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Freshwater fishes of the Chimmony Wildlife Sanctuary, Western Ghats, India

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Abstract: The fish diversity of Chimmony Wildlife Sanctuary in the Western Ghats of Kerala was studied between January 2018 and December 2020. The ichthyofauna comprised of 40 species belonging to 11 Orders, 17 Families, and 29 genera, of which 35% are endemic to the Western Ghats region, and two are endemic to the state of Kerala. Cyprinids were the most dominant family, represented by 19 species belonging to three genera, followed by family Channidae (3 species) and loaches belonging to the family Nemacheilidae (3 species). Of the 40 species, one (Mesonemachellus herrei) belonged to the ‘Critically Endangered’ (CR), one species is listed as ‘Vulnerable’ (VU), and four ‘Near Threatened’ (NT) category and on the IUCN Red List. Results are presented in the form of a primary checklist of the freshwater fish fauna of the Chimmony Wildlife Sanctuary, together with remarks on their threats and conservation requirements.

Keywords: Checklist, diversity, endemic species, ichthyofauna, Kerala.
INTRODUCTION

India’s Western Ghats mountain ranges feature a high level of ecological variety and endemicity in terrestrial fauna, and are listed as a global biodiversity hotspot (Myers et al. 2000). Around 320 species belonging to 11 orders, 35 families, and 112 genera are known from this region, of which more than 60% are endemic (Dahanukar & Raghavan 2013). The Chimmony Wildlife Sanctuary (Chimmony WS) covering a catchment area of 85.06 km² is an IUCN category IV protected area located on the western slopes of the Nelliampathi Hills in Thrissur district of Kerala, India (IUCN 2020). This protected area falls between 10.38° & 10.48° N and 76.43° & 76.55° E (Figure 1). The sanctuary, which is bordered on the east by the Parambikulam Wildlife Sanctuary and on the west by the Peechi-Vazhani Wildlife Sanctuary, was established as a wildlife sanctuary in August 1984.

The vegetation of Chimmony WS comprises a mix of evergreen, damp teak, and wet mixed deciduous trees and except the watershed area, the whole area is considered as a core zone of the sanctuary (Thomas et al. 2000a). The Chimmony Dam on the Chimmony River provides means of subsistence fishing from the reservoir, specially permitted to tribal communities. Much research has been conducted on the fish fauna of Kerala’s wildlife sanctuaries and reserved forests, including the Aralam WS (Shaji et al. 1995), Neyyar WS, Idukki WS (Thomas et al. 2000b), Parambikulam WS (Biju et al. 1999), Karimpuzha WS (Baby et al. 2010), Periyar Tiger Reserve (Radhakrishnan & Kurup 2010), and Achankovil Reserve Forest (Baby et al. 2011). Thampy et al. (2021) recorded a total of 136 fish species belonging to 13 orders, 29 families and 69 genera from the upper-catchment of Kabini River in Wayanad, an indication of high diversity of upper catchment areas of Kerala Rivers.

The only previous study of ichthyodiversity and fishery resources of Chimmony WS is that of Thomas et al. (2000a), conducted by visiting two sites within the sanctuary. A thorough exploratory study of the protected area’s freshwater habitats covering all seasons would reveal a more comprehensive assessment of fish diversity and abundance in the area, and this was the aim of the present study. Identification of major threats to fish fauna and providing suggestions on suitable conservation strategies were the other main objectives.

MATERIALS AND METHODS

Based on elevation gradients and topographical variations of the habitat, sampling was carried out from 23 sampling sites of Chimmony WS (Fig. 1; Table 1). To understand the seasonal variation, sampling was carried out during pre-monsoon, monsoon, and post monsoon periods from January 2018 to December 2020. Gillnets, cast nets, and scoop nets with different mesh sizes were operated for catching fish from all sampling sites. Personal expertise of tribal fishermen was utilised in fishing gear selection and sample collection methodology. All the fish caught were identified and photographed live. Specimens collected through a detailed survey of the reservoir’s...
tribal fishery were supplemented. Fish samples were fixed in 5% formaldehyde, and those for genetic analysis were directly fixed in 99% ethanol. Fish identification was confirmed using the available literature (Jayaram 1981, 1999). Voucher specimens were deposited in the Department of Fisheries Resource Management, Kerala University of Fisheries and Ocean studies, Kochi, Kerala, India. Checklist of fishes collected during the present study was prepared following Nelson et al. (2016) and Fricke et al. (2021). Personal interviews and discussions with focus groups including field staff of the Kerala State Forest and Wildlife Department and tribal fishermen were conducted to understand the changes that took place in the habitat and abundance of fishes. Views of tribal fishermen regarding the present threats to the system were recorded to understand the status of diversity of the wildlife sanctuary.

