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Cover: Orange Oakleaf *Kallima inachus* with colour pencils and watercolor wash by Elakshi Mahika Molur adapted from a workshop by Lenin Raj.



INTRODUCTION

The swamp eel, a distinctive eel-like percomorph fish, belongs to the Synbranchidae family. These eels are found across tropical and sub-tropical regions globally, excluding Antarctica (Rosen & Greenwood 1976; Bera 2007; Britz et al. 2021a,b). According to Praveenraj et al. (2021), the Synbranchidae family comprises four genera and approximately 26 species, with 12 residing in India (Gopi et al. 2017; Praveenraj et al. 2021), including *Monopterus eapeni* Talwar, 1991, *M. albus* (Zuiew, 1793), *Ophichthys cuchia* (Hamilton, 1822), *O. fossorius* (Nayar, 1951), *O. hodgarti* (Chaudhuri, 1913), *O. ichthyophoides* (Britz, Lalremsanga, Lalrotluanga & Lalramliana, 2011), *Rakthamichthys digressus* (Gopi, 2002), *R. indicus* (Silas & Dawson, 1961), *R. roseni* (Bailey & Gans, 1998), *R. rongsaw* (Britz, Sykes, Gower & Kamei, 2018), *R. mumba* Jayasimhan, Thackeray, Mohapatra & Kumar, 2021, and *Ophisternon bengalense* McClelland, 1844 (Gopi et al. 2017; Britz et al. 2020, 2021a,b).

The state of West Bengal contains diverse habitats ranging from the eastern Himalaya in the north to the Bay of Bengal in the south (Das et al. 2020; Bera et al. 2018). This geographic diversity underscores the state's significance in terms of biodiversity. Surprisingly, no comprehensive study on the taxonomy and conservation status of swamp eels in West Bengal, India, has been conducted by any previous author. These fishes inhabit a variety of environments, including subterranean waters and mud holes in swamps and caves, making their harvesting challenging with conventional fishing methods. Additionally, their superficial anatomy lacks distinctive features, and the limited external characteristics are highly variable, posing identification challenges. Consequently, this study seeks to investigate the taxonomy and conservation status of swamp eels in West Bengal, India, including the identification of major threats to facilitate effective conservation strategies.

MATERIALS AND METHODS

The research spanned January 2019 to April 2023 in West Bengal (Figure 1), involving the collection of swamp eel specimens from nine districts of West Bengal (Cooch Behar, Alipurduar, Jalpaiguri, Uttar Dinajpur, Purba Bardhaman, Nadia, Purba Medinipore, North 24 Parganas and South 24 Parganas; Table 1). Sampling sites were systematically chosen to ensure representation across diverse climatic and topographical conditions. Traditional fishing techniques such as Shuli,

kodal-assisted digging, and handpicking were used in rice fields and marginal water areas, while drag nets and mosquito nets were employed in weed-infested wetlands like oxbow lakes. Additionally, baited hooks on hand lines were used to capture species in ditches and fish ponds. Post-harvest, specimens were photographed and preserved in 10% formalin solution, each assigned a museum voucher/accession number for documentation. Detailed morphometric measurements were conducted using a digital caliper to measure various morphometric measurements like total length (TL), head length (HL), snout length (SL), pre-anal length, gape length, the distance between anterior-posterior naris, the width of the body at vent and depth of the body at the vent. The meristic character, like vertebral count, was also undertaken. The vertebrae counts were determined through X-ray radiography and examined various anatomical features, such as fins, scales, gill cleft, soft tissue around the upper jaw, branchiostegal membrane, holobranchs, suprapharyngeal pouches, and afferent and efferent blood vessels of 4th gill arch. Fishes were identified as per the standard taxonomic keys (Rosen & Greenwood 1976; Jayaram 2010).

The assessment of species threat status adhered to the criteria outlined by the IUCN Red List of threatened species (Dahanukar 2010; Dahanukar et al. 2019). Additionally, the frequency of each species' occurrence was determined by calculating the number of times it was collected during the sampling process. This determination was facilitated by employing a standard catch frequency chart, as presented by Tamang et al. (2007), where catch frequencies were categorized as follows: 91–100% (common), 81–90% (abundant), 61–80% (frequent), 31–60% (occasional), 15–30% (sporadic), 05–14% (rare), and less than 5% (extremely rare).

