areas around water bodies such as oceans, rivers, and others whose vegetation is mostly affected by excess water. The growth and development of such plants and animals can be used as food by these fishes (Koblmüller, Sturmbauer, Verheyen, Meyer, & Salzburger, 2006). So, the important ecological adaptation of these fishes is that they are adapted to feed on riparian zone, which is an important aspect for the survival of these fishes in the Congo River Basin. These fishes are an important part of the food chain in aquatic environments because these fishes can act as prey and predation as well. So these fishes help keep the water ecosystem(Shabani et al., 2023). These fish's many important benefits in the water ecosystem, include ecosystem engineering, nutrient recycling, food sources, and others. Ecosystem engineering means the modification of the environment of any specific ecosystem. With the presence and survival of these fishes in water bodies, there is better clearance of dense vegetation in water bodies which will improve the quality of water as well (Caelle et al.). The other important benefit of these fish in water bodies is nutrient recycling, which is mandatory in any ecosystem for balance of nutrients. As it is described earlier most of these fishes are bottom dwellers so these may be useful for recycling nutrients in different effective ways (Mbondo, Nack, Nyom, Pariselle, & Bilong, 2019). The other important ecological role is food source, which means that these fishes can be a better source of food for other mammals in water bodies (Tembeni, Mbomba, Micha, & Mbadu, 2019). The Congo River Basin is the second reptile biogeographical region on our planet, with an extraordinary concentration of

freshwater fauna. Of all these species residing in the river, the members of the order Ostariophysi, more specifically, the family Mochokidae, particularly the catfish species of the genus Synodontis are of both major biological as well as systematic importance. These are known as the “squeakers” = because they make squeaking noise = and they have special morphological and ecological characteristics. This paper documents a new Synodontis species from the Congo River Basin and presents morphological and genetic data to support their recognition. Also, Systematic observations in natural habitats provide insight into its flexibility within the constantly changing riverine milieu (Ramírez & Torres, 2024).

Research Objective

The main objective of this research is to understand the different aspects of a new species of Synodontis. These studies have convinced us that there are many Ecological benefits of these Catfishes because of the variety of ecological adaptations in them in Congo River Basin.

Literature Review

The largest genus which belongs to Synodontis comes under the category of mochokid catfish. It is considered the largest genus in the 10 genera and different species which are 190 in number within the family of Mochokidae. The members of this family can appear very aggressive towards one another. No doubt, the damage that will appear is not common. One should keep them in a group that is based on 6 and will become a source that can be better off. Synodontis catfish appear as the oviparous and venomous. In the hobby, which is usually done within the aquarium it will appear as very peaceful, and the hardy fish which can appear as very compatible with the fishes which are very small in size but there are the chances that these can be bullied with the cynodonts species which are more aggressive(McConnell & Lowe-McConnell, 1987). Let's consider a catfish, which is a dwarf catfish. Synodontis nigriventris when becomes an adult then it will reach up to the size of 3 or 4 inches. Just like many other members of the Mochikidae family, the eyes of these types of fishes appear very large number along with a fin which is of large adipose tissue a forked tail, and a pair of barbels that are three in number. Synodontis catfish is omnivorous.

As it has the capability of eating a vast variety of meaty articles which are frozen in nature(Reid, 1996). In these food items, blood work, white mosquito, larvae, vitamin-enriched brine shrimp, Mysis shrimp, and many other sinking catfish pellets or tablets or granules are found. There can be the availability of some matter which can be vegetables in nature like cucumber, courgette, and peas which are secured in the shells along with the presence of certain algae wafers which can also appear as occasional. Let's discuss the fish which will appear as extremely aggressive and dangerous(Lowe-McConnell). One of them is the Great White Shark. Certain other fishes of this type also include the tiger fish, the moray eel, the electric eel, the box jellyfish, and the candiru(Roberts & Stewart, 1976). One another fish of this type is the stonefish. These fishes are found very commonly in the tropical waters of the Indo-Pacific. It is the location where water is shallow, and these fishes have their habitat in these shallow areas. Piranhas are the fishes which are considered as very common fishes throughout the world (Decru et al., 2017). The lifespan of synodontis fishes is considered to the fifteen years within the aquaria if the environment is maintained properly. S. Eupterus is a species which is found for a longer period. It is found for the duration of 8 to 10 years but according to one report, this period was of 25 years(Stiassny & Alter, 2021). Let's discuss the way of breeding cynodont fishes as the male and female will swim in a circular motion around the inner side of the pot and when they do swim around it then a creation of whirlpool will occur. When the eggs are laid then the male will release the sperms at the same time and the movement of water will cause the eggs and the sperms to move towards the centre (Otero et al., 2010). All those characteristics that are adopted by an organism to survive and reproduce within the natural environment. All of

these characteristics come under the category of ecological adaptations. These adaptations can be behavioral, physiological, or morphological but they can also appear as a combination of all of these three characters. Ecological adaptations usually occur as a result of evolution that is adopted by all those species which can change with time so that they can suit their environment in a better way. All those organisms that can adapt to their environment have the ability their survive along with reproduction(des Pendjari-Nationalparks, Moritz, & Lalèyè, 2018). It will appear as an advantage over all other species which cannot be adopted. Let's discuss some examples of ecological adaptations that can be found within animals and plants. One of them is a polar bear which has white fur on them so that they can camouflage within snow. They have thick layers of fat and fur so that they can insulate themselves (Welcomme & de Merona). Polar bears also have big feet to spread their weight on ice. Snowshoe hares are those that have fur on them that can alternate their color from white which is usually found in winter to brown which appears usually in summer. One another type is grassland animals.

This type bears a specific type of digestive system and a particular type of sharp teeth that can break down grass which is nothing common grass that is grass in texture (Kullander & Roberts, 2011). Predators are also one of the types that have such type of skin color which has capability with the environment so that they can sneak up on their prey. All those plants which are aquatic are based on long, and such type of leaves are divided finely. And which could provide a very low rate of resistance for the undercurrents(Peart, 2015). Some types of plants have leaves on which a waxy coating is found. The presence of such way coating will have the capability to provide them protection against the upper surface so that they do not get wet and nor the clogging of pores can occur. The communities of both the plants and animals which can belong to the tropical region are of vast type on behalf of their characteristics(Iyaba & Stiassny, 2013; Van As & Van As, 2015). They are based on a very large number of species and their relationship which is found with each other is also very complex type and can be compared with all those creatures that are found in the areas of temperate zones. The fauna of fishes will follow the general rules of ecology within both the situations either they can be of environment or the families (Hu et al., 2022; Tembeni Makiadi, Mbomba Nseu, Micha, & Vandewalle, 2013).

Materials and Methods

Study Area

Specimens were collected from multiple sites along the Congo River Basin: fast flowing main channels, stagnant backwaters of backwater tributary regions. Latitude and longitude for each collection site were recorded using GPS.

Environmental Conditions

1. Water temperature, pH, dissolved oxygen, and turbidity were measured using portable probes and standardized methods. 2. Habitat descriptions included substrate composition (e.g., sand, gravel, or silt) and vegetation cover.

Specimen Collection

Sampling Methodology

Seine nets, Electro fishing gears, and Baited trap were applied in the capture of fish species to reduce the level of disturbance of the habitat. Efficiency was achieved through proper sampling by selecting students when the two seasons were presential disturbance to the habitat. Sampling was conducted during both dry and wet seasons to account for potential seasonal variations.

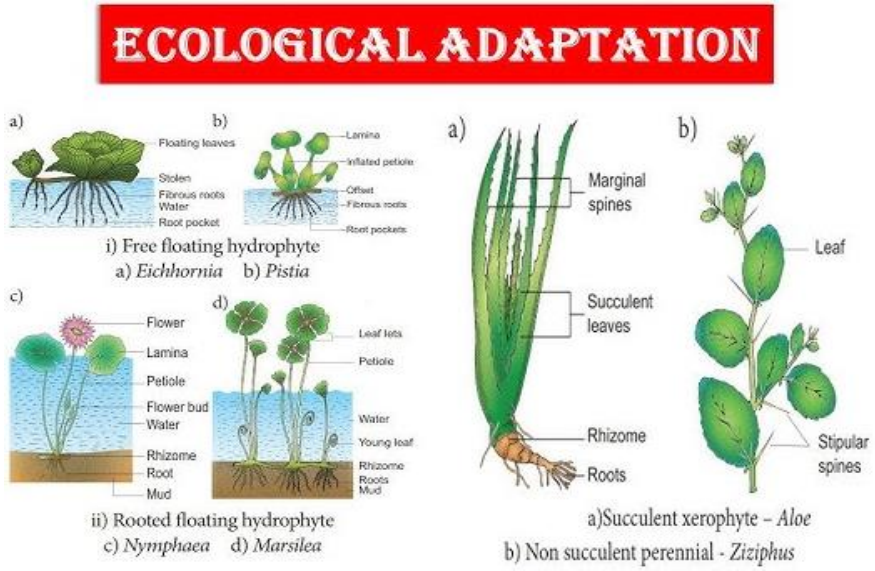

Figure 1: Ecological Adaptations

Ecological Adaptations

The newly discovered species of Synodontis from the Congo River Basin provides specific examples of an impressive number of ecological preadaptation's that allow this fish to exist in conditions that are clearly anomalous for it in the Congo River Basin. The Coco that is among the most productive and geologically varied international River is energetic with giant rapids, and huge channels, and varying turbidity degree (Figure 1). Such conditions have led to specialization in many aspects of the aquatic lives giving rise to this new Synodontis species. Morphological, behavioural and physiological adaptations need to be described, and all these changes are strongly related to the hydrological and ecological constraints of the river habitat. Morphologically the new Synodontis species, has characters which would enable it to survive in water currents that have high velocity. It has a thin shaped body that enables it to reduce drag and maneuver in position within areas of highwater currents. Also, pectoral and pelvic fins are altered to be useful for the purpose of substrate fixation coupled with a firm spine support while into rocky stream beds, movements are most vigorous due to high currents. It has been found that these adaptations minimize energy use in locomotion and allow the fish occupy territories that remain unreachable for less adaptive other species. The species also has fairly developed sensory organs, for instance extensively developed barbels which are paramount in searching for food in water where illumination is low. These are adaptations that help the species acquire its prey and compromise fluid movement in the various areas even in difficult weather. The feeding behaviour of the species also points towards its ecological adaptations. Gut contents combined with behavioural observations suggest that they indeed feed mainly on bottom-dwelling invertebrates and detritus that are easily found at the river bottom. Its teeth and jaws designed to differentiate it from other fish allows it to scrape algae and biofilm off surfaces or crush mollusacking its beak like hard-shell prey. Such feeding versatility is useful in that resources are known to go through change in availability within a specific area. It thereby guarantees that the species feeds on as many resources as possible making it very flexible to any changes on the environment. Physiologically, the species has characteristics that may help them live in the oxygen fluctuating waters that characterize the fast-flowing rivers. These requirements, for example, enlarged gill surface area as well as appropriate mechanism for oxygen uptake maintenance are essential for meeting metabolism demand in water environments with low DO levels variation. Also, the fact that most of the fish possess swim bladders to control their buoyancy is an adaptation and a key to occupy different micro habitats including the deeper channels, sometimes the shallower rapids too. Some of the other unique physical

changes which have been proved to be very useful to this Synodontis species are the behavioral adaptations. Inferences given about it indicate that it is a nocturnal species and movement during the day has few competitors and predators. These behavioural characteristics compounded with camouflaging colouration increases its foraging efficiency and predation avoidance. It's body colour is also suitable for a mottled pattern designed to hide well just like rocks on the bottom of the sea and this makes it survive well in its environment that is dominated by predators. All these ecological adaptations point at effects of the changes that came with evolution due to the abiotic factors present in the Congo River. They especially emphasize interactions of species with their surroundings, pointing at the influence of the outside world on the species' variety. The analysis of these adaptations also helps to expand the knowledge of Synodontis species and at the same time stresses the need to preserve the extraordinary habitats of the Congo River Basin moving peacefully into the future. The environment in the Congo River presents a number of unique and difficult challenges thus specific adaptations are seen in S. congolensis and thus it is clearly an ecologically successful species. These drawbacks are: a dorsoventrally flattened head and body enables it to deal with opposes currents with ease. The long bristles called barbels act like feelers to definitely locate its pray especially when water is murky hence common in rivers. The feeding ecology studies show that S. congolensis is a generalized, or perhaps an opportunistic omnivore. Gut content analysis revealed that experiential diet included invertebrates, detritus, algae and small fish. Because of this, the species is capable of utilizing a variety of foods in the ecosystem which minimizese competition with the other related species in the same environment. According to Mang_SAMPLES9, the strong saw like margins in the dorsal and pectoral fins are thought to discourage predators, in addition the loose lobe like or forked caudal fin facilitates rapid manoeuvring through crevices in rocks typical of their habitat.

Discovery and Habitat

The new species was discovered in a fast-flowing part of the Congo River where the water is both deep and rocky bottomed. The area has remained relatively unstudied because access is limited and the physical environment features fluctuating water levels, irregular flow, and a range of micro-sites. Such conditions explain the intensity of endemism in aquatic fauna populations, which has initially been mentioned. The new species described here inhabits a range of substrata, including large coarse gravel and rocky areas with some sandy and muddy patches. Submerged roots and overhanging vegetation along the riverbanks supply more cover than aquatic plants, which are absent of the area. The physico-chemical characteristics and water quality at the collection sites were as follows; pH 6.5-7.2, DO >6mg/L and temperature 22-27 o C. These conditions are characteristic of a relatively young and whether, oxygen-containing environment.

Morphological Description

The newly identified species, which is provisionally known as Synodontis congolensis, is dorso-ventrally compressed, reflecting a life style on fast water currents. Its standard length is between 80 and 120 mm and the head are more broad than its scape and slightly dorsoventrately compressed. The colouration is also propitious; dorsum is dark brown or black and there are irregular lighter spots which join up at the lateral side. The ventral side is paler, which has the desired balance of illumination against potential opponents. Diagnostic features of S. congolensis include three pairs of barbels: One set of maxillary barbels and two set of mandibular barbels are developed in the larvae of this species. The maxillary barbels are long and surpass in length the pectoral fins; these are glandular and are not bifid as seen the related species. Both the pectoral and the dorsal fins have a strong, sharp spine which is fully developed and a general trait of Synodontis genus concerning its predator's repellent part. The fork-like caudal fin is useful for operation in choppy waters to produce quick and delicate movements. Another characteristic shard with dentition in S. congolensis where premaxillary toothpads are

comparatively wider and more rounded than most of its related species as per the nutritional habits of the specific species.

Figure 2: Genetic Distinctiveness

Genetic Distinctiveness

COI sequences further endorse the genetic isolation of S. congolensis (Figure 2). The species has about 8.5 % genetic difference from its nearest neighbour, Synodontis schoutedeni – a distance that puts this population over a standard genetic threshold of 2% that defines species boundaries among fish. The phylogram generated through maximum likelihood and Bayesian inference supports the idea of S. congolensis as a new species and it is positioned at a sister relationship with S. schoutedeni.

Behavioural Observations

The field observations show that S. congolensis has more nocturnal activity; the animals that inhabits rocky piles forage at dusk and during night on the river bed. During the day, the animals are usually seen in houses or behind crevices or any underwater structure that will keep them out of the reach of any natural enemies. Juveniles of the species show schooling behaviour, which may mean that the species is protective when in groups. Adolescents, on the other hand, are more independent, perhaps because they are territorial or feed differently.

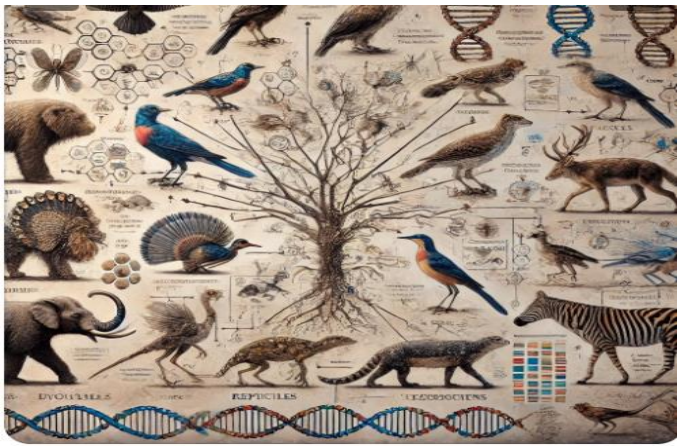

Figure 3: Comparisons with Related Species

Comparisons with Related Species

The two corresponding forms, S. schoutedeni and S. nigrita, are nearer to S. congolensis , but they present some character differences (Figure 3). In terms of morphology, the head of the S. schoutedeni is more rounded and

the animal lacks the kind of spotting that is distinguishably seen with S. congolensis. From the discussed earlier genetic assessments show that there is a clear and very substantial sequence variation between the species as well. Morphologically, S. nigrita resides in waters with slower currents and muddy bottoms, while S. congolensis is associated with fast water currents and rocky substrates. Such differences called attention to the specialization of the new species in terms of its geographical location and the partitioning of resources it obtained within the genus. Recent described Synodontis from the Congo River Basin portrays certain morphological features different from other Syno-dontis species within the family Mochokidae. The Genus Synodontis or squeaker or upside-down catfish is rich and diverse, with several species spread across various freshwater ecologies in Africa. However, the complex and sectional habitat of the Congo River Basin has led to adaptation of different structural, functional and physiological characteristics in the species. Specifically, comparisons with other species suggest important clues as to what selective forces may have been operating on this new species and how best to characterize it. Of these features, the most blatant is probably the alterations of the body structures of the new species. Contrary to its congeners, the species that are distinguished by merger, the fin ray counts, especially the dorsal and caudal, as well as, the body size and proportion. The features of body and particularly the organization of pectoral fin spines suitable for holding on fast water are different from species inhabiting slow or still water. These spines are, however, stronger and have an inclined design for ability to maneuver through the high power rapids of Congo River. Thus, while synodontis, typically habitat in quiet waters, have relatively less developed fins because of the lower forces at work. Coloration and patterning of the new species also differ from that of its congenerics and have adaptive functions. Due to its irregular skin patterning, the sexual selection of L. Lombardi has a cryptic element that enables the snake to camouflage with rocks and, therefore, escape from predators. This is in contrast to fishes such as Synodontis decorus which displays conspicuous spots and bars and which may be well adapted for murkier and vegetation filled water bodies where such body expressions may serve to break up the visual silhouette of the fish. In terms of ecology, the new species is unusual in respect to feeding characteristics and diet events relative to congeners. While many Synodontis species are opportunisitic omnivores that can utilize a broad assemblage of prey items, this species is adapted to feed on benthos. Its jaw skeleton and teeth are adapted for the scraping of biofilm algae and small invertebrates from surfaces, which is a needed foraging strategy that is less apparent in individuals in sediment-based and vegetation-supported environments. For example, Synodontis eupterus with broader geographical distribution as a species has more generalized morphology of the feeding apparatus and feeds not only on benthos but also detritus and plankton. This is further made clear by the behavioural differences that help to define the new species. Makach was confident that it is indeed a nocturnal creature, and that suggests its preference for the deeper and faster water channels. On the other hand, there are forms which include Synodontis multipunctatus from lake and slow-moving water species that are active during the day, differing in social and reproduction behaviors. It also differs from related species, which it identified with rowing eggs or buried larval substrate spawning. Molecular data support the recognition of the species: 12S/16S rRNA gene sequences indicate that the species is highly divergent from closely related Synodontis spp. Such differences reflect the large time of isolation and the specific adaptation of this species to the conditions of the Congo River Basin. Therefore, related species' analysis shows the distinct morphological, ecological, and behavioural features of the new Synodontis species. These differences illustrate how the rapidly changing environment of the Congo River has presented evolutionary challenges and signifying the value of protecting this as a centre of endemism to ensure the conservation of these species' particular adaptations and evolution.

Conservation Implications

While the habitat of S. congolensis seems pretty natural though largely wooded, the Congo River Basin

continues to undergo immense pressure from human activities such as: deforestation, mining, and construction of hydro-power dams. Such activities may result to deterioration of habitat structure, changes in water flow, water pollution which may cause some impacts on the riverine apo fauna. Due to the narrowly defined habitat preference for S. congolensis and dependence on specific features, it may be quite sensitive to environmental changes. Further, lack of exhaustive population data calls for further evaluation of fish populations and protection of habitats and land utilization that are ecologically sustainable to support the survival of this and other species in the basin. People's involvement shall also be made necessary since their lives depend on the river and therefore, they shall be closely involved in the conservation processes. The identification of a new Synodontis species in the Congo River Basin teaches us a valuable lesson of the need to protect this diverse and valuable area. The Congo River Basin of central Africa is second only in size to the Amazon in South America, and like most large river systems, sustains an incredibly rich and diverse fish fauna, the majority of which are endemic, which means that they are not known to occur elsewhere. This water basin is characterized by the constantly changing currents, deep water zones, and annually inundated floodplains, producing high levels of species richness. Yet, habitat destruction, pollution, overfishing, climate change among others are harsh realities and they lean heavily on the ecological health of the seas and oceans. The newly discovered Synodontis species provides an opportunity to understand the susceptible nature of specialized organisms in relation to altered environment. Those physical characteristics that include the use of fast currents, special type of feeding, and other features related with its habitat render it as one of the most sensitive species to disturbance. Things like building dams and changing the channel of rivers hinder the natural form and take away habitats where these species for example, can be found. They split populations of organisms, restrict access to spawn sites and decrease water availability and quality – all of which results in loss of habitats. This means that species although have the ability to undergo developmental changes that are gradual but may affect the species a lot and lead to endangerment or even extinction of species that are ecologically sensitive species. Habu also notes that pollution is a major threat to Congo River Basin in Africa. Water pollution resulting from industrial waste, agricultural drainage or raw sewage increases the risk of aquatic life health. Due to feeding on bottom debris, the new Synodontis species is vulnerable to risks that may be associated with bioaccumulation of toxins in the benthic region. Furthermore, overfishing that is sustained by the locals, as well as by the international market, threatens fish populations. Target-specific and incidental fishing of species like Synodontis, which are food-security fish in most African countries, may lead to declines in stock abundance and disruption of the ecosystem. These threats are further aggravated by climate change, particularly increased temperatures and changes in the timing, amount and intensity of rainfall that affects the rivers. Alterations in water temperature and dissolved oxygen concentration are able to alter the physiology and geographical location of water living organisms. They undergo changes in floodplain management, fluctuating water levels and seasons affecting their breeding and feeding patterns, forcing species to their limits. Conservation measures for the Congo River Basin have to focus on acting toward the protection of habitats, including controlling the pollution of natural resources and the rational use of natural resources. Creation of protected areas and impose restriction measures against habitat degradation is the initial approach necessary for its achievement. Multilateral approach is appropriate crucial because the basin cuts across a number of countries, and therefore there is need to have a harmonized approach to conservation and management. It is also crucial to imply inhabitants into the process because people remain reliant on the river as an essential source of their income. Non-governmental conservation strategies can involve education campaigns and participants in sustainable fishing and pollution fights along with financial and initiative motivators for restoring damaged ecosystems. The two principal processes that are crucial in the conservation of the Bio diversity are research and monitoring. This new Synodontis species proves the existence of the basin and is a clear indication that more research and documentation is needed among this basin. Species-

specific and distribution databases offer considerable information that can inform conservation efforts. Besides, stimulating tourism and other forms of sustainable development might help to secure funding and permanent action towards the aims of protection.

Conclusion

As is so often the case in Africa, the discovery of Synodontis congolensis emphasizes the Congo River Basin as a hotspot for freshwater biodiversity. This new species adds further richness of information concerning the genus Synodontis, but more importantly, as it inhabits one of the most endangered and threatened habitats in Africa, it serves to emphasize the urgent need to protect this habitat. Morphological and genetic analysis provide robust framework for identifying and differentiating the species, while ecological studies show role of the species to riverine ecosystem. Its life history, population dynamics, and interactions with other species have yet to be explored further. The main objective of this research is to understand the topic of A New Species of Synodontis (Mochokidae) from the Congo River Basin with Notes on Its Ecological Adaptations. This understanding proves very helpful for the researchers in their practical experience. The identification and characterization of a new Synodontis species from the Congo River Basin proves that African is potentially rich in freshwater fish species population diversity and this a clear indication of the complexity of the freshwater ecosystem. This species possesses the morphological and ecological characters that allow it to survive in the high energy environment of the Congo River system. These adaptations like feeding structures and body shape that lessen water resistance point to strong interconnection between species and their environment in this complex system. The research prototype maintains importance the Congo River Basin as one of the most biodiverse regions and raises awareness on the necessity of its conservation. The threats due to anthropogenic pressure in the region are rising constantly in the form of habitat destruction, pollution, and overfishing. Stakeholders in the protection of the basin's diverse aquatic species shall engage in research, policy-making and popular intervention. Therefore, this work forms part of the emerging literature in the description of the Congo River's disparate ichthyofauna and can be used as a basis for future works on the environmental functions and conservation requirements for Synodontis and other members of the assemblage. Actually, by presenting such a new species the study does contribute to the broadening of taxonomic information but also points to the need to protect one of the most impending biodiverse water habitats of the Earth.

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