### RESULTS

A total of 40 fish species belonging to 10 orders, 17 families, and 26 genera were recorded from the Chimmony WS, with results presented in Table 2. Order Cypriniformes dominated with 19 species (47 %) under three families (Cyprinidae, Nemacheilidae, Cobitidae), followed by Siluriformes (10%) and Anabantiformes (10%) with four species each. IUCN status and population trend of species recorded are shown in Table 2. A majority of fish species found in the study region are classified as ‘Least Concern’ (IUCN 2020) as per IUCN Red List of Threatened Species. However, one species Mesonemacheilus herrei has been listed as ‘Critically Endangered’ (CR), one species is listed as ‘Vulnerable’ (VU), and four as ‘Near Threatened’ (NT). Additionally, one species was listed as ‘Data deficient’ (DD) (Figure 2), and two species Oreochromis niloticus and Gibelion catla were exotic. According to the IUCN Red List, the population trend for Mesonemacheilus herrei, Aplocheilus lineatus, and Clarias dussumieri is known to be decreasing, while the population trend for an additional 11 species are stable. The population trend for the other species recorded from the wildlife sanctuary is currently not known (Figure 3). Species richness of the study area was inversely proportional to the elevation of the sampling site.

Garra mullya was recorded from all the sampling sites, but loaches and Garra mullya were the only fish species recorded from habitats situated at an elevation above 700 m (Figure 4). Out of the 40 species, 36 were recorded from the elevation below 300 m. Dawkinsia filamentosa, Channa gachua, Garra mullya, Devario malabaricus, Haludaria melanampyx, Rasbora dandia, Mesonemacheilus triangularis, Mystus armatus, and Ompok malabaricus were distributed throughout the Chimmony WS other than high elevation sites.

### Table 1. Sampling sites, their co-ordinates, and elevation.

| Sampling sites  | Longitude (°E) | Latitude (°N) | Elevation (m) |
|-----------------|----------------|---------------|---------------|
| Cheenikuzhi     | 76.2716        | 10.2805       | 550           |
| Ponmudi         | 76.2817        | 10.2824       | 444           |
| Virakuthodu     | 76.2758        | 10.2743       | 90            |
| Nellipara       | 76.2836        | 10.2751       | 168           |
| Mukkomkodal     | 76.2818        | 10.2732       | 165           |
| Kodakkallu      | 76.2954        | 10.2716       | 142           |
| Thekkallu       | 76.2948        | 10.2753       | 322           |
| Vedivachankallu | 76.2858        | 10.2818       | 527           |
| Mangalamkavu    | 76.2918        | 10.283        | 566           |
| Anaporu         | 76.3005        | 10.2702       | 118           |
| Moongamadu      | 76.3057        | 10.2748       | 435           |
| Veerimudi       | 76.3117        | 10.2701       | 419           |
| Mulapara        | 76.3041        | 10.2614       | 157           |
| Muramadukuthu   | 76.3145        | 10.2622       | 669           |
| Chaurala        | 76.315         | 10.2519       | 333           |
| Karimadakallu   | 76.3247        | 10.2619       | 752           |
| Payamapara      | 76.3021        | 10.2556       | 121           |
| Karandanpara    | 76.3044        | 10.2535       | 239           |
| Pundimudi       | 76.3122        | 10.2452       | 404           |
| Kalichembara    | 76.2951        | 10.2532       | 80            |
| Pandipetti      | 76.3041        | 10.245         | 429           |
| Poormala        | 76.2927        | 10.2508       | 297           |
| Ettakombannala  | 76.2811        | 10.2519       | 232           |

Figure 2. IUCN Red List threat status of fish collected from Chimmony Wildlife Sanctuary.
Table 2: List of fish collected from Chimmony Wildlife Sanctuary and their IUCN status, population trend and distribution at different sampling sites.