RESULTS

The study revealed the occurrence of two species of swamp eel, *Ophichthys cuchia* (Hamilton, 1822) and *Ophisternon bengalense* McClelland, 1844 in the study area (Table 2).

Taxonomic account

The recorded swamp eels belong to the family Synbranchidae, which is characterized by anterior and posterior nostrils widely separated; gill openings united to form a single pore or slit under the head or throat,

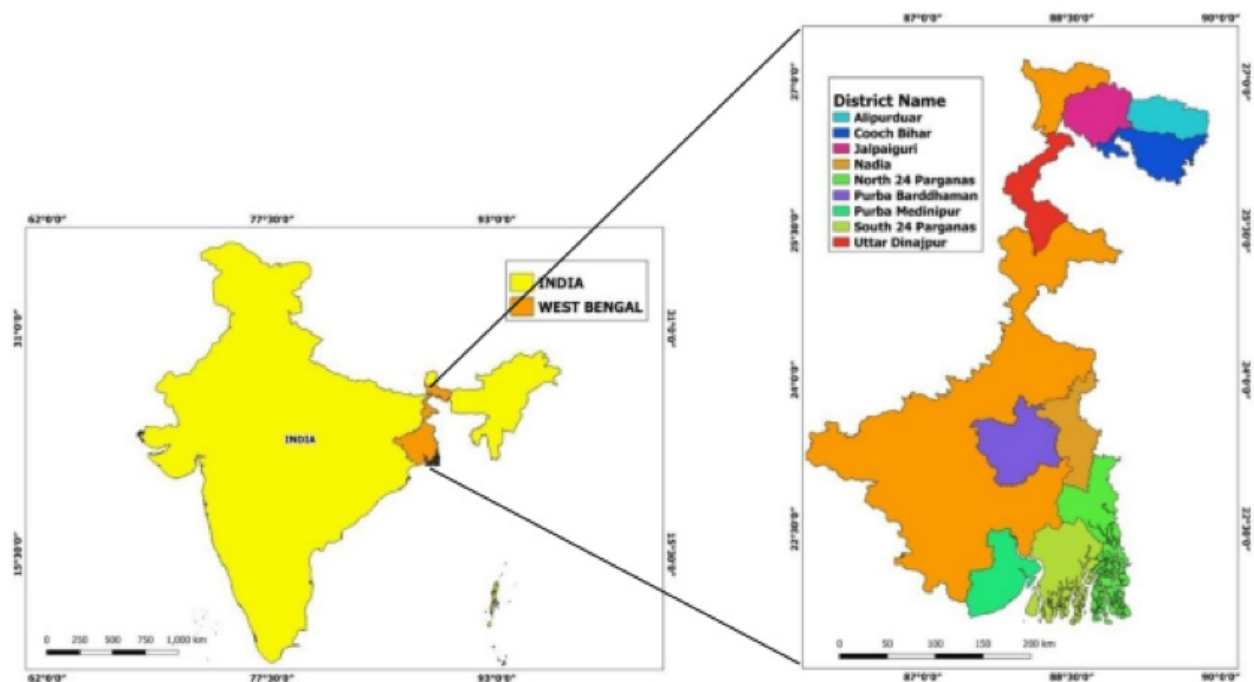


Figure 1. Map of West Bengal in the India map showing the study area.

Table 1. Details of the sampling sites.

| District | Block | Village | GPS Readings | Type of water bodies |
|-------------------|----------------|-------------------|------------------------|----------------------------------|
| Cooch Behar | Tufanganj II | Bochamari | 26.2500°N, 89.4400°E | Bochamari Beel (ox-bow lake) |
| | Cooch Behar II | Kharija Kakribari | 26.2292°N, 89.2557°E | Beel (ox-bow lake) |
| | | Baneswar | 26.2400°N, 89.2993°E | Ditches |
| | Sitalkuchi | Gosaierhat | 26.2048°N, 89.2876°E | Beel (ox-bow lake) |
| Alipurduar | Kumargram | Hindupara | 17.4291°N, 83.1805°E | Rice Field |
| | | Madