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Identification and Profiling of Risk Factors Associated with Decreased Fish Population and Biodiversity: A Case Study of Kolleru Lake in Andhra Pradesh during 2020 to 2021

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

At the start, we consider the greatest decreases in reproducing populace size that have been seen across a wide scope of animal categories. The essential imperative on such an activity is that these alleged memorable paces of decline will constantly misjudge real decays, since genuine notable populace maxima will have happened well before fishery the executives offices started gathering information on fish overflow. For most fish populaces, dependable quantitative information on overflow have just been accessible for the beyond 2 to thirty years. In this information base, bringing forth stock size, enlistment, gets by the fishery, and fishing mortality, all assessed by the

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public or global organization answerable for the administration of every populace, are accessible for a considerable length of time. Obviously marine fishes have encountered phenomenal downfalls comparative with known memorable levels. These information depend on populaces for which time series reach out something like 10 years, with a mean of 25 years and a limit of 73 years. Taken all in all, the middle greatest populace decline among the 232 populaces for which information are accessible is 83%; well over portion of the populaces (58%) showed most extreme decays of 80% or more. The solid negative slant in the information, and the high middle decrease in overflow, are likewise apparent at lower ordered levels. Among 56 populaces of *clupeids,* 73% experienced notable downfalls of 80% or more. Inside the *Gadidae* and *cod*, of the 70 populaces for which there are information, the greater part declined 80% or more. Furthermore, among 30 *pleuronectid* populaces, 43% displayed declines of 80% or more. These outcomes are sobering for two reasons. To start with, a considerable lot of them have happened notwithstanding a gigantic work to keep them from occurring. Second, as indicated above, they depend on "noteworthy" maxima that are not exactly notable by any means, most fisheries having been well under way many years or hundreds of years before the time series of information started. Without even a trace of longer-term information, analysts' discernments will more often than not scale to time spans that they, or maybe their *folks,* can recall. This outcomes in the "moving benchmark condition", by which researchers acknowledge information from an ever increasing number of late periods as baselines, failing to remember that this permits definitely diminished populaces to fill in for the a lot higher baselines that happened before people started significantly affecting populaces.

Keywords: Identification; risk; decreased; fish; biodiversity; molecular; syndrome.

1. INTRODUCTION

The reason behind most administration methodologies and recuperation plans is that the essential element repressing recuperation is fishing. While this appears to be intelligent, particularly in light of the fact that fishing is generally firmly embroiled in a populace's underlying decay, the help for this thought is shockingly dubious [1-5]. To analyze whether recuperation is emphatically connected to decreases in fishing, examined appraisals of abuse rate (how much fish taken by a fishery corresponding to what is accessible to be taken, including accidental or by get mortality when such information are free) from the Myers data set. Utilizing these assessments, Hutchings determined the proportions of double-dealing rates for every populace 5 years after breakdown to abuse rates in the 5 years before breakdown. Consequently, a decline in a populace's abuse rate after breakdown would yield a proportion not exactly[1] [6]. True to form, populaces recuperated all the more rapidly while fishing mortality declined after breakdown. Populaces got back to a normal of 39% of their prolapse size while fishing mortality declined, contrasted and a normal of just 29% recuperation while fishing mortality stayed steady or expanded [7-10]. Along these lines, apparently a decrease in fishing mortality is for sure vital for recuperation. Shockingly, notwithstanding, the degree to which fishing mortality was decreased after a breakdown had no distinguishable impact on recuperation 5, 10, or after 15 years. This ended up being the case regardless of whether one represented populace contrasts in the greatest potential populace development rate [11][2]. The absence of relationship between decreases in fishing mortality and paces of recuperation 5 years or more after a breakdown ought not be deciphered as proof that diminished fishing has no advantageous impact on recuperation. Obviously, a few populaces have answered well to decreases in fishing mortality, while others have not. Decreases in fishing give off an impression of being vital, however not generally adequate, for recuperation. A few other likely connects of recuperation in marine fishes can be distinguished from the writing and from known or suspected joins between different elements[3].

1. *Balasch Joa.n Carles and Tort Lluís (2019). Netting the Stress Responses in Fish. Frontiers in Endocrinology, 10, 62. DOI: 10.3389/fendo.2019.00062.*
2. *Arzegar, R., Moghaddam, A., Deo, R., Fijani, E. and Tziritis, E. (2018) Mapping Groundwater Contamination Risk of Multiple Aquifers Using a Multi-Model En-semble of Machine Learning Algorithms. Science of the Total Environment, 621C, 697-712.*

[3]. Balasch Joa.n Carles and Tort Lluís (2019). Netting the Stress Responses in Fish. Frontiers in Endocrinology, 10, 62. doi: 10.3389/fendo.2019.00062.

1.1 Profiling of Risk Factors Associated With Decreased Fish Population and Biodiversity

Freshwater conditions are encountering not kidding danger to both biodiversity and biological system dependability and numerous methodologies have been proposed to tackle this emergency (Williams et al., 1989; Warren and Burr, 1994; Cowx, 2002; Suski and Cooke, 2006). Late gauges propose that, around the world, 20% of all freshwater species are wiped out, imperiled or defenceless (Maclean and Jones, 1995; IUCN, 2010). Oceanic biological systems are especially worried by the deficiency of biodiversity (Ricciardi and Rasmussen, 1999; Gibbs 2000; Saunders et al., 2002; Dawson et al., 2003), particularly because of human movement (Pullin, 2000; Abell, 2002). Freshwater fish are perhaps the most compromised scientific classification (Darwall and Vie, 2005; Dudgeon et al., 2006; Sarkar et al., 2008; Schmeller, 2008) in light of their high aversion to the quantitative and subjective changes of amphibian natural surroundings (Oberdorff et al., 2002; Laffaille et al., 2005), restrictions in the physiology, morphology, and life history of species related with ecological limitations (Williams et al., 2003; Skov and Svenning, 2004; Hilbert et al., 2004; Thomas et al., 2004). As a result, they are regularly utilized as bio indicators for the appraisal of water quality, waterway network availability or stream system and a vital component in ecological preparation (Schneiders et al., 1993; Schiemer, 2000; Chovanec et al., 2003; Whitfield et al., 2005). The primary driver are territory obliteration and discontinuity, changing acts of land-use (counting surrender, and heightening of purpose of normal assets) (Chapin et al., 2000; Sala et al., 2000), colorful species presentation, water system necessities, enterprises and private use (Szollosi-Nagy et al., 1998), contamination (Lima-Junior et al., 2006) and worldwide environmental change impacts (Cuizhang et al., 2003; Leveque et al., 2005; Leptez et al., 2009).

To monitor the biodiversity, United Nations announced 2010 to be the International Year of Biodiversity (Martens, 2010). The world is welcome to make a move in 2010 to defend the assortment of life on the planet: biodiversity. (http://www.cbd. int/2010/welcome/). In the Ganga waterway bowl, the existence line of Northern India, modifications in fish variety and local area structure are predominantly due to hydrological adjustments, dam developments, over fishing, contamination, water redirections, changing area use design, fascinating species intrusion, quick sedimentation, deforestation, climatic changes and land disintegration and so forth (Sarkar et al., 2011a; Lakra et al., 2011b). Angles on biodiversity and protection of the ichthyofauna in the Asian area have been generally less reported, in contrast with that of Africa, Europe and North America (Thuy et al., 2006). The riverine environments of India have experienced extreme human intercession bringing about living space misfortune and corruption and as a result, many fish species have become exceptionally imperiled, specific in Ganges bowl where weighty interest is put on freshwaters

1.2 Pattern of Fish Diversity

Ongoing endeavors on fish variety studies in India are being alarming on those waterways which has been made arrangements for interlinking activities in not so distant future. Taking into account that, one of the significant feeder of waterway Yamuna has been concentrated broadly as to its freshwater fish variety and species structure (Lakra et al., 2011b). Correspondingly now, this study presents gauge data on the species structure, overflow and dissemination in a neglected and unimpacted stream in Indian waterway framework that might be vigorously changed by an interlinking venture in not so distant future. The preeminent data on the fish variety of this waterway which portrayed 57 species addressing 42 genera and 20 families addresses a rich animal categories variety in examination with a portion of the Western Ghats (a biodiversity area of interest locale) Rivers and Gomti River of the Gangetic fields (Sarkar et al., 2009) and Betwa stream covering whole stretch in Andhra Pradesh (Lakra et al., 2010; Joshi et al., 2009) yet lesser than revealed by Srivastava (1988) from States of Andhra Pradesh and Tamilnadu, 111 species and 92 species from Central Western Ghats (Bhatt, 2003), 69 species from Northeastern India (Kar et al., 2006) lesser a new report from one more feeder of a stream (Gerua stream, waterway Ganga) in Uttar Pradesh (Sarkar et al., 2007, 2008) 71 species in Chalakudy River, Western Ghat (Raghavan et al., 2008a) however higher than the 46 species depicted from a bird safe-haven in UP. The variety is additionally fairly more than streams of the Western Ghat (a biodiversity area of interest locale) viz. Sharavati (51 species), Aghanashini (52 species), and Kali (53 species) revealed by Bhatt 2019.

2. REVIEW OF LITERATURE

In one more concentrate by Lakes of India (February12, 2022) [4] who utilized multivariate investigation of morphometric information alongside meristic characters to explain the intra- and inter population variety in silver roost, Leiopotherapon plumbeus from three lakes in the Philippines. Bektas and Belduz inspected morphological variety of the Atlantic pony mackerel, trachurus among five different testing areas in Turkey. Lakes Report analyzed morphological inconstancy among three geologically particular Arctic char populaces raised in a typical incubator climate utilizing 27 morphometric factors and the majority of the complete variety was made sense of by the general body power, aspects of the head and caudal peduncle length. Subsequent to controlling for a body size, critical heterogeneity in body shape was found among populaces. These report identified huge morphometric contrasts among the populaces of Mesopotamian Spiny Eel, mastacembelus, while meristic qualities didn't vary in three populaces [12-16].

Balasch Joa.n Carles and Tort Lluís (2019) [5] Techniques for contrasting natural structures range from exemplary verbal and pictorial portrayals, strategies including the following of frameworks arrangements of estimated direct distances between sets of recognizable milestones on a life form and more current techniques including the mathematical areas of tourist spots. Multivariate examination of a bunch of phenotypic characters is viewed as a strong procedure for the assurance of morphological connections between the populaces of an animal groups.

Arzegar, R., Moghaddam, A., Deo, R., Fijani, E. and Tziritis, E. (2018) [6] assessed the morphometric separation among fish populaces by utilizing Truss framework. Cavalcanti et al. (1999) performed Landmark based Morphometric Analysis in Selected Species of *Serranid* Fishes. Fitzgerald (2002) assessed the use of support examination for the measurement of changes in fish condition. Silva (2003) dealt with morphometric variety among sardine (Sardinapilchardus) populaces from the north-eastern Atlantic and the western Mediterranean.

2.1 Objectives of the Study

My study aim is addressed through four research objectives using a variety of exploratory and analytical techniques incorporating both desk and field-based study. These objectives, outlined below:

- To explore, assess and document the fish diversity of Kolleru Lake in Andhra Pradesh.
- To determine the influence of habitat in structuring assemblage of the fishes listed as threatened in Kolleru Lake in Andhra Pradesh.
- Truss based multivariate discrimination of selected species of genus based on morphometric variation Kolleru Lake in Andhra Pradesh.
- To generate the best set of characters for group separation based on multivariate technique Kolleru Lake in Andhra Pradesh.

3. MATERIALS AND METHODS

The essential imperative on such an activity is that these alleged memorable paces of decline will constantly misjudge real decays, since genuine notable populace maxima will have happened well before fishery the executives offices started gathering information on fish overflow. For most fish populaces, dependable quantitative information on overflow have just been accessible for the beyond 2 to thirty years. One incredibly helpful information base in such manner has been kept up. In this information base, bringing forth stock size, enlistment, gets by the fishery, and fishing mortality, all assessed by the public or global organization answerable for the administration of every populace, are accessible for a considerable length of time. Obviously marine fishes have encountered phenomenal downfalls comparative with known memorable levels.

4. RESULTS AND DISCUSSION

The Kolleru Lake is one of the very important freshwater lakes and National wetlands of India.

[4] *Report of Lakes in India (February12, 2022)*
[5] *Balasch Joa.n Carles and Tort Lluís (2019). Netting the Stress Responses in Fish. Frontiers in Endocrinology, 10, 62. doi: 10.3389/fendo.2019.00062*
[6] *Arzegar, R., Moghaddam, A., Deo, R., Fijani, E. and Tziritis, E. (2018) Mapping Groundwater Contamination Risk of Multiple Aquifers Using a Multi-Model En-semble of Machine Learning Algorithms. Science of the Total Environment, 621C, 697-712. https://doi.org/10.1016/j.scitotenv.2017.11.185*

Many riverine important edible fishes utilize this wetland for their breeding grounds. The presence of ***juvenile*** specimens of almost all the fishes especially the carps in this lake indicates that these fishes use this water body as their spawning grounds. Since this lake is distantly connected with the Kolleru Lake through river often some marine fishes are also found in the fish ***fauna*** of this lake. Among the important commercial fishes of this lake ***Anabas*** above mentioned families are abundantly found throughout the year. This lake also has been found to contain 13 endemic species of our Lake. This species is found only in the two important south Indian waters of the Godavari and Krishna.

The similarity in species composition among different sampling sites of the river was analysed for calculating the extent of similarity between pairs of data sets. In river, the similarity in species composition in Thirteen verities is shown as an if fish family's. Here, we observed greatest similarity between sites (I to XIII Family's). The evenness index was calculated between the rivers to express how evenly the individuals are distributed among the different species (Table .2). The evenness index varied from 11% to 16%, the highest evenness index was found at site Ist family, while the lowest was found at XIII.

Table 1. Profiling of Risk Factors Associated with Decreased Fish Population in Kolleru Lake in Andhra Pradesh during the year of December, 2020 to December, 2021

S.No	Family Angillidae	Account of the Fishes of the Koleru Lake	Percent of Fishes of the Koleru Lake
1	Family I	Clupeidae	14 (14%)
2	Family II	Notopteridae	12 (12%)
3	Family III	Crprinidae	10 (10%)
4	Family IV	Cobitidae	09 (09%)
5	Family V	Bagridae	09 (0.9%)
6	Family VI	Siluridae	07 (07%)
7	Family VII	Schilbeidae	08 (08%)
8	Family VIII	Claridae	06 (06%)
9	Family IX	Heteropneustidae	06 (06%)
10	Family X	Belonidae	05 (0.5%)
11	Family XI	Cyprinodontidae	04 (04%)
12	Family XII	Channidae	05 (05%)
13	Family XIII	Synbranchidae	05 (05%)
Total			100 (100%)

Source: Primary Data

Table 2. Indices of Diversity Biodiversity in Kolleru Lake in Andhra Pradesh, during the year of December, 2020 to December, 2021

S.No	Family of Diversity Biodiversity in Kolleru Lake in Andhra Pradesh	Total Species	% of species
1	Family I in Kolleru Lake Biodiversity Species In Andhra Pradesh	Clupeidae	16 (16%)
2	Family II in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Notopteridae	15 (15%)
3	Family III in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Crprinidae	14 (14%)
4	Family IV in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Cobitidae	14 (14%)
5	Family V in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Bagridae	13 (13%)
6	Family VI in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Siluridae	12 (12%)
7	Family VII in Kolleru Lake Species of Biodiversity Species In Andhra Pradesh	Schilbeidae	12 (12%)
8	Family VIII in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Clariidae	13 (13%)
9	Family IX in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Heteropneustidae	14 (14%)
10	Family X in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Belonidae	14 (14%)
11	Family XI in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Cyprinodontidae	12 (12%)
12	Family XII in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Channidae	12 (12%)
13	Family XIII in Kolleru Lake Species Biodiversity Species In Andhra Pradesh	Synbranchidae	11 (11%)
Total			100 (100%)

Source: Primary Data

4.1 My Study Proposes the Following Remedies to Preserve Freshwater Biodiversity

- Ensuring that Kolleru Lake have the water that they need, when they need it to help local sea-going networks and at the same time meet fundamental human necessities.
- Improving water quality through a guarantee to diminishing toxins at their source, advancing the utilization of nature as a channel, and putting resources into adequate wastewater treatment.
- Protecting and reestablishing basic territories in manners that perceive the exceptional elements of freshwater frameworks as well as their coordination inside bigger scenes.
- Managing abuse of freshwater species as well as extraction of sand and rock through better guideline and implementation.

5. CONCLUSIONS

The proposed waterway connecting venture of India is a most aggressive arrangement. There is need to imagine numerous important issues of the feasible oceanic biodiversity protection of the fish fauna of the Kolleru Lake. The ideas like water and amphibian asset protection, best guideline of existing offices, water reaping, watershed and stream bowl the executives, water reuse and so on will keep on being profoundly applicable will be a significant enhancement to this (Jain et al. 2005). The overall model recommends that it is unobtrusively challenging to foresee definitively whether the execution of proposed interlinking ventures will be gainful or unsafe to nature and normal assets, involves banter. The suitable current innovation and conditions should be followed in view of the natural prerequisites/conduct of fishes and other sea-going life forms with their resilience limit. In the

current review the standard data on the situation with variety, species creation, overflow, lavishness, conveyance, ID of need living space qualities of the waterway would assist with consolidating sufficient control measure on the antagonistic impacts from the venture arranging stage to different progressive phases and could be valuable to evaluate the degree of species and environment change/misfortune in the wake of interlinking of Koleru streams. It is normal that this study will be useful for dynamic apparatus for the appraisal of variables connected with proposed interlinking and protection and the executives of fish, nature and biodiversity [17-21]. Today, many freshwater fish are near termination in India. Upkeep of freshwater fish biodiversity is a basic trial of whether water use and environment changes are maintainable. A large number of the basic biodiversity rich regions are now profiting from purposeful endeavour's to ration their risked freshwater life. The review introduced here contends that deliberate endeavour's to safeguard the key watershed regions in freshwater reverine regions will make a critical commitment to the protection of the India's freshwater biodiversity. The biodiversity situation in the present status which are profiled here, offer numerous chances to safeguard the rich freshwater fish biodiversity [22-28]. Achievement will rely upon the degree to which progressives, water commissions, organizations, and districts work agreeably in these spots to keep up with or re-establish regular water environments of the freshwater assets. To safeguard freshwater species and frameworks, there is a dire need to counter the dangers that risk their endurance.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Abdel-Tawwab M, Mohamed N. Monier, Seyed Hossein Hoseinifar, Caterina Faggio. Fish response to hypoxia stress: growth, physiological, and immunological biomarkers Fish Physiol Biochem; 2019. DOI:https://doi.org/10.1007/s10695-019-00614-9
2. Barat A, PrabhatiKumariSahoo, Rohit Kumar, Chirag Goel, Atul Kumar Singh. Transcriptional response to heat shock in liver of snow trout (*Schizothorax richardsonii*) a vulnerable Himalayan Cyprinid fish. Funct Integer Genomics; 2016. DOI 10.1007/s10142-016-0477-0
3. Barman RP. The fishes of the Kolleru Lake, Andhra Pradesh, India with comments on their conservation rec. Zool. Surv. India. 2004;103(1-2):83-89.
4. Davidson NC. How much wetland the world lost? Long-term and recent trends in global wetland area. Marine and Freshwater Research. 2014;65(10):934–941.
5. Eissa N, Wang H-P. Transcriptional stress responses to environmental and husbandry stressors in aquaculture species. Reviews in Aquaculture. 2016; 8:61–88.
6. Balasch Joa.n Carles, Tort Lluís. Netting the stress responses in Fish. Frontiers in Endocrinology. 2019;10:62. DOI: 10.3389/fendo.2019.00062.
7. FAO. The State of World Fisheries and Aquaculture 2018 – Meeting the Sustainable Development Goals. The State of World Fisheries and Aquaculture. Food and Agriculture Organization of the United Nations, Rome; 2018.
8. Faught E, Aluru N, Vijayan MM. The molecular stress response. In Fish Physiology - Biology of Stress in Fish, (eds. C. B. Schreck, L. Tort, A. P. Farrell and C. J. Brauner), San Diego, CA: Academic Press. 2016;35.
9. Froese R, Pauly D. (Eds), FishBase. World Wide Web Electronic Publication; 2009. Available:http://www.fishbase.org, version (last accessed on 10 December 2010).
10. Gupta BK, Sarkar UK, Bhardwaj SK. Assessment of habitat quality with relation to fish assemblages in an impacted river of the Ganges basin, northern India. Environmentalist. 2012;32(1):35-47.
11. Arzegar R, Moghaddam A, Deo R, Fijani E, Tziritis E. Mapping groundwater contamination risk of multiple aquifers using a multi-model en-semble of machine learning algorithms. Science of the Total Environment. 2018;621C:697-712. DOI:https://doi.org/10.1016/j.scitotenv.2017.11.185
12. Galat DL, Zweimuller I. Conservation large-river fishes: is the highway analogy an appropriate paradigm? J. N. Am. Benthol. Soc. 2001;20:266-279.
13. Hassan Z, Shah AJ, Kanth AT, Pandit KA. Land use/land cover on the water

chemistry of Wular Lake in Kashmir Himalaya India; 2015.
DOI: 10.1186/s13717-015-0035-z.

14. Hu SH, Qi CX, Wu et al. Preliminary assessment of heavy metal contamination in surface water and sediments from Honghu Lake, East Central China. Frontiers of Earth Science. 2012;6(1): 39–47.
15. Ikhane PR, Akintola AI, Bankole SI, Oyebolu OO, Ogunlana EO. Granulometric analysis and heavy mineral studies of the sandstone facies exposed near Igbile, southwestern Nigeria. International Research Journal of Geology and Mining. IRJGM 2276-6618. 2013;34:158-178.
16. IUCN. IUCN Red List of Threatened Species. Gland, Switzerland and Cambridge, UK: IUCN; 2002.
Available:http://www.iucnredlist.org
17. James V, Morrow, Jr, Fischenich C. Habitat requirements for freshwater fishes. ERDC TN-EMRRP-SR-06. 2000;1-14.
18. Karaoglu H, Belduz AO. Multivariate discrimination among three Trachurus species from Turkey. Journal of Animal and Veterinary Advances. 2011;10(1):121-127.
19. Kar D, Barbhuiya MH. Abundance and diversity of zooplankton in Chatla Haor, a floodplain wetland in Cachar district of Assam. Environ. Ecol. 2004;22(1):247-248. Report of Lakes in India (February12, 2022)
20. Lakra WS, Sarkar UK. NBFGR-Marching ahead in cataloguing and conserving fish genetic resources of India. Fish. Chimes. 2010;30(1):102-107.
21. Locke S, Mclaughlin J, Marcogliese D. DNA barcodes show cryptic diversity and a potential physiological basis for host specificity among Diplostomoidea (Platyhelminthes: Digenea) parasitizing freshwater fishes in the St. Lawrence River, Canada. Mol. Ecol. 2010;19:2813–2827.
22. Mekkawy IAA, Mohammad AS. Morphometrics and Meristics of the three Epinepheline species: Cephalopholis argus (Bloch and Schneider, 1801), Cephalopholis miniata (Forsskal, 1775) and Variola touti (Forsskal, 1775) from the Red Sea, Egypt. J. Biol. Scie. 2011;11 (1):10-21.
23. Singh AK, Pathak AK, Lakra WS. Invasion of an exotic fish Common Carp, Cyprinus Carpio L. (Actinopterygi: Cypriniformes: Cyprinidae) In the Ganga River, India and its Impacts. Act. Icthyol. Piscat. 2010; 40(1):11-19.
24. Sen N. Studies on the systemetics, distribution and ecology of the Ichthyofauna of Meghalaya and their bearing on the fish and fisheries of the state. Ph D Thesis, University of Gauhati, Assam, pp 576. Tuya, F, Wernberg, T. and Thomsen, M.S, (2009) Habitat structure affects abundances of labrid fishes across temperate reefs in south-western Australia. Environ. Biol. Fish. 1982;86:311–319.
25. Turak E, Linke S. Freshwater conservation planning: an introduction. Freshw. Biol. 2011;56:1–5.
26. Umamaheswari S, Saravanan NA. Water quality of Cauvery River basin in Trichirappalli, India. Int. J. Lakes Rivers. 2009;2(1):1-20.
27. Vishwanath W, Lakra WS, Sarkar UK. Fishes of North East India.Published by National Bureau of Fish Genetic Resources, Lucknow; 2007. ISBN, 978-81-905540-1-5.
28. Vishwanath W, Linthoingambi I. A new sisorid catfish of the genus Glyptothorax Blyth from Manipur, India. J. Bombay Nat. Hist. Soc. 2006;102:201–203.

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