| Order/family | Scientific name | Authority | IUCN Red List status | Sampling sites | Elevation range | Population trend | Voucher no. |
|--------------|-----------------|-----------|----------------------|----------------|-----------------|------------------|-------------|
| Anabantiformes | | | | | | | |
| Anabantidae | Anabas testudineus | Bloch, 1792 | LC | 10,17,20 | 80–120 | Stable | KUFOS.FV.2019.1002 |
| Channidae | Channa gachua | Hamilton, 1822 | LC | 3,4,5,6,7,10,12,13,15,18,20,22,23 | 80–450 | Unknown | KUFOS.FV.2019.1007 |
| | Channa striata | Bloch, 1793 | LC | 17,20 | 80–120 | Stable | KUFOS.FV.2019.1009 |
| | Channa pseudomarulius | Hamilton, 1822 | LC | 20 | 80 | Unknown | KUFOS.FV.2019.1008 |
| Anguilliformes | | | | | | | |
| Anguillidae | Anguilla bengalensis | Gray, 1831 | NT | 5,10,17,18 | 80–240 | Unknown | KUFOS.FV.2019.1003 |
| | Anguilla bicolor | McClelland, 1844 | NT | 5,13,22 | 150–310 | Unknown | KUFOS.FV.2019.1004 |
| Beloniformes | | | | | | | |
| Belonidae | Xenentodon cancila | Hamilton, 1822 | LC | 17,20 | 80–120 | Unknown | KUFOS.FV.2019.1040 |
| Cichliformes | | | | | | | |
| Cichlidae | Pseudetroplus maculatus | Bloch, 1795 | LC | 10,13,17,20 | 80–160 | Stable | KUFOS.FV.2019.1033 |
| | Oreochromis niloticus | Linnaeus, 1758 | LC | 17 | 120 | Unknown | KUFOS.FV.2019.1029 |
| Clupeiformes | | | | | | | |
| Clupeidae | Dayella malabarica | Day, 1873 | LC | 10,13,17,20 | 80–150 | Unknown | KUFOS.FV.2019.1013 |
| Cypriniformes | | | | | | | |
| Cobitidae | Lepidocephalichthys thermalis | Valenciennes, 1846 | LC | 3,5,6,10,13,17,18,20 | 80–250 | Stable | KUFOS.FV.2019.1021 |
| Cyprinidae | Amblypharyngodon meleagris | Valenciennes, 1844 | LC | 10,13,17,20 | 80–150 | Unknown | KUFOS.FV.2019.1001 |
| | Gibelion catla | Hamilton, 1822 | LC | 17 | 120 | Unknown | KUFOS.FV.2019.1020 |
| | Cyprinus carpio | Linnaeus, 1758 | LC | 10,20 | 80–120 | Unknown | KUFOS.FV.2019.1018 |
| | Labeo dussumieri | Valenciennes, 1842 | LC | 3,5,6,10,13,17,18,20,22,23 | 80–165 | Unknown | KUFOS.FV.2019.1012 |
| | Dawkinsia filamentosa | Valenciennes, 1844 | LC | 3,5,6,10,13,17,18,20,22,23 | 80–150 | Stable | KUFOS.FV.2019.1014 |
| | Devario malabaricus | Jerdon, 1849 | LC | 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23 | 80–750 | Stable | KUFOS.FV.2019.1015 |
| | Garra mulya | Sykes, 1839 | LC | 3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23 | 80–450 | Stable | KUFOS.FV.2019.1015 |
| | Hypseleotris kraloi | Menon & Rema Devi, 1995 | LC | 17 | 120 | Unknown | KUFOS.FV.2019.1019 |
| | Haludaria melanampyx | Jerdon, 1849 | LC | 3,5,6,7,10,12,13,15,17,18,20,22,23 | 80–420 | Unknown | KUFOS.FV.2019.1017 |
| | Pethia punctata | Day, 1865 | LC | 3,5,6,10,13,17,20,22 | 80–150 | Stable | KUFOS.FV.2019.1032 |
| | Puntius mahecola | Valenciennes, 1844 | LC | 5,6,10,13,18,20,22 | 80–150 | Unknown | KUFOS.FV.2019.1035 |
| | Puntius parrah | Day, 1865 | LC | 10,13,17,20 | 80–150 | Unknown | KUFOS.FV.2019.1036 |
| | Puntius vittatus | Day, 1865 | LC | 3,10,13,17,20 | 80–150 | Unknown | KUFOS.FV.2019.1037 |
| Family                      | Genus                                | Species                     | Status | IUCN Code | KUFOS.FV.2019.1038 |
|-----------------------------|--------------------------------------|-----------------------------|--------|-----------|--------------------|
| Rasbora dandia              | Valenciennes, 1844                   |                            | LC     | 3,5,6,7,10,12,13,15,17,18,20,22,23 | 80–420   Stable     |
| Systemus sarana             | Hamilton, 1822                       |                            | LC     | 3,5,6,10,13,17,18,20,22,23     | 80–300   Unknown   |
| Nemacheilidae               | Mesonoemacheilus herrei               | Naibant & Banarescu, 1982  | CR     | 11,12,14,15,16,19               | 400–750 Decreasing |
| Mesonoemacheilus triangulans| Day, 1865                            |                            | LC     | 1,2,4,7,8,9,11,12,14,15,16,18,19,20,21 | 80–750   Stable     |
| Mesonoemacheilus guentheri  | Day, 1865                            |                            | LC     | 1,2,4,9,11,12,14,15,16,19,21   | 150–750  Stable     |

**Cyprinodontiformes**

| Family                      | Genus                                | Species                     | Status | IUCN Code | KUFOS.FV.2019.1038 |
|-----------------------------|--------------------------------------|-----------------------------|--------|-----------|--------------------|
| Aplochelidae                | Aplochelius lineatus                 | Valenciennes, 1846          | LC     | 5,10,17,18,20                           | 80–160   Decreasing |
| Gobiformes                  | Aplochelus blockii                   | Arnold, 1911                | LC     | 5,17,18                                        | 80–160   Unknown   |
| Gobidae                     | Glossogobius giuris                  | Hamilton, 1822              | LC     | 3,5,10,17,18,20                           | 80–230   Unknown   |
| Oxudercidae                 | Pseudogobiopsis oligactis            | Bleeker, 1875               | LC     | 10,13,17,20                                   | 80–160   Unknown   |

**Incertae sedis under Ovalenteria**

| Family                      | Genus                                | Species                     | Status | IUCN Code | KUFOS.FV.2019.1038 |
|-----------------------------|--------------------------------------|-----------------------------|--------|-----------|--------------------|
| Ambassidae                  | Parambassis dayi                     | Bleeker, 1874               | LC     | 3,5,10,17,18,20                           | 80–160   Stable     |
| Parambassis thomassi        | Day, 1870                           |                            | LC     | 3,5,6,10,13,17,18,20,22                   | 80–150   Unknown   |

**Siluriformes**

| Family                      | Genus                                | Species                     | Status | IUCN Code | KUFOS.FV.2019.1038 |
|-----------------------------|--------------------------------------|-----------------------------|--------|-----------|--------------------|
| Bagridae                    | Mystus armatus                       | Day, 1865                   | LC     | 3,5,6,10,13,15,17,18,20,22,23             | 80–350   Unknown   |
| Mystus malabaricus          | Jerdon, 1849                        |                            | NT     | 3,13,17,20,22                              | 80–160   Unknown   |
| Claridae                    | Clarias dussumieri                   | Valenciennes, 1840          | NT     | 10,13,17,20                                   | 80–150   Decreasing |
| Siluridae                   | Ompok malabaricus                   | Valenciennes, 1840          | LC     | 3,4,5,6,10,12,13,15,17,18,20,22,23         | 80–420   Unknown   |

**Synbranchiformes**

| Family                      | Genus                                | Species                     | Status | IUCN Code | KUFOS.FV.2019.1038 |
|-----------------------------|--------------------------------------|-----------------------------|--------|-----------|--------------------|
| Mastacembelidae             | Mastacembelus armatus                | Lacepede, 1800              | LC     | 5,10,17,18                                  | 120–250  Stable     |

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**DISCUSSION**

Results of the present study revealed the existence of 40 species within the Chimmony WS (Table 2). Thomas et al. (2000a) examined the fish diversity of Chimmony and Peechi WS, and recorded 37 species, with Chimmony WS harbouring 34 species belonging to 15 families, whereas Peechi Wildlife Sanctuary had 33 species belonging to 15 families. Their research was conducted by visiting only two sites within Chimmony WS. The present study carried out a thorough exploratory survey of the protected area’s freshwater habitats over multiple seasons to better assess fish diversity and abundance, and our findings indicate that the ichthyo-diversity of Chimmony WS is somewhat greater than previously reported.

A comparative statement of the results of studies on
Image 9. *Haludaria melanampyx*

Image 10. *Hypselobarbus kurali*

Image 11. *Lepidocephalichthys thermalis*

Image 12. *Mastacembelus armatus*

Image 13. *Mesonoemacheilus guentheri*

Image 14. *Mesonoemacheilus triangularis*

Image 15. *Mystus armatus*

Image 16. *Pethia punctata*

Image 17. *Pseudetroplus maculatus*
Figure 4. Elevation based fish species richness in Chimmony Wildlife Sanctuary.
Table 3. Studies on fish fauna of Kerala’s wildlife sanctuaries and reserved forests.

| Area of study                   | Number of species recorded | Author                      |
|--------------------------------|----------------------------|-----------------------------|
| Aralam Wildlife Sanctuary      | 33                         | Shaji et al. 1995           |
| Neyyar Wildlife Sanctuary      | 38                         | Thomas et al. 2000b         |
| Parambikulam Wildlife Sanctuary| 40                         | Biju et al. 1999            |
| Idukki Wildlife Sanctuary      | 40                         | Thomas et al. 2000b         |
| Karimpuzha Wildlife Sanctuary  | 43                         | Baby et al. 2010            |
| Achankovil Reserve Forest      | 46                         | Baby et al. 2011            |
| Periyar Tiger Reserve          | 54                         | Radhakrishnan & Kurup 2010  |
| Chimmony Wildlife Sanctuary    | 40                         | Present study               |

The fish fauna of Kerala’s wildlife sanctuaries and reserved forests is presented in Table 3. The results of the present study are in agreement with findings of the earlier studies conducted on the fish fauna of Kerala’s wildlife sanctuaries and reserved forests. Baby et al. (2010), Radhakrishnan & Kurup (2010), and Baby et al. (2011) recorded higher numbers of species than the present study. This indicates that topography habitats, elevation of sites and differences in hydrological parameters and vegetation play major roles in the distribution and abundance of fish in the upper reaches of the river.

Present study collected information on the habitat, ichthyofauna and fishery of the Chimmony WS, and the compiled results of responses indicate that illegal fishing methods practiced in the area will have harmful effects on habitat and ichthyofauna diversity. The Kerala State Forest Department has banned fishing inside the sanctuary’s limits, but illegal fishing in the upper reaches of the river is still prevalent and destructive fishing practices pose a major threat to the sanctuary’s fish diversity. Indiscriminate capture of adult individuals during their yearly spawning migration (locally known as ‘Ootha’) is another illegal practice that has drastic effects on the fish population. Stream bank alteration and loss of riparian vegetation due to human-induced disturbance and local firewood collection resulted in deterioration of habitat. Most protected area staff working with the forest department were not familiar with freshwater habitats, ichthyofaunal diversity and the concept of conservation of fishery resources. Preliminary training of forest staff on ichthyofaunal diversity, sustainable fisheries and informed habitat management is needed. Comprehensive multi-disciplinary research, outreach and capacity building of the diversity, distribution, ecology, and threats to fish and other aquatic species inhabiting in the Chimmony WS is also highly recommended.

REFERENCES

Baby, F., J. Tharian, A. Ali & R. Raghavan (2010). A checklist of freshwater fishes of the New Amarambalam Reserve Forest (NARF), Kerala, India. Journal of Threatened Taxa 2(12): 1330–1333. https://doi.org/10.11609/jott.o2497.1330-3
Baby, F., J. Tharian, S. Philip, A. Ali & R. Raghavan (2011). Checklist of the fishes of the Achankovil forests, Kerala, India with notes on the range extension of an endemic cyprinid Puntius chalakkudiensis. Journal of Threatened Taxa 3(7): 1936–1941. https://doi.org/10.11609/jott.o2674.1936-41
Biju, C.R., K.R. Thomas & C.R. Ajithkumar (1999). Fishes of Parambikulam Wildlife Sanctuary, Palakkad District, Kerala. India. Journal of the Bombay Natural History Society 96: 82–87.
Dahanukar, N. & R. Raghavan (2013). Freshwater fishes of Western Ghats: Checklist MIN-Newsletter of IUCN SSC/WI, FFCSA 1: 6–16.
Fricke, R., W.N. Eschmeyer & R. van der Laan (eds) (2020). Eschmeyer’s catalogue of fishes: genera, species, references. http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp. Electronic version accessed on 02 August 2021.
IUCN (2020). The IUCN Red List of Threatened Species. Version 2015.1. <http://www.iucnredlist.org>. Downloaded on 26.04.2020.
Jayaram, K.C. (1981). Freshwater Fishes of India - A Handbook. Zoological survey of India, Calcutta, 482 pp.
Jayaram, K.C. (1999). The Freshwater Fishes of the Indian Region. Narendra Publishing House, New Delhi, xxvi+ 551 pp.
Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca & J. Kent (2000). Biodiversity hotspots for conservation priorities. Nature 403(6772): 853–858. https://doi.org/10.1038/35002501
Nelson, J., T. Grande & M. Wilson (2016). Fishes of the World, fifth edition. John Wiley & Sons, Hoboken, New Jersey, xlii+707 pp. https://doi.org/10.1002/9781119174844
Radhakrishnan, K.V. & B.M. Kurup (2010). Ichthyodiversity of Periyar Tiger Reserve, Kerala, India. Journal of Threatened Taxa 2(10): 1192–1198. https://doi.org/10.11609/jott.o2350.1192-8
Shaji, C.P., P.S. Easa & S.C. Basha (1995). Fresh water fish diversity in Aralam Wildlife Sanctuary, Kerala, South India. Journal of the Bombay Natural History Society 92: 360–363.
Thampy, D.R., M.R. Sethu, M.B. Paul & C.P. Shaji (2021). Ichthyofaunal diversity in the upper-catchment of Kabini River in Wayanad part of Western Ghats, India. Journal of Threatened Taxa 13(2): 17651–17669. https://doi.org/10.11609/jott.o6159.13.2.17651-17669
Thomas, K.R., C.R. Biju & C.R. Ajithkumar (2000a). Fishes of Chimmony and Pechi-Vazhani wildlife sanctuaries, Kerala, India. Journal of the Bombay Natural History Society 97: 289–292.
Thomas, K.R., C.R. Biju & C.R. Ajithkumar (2000b). Fish fauna of Idukki and Neyyar wildlife sanctuaries, Southern Kerala, India. Journal of the Bombay Natural History Society 97: 443–446.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca & J. Kent (2000). Biodiversity hotspots for conservation priorities. Nature 403(6772): 853–858. https://doi.org/10.1038/35002501
Nelson, J., T. Grande & M. Wilson (2016). Fishes of the World, fifth edition. John Wiley & Sons, Hoboken, New Jersey, xlii+707 pp. https://doi.org/10.1002/9781119174844
Radhakrishnan, K.V. & B.M. Kurup (2010). Ichthyodiversity of Periyar Tiger Reserve, Kerala, India. Journal of Threatened Taxa 2(10): 1192–1198. https://doi.org/10.11609/jott.o2350.1192-8
Shaji, C.P., P.S. Easa & S.C. Basha (1995). Fresh water fish diversity in Aralam Wildlife Sanctuary, Kerala, South India. Journal of the Bombay Natural History Society 92: 360–363.
Thampy, D.R., M.R. Sethu, M.B. Paul & C.P. Shaji (2021). Ichthyofaunal diversity in the upper-catchment of Kabini River in Wayanad part of Western Ghats, India. Journal of Threatened Taxa 13(2): 17651–17669. https://doi.org/10.11609/jott.o6159.13.2.17651-17669
Thomas, K.R., C.R. Biju & C.R. Ajithkumar (2000a). Fishes of Chimmony and Pechi-Vazhani wildlife sanctuaries, Kerala, India. Journal of the Bombay Natural History Society 97: 289–292.
Thomas, K.R., C.R. Biju & C.R. Ajithkumar (2000b). Fish fauna of Idukki and Neyyar wildlife sanctuaries, Southern Kerala, India. Journal of the Bombay Natural History Society 97: 443–446.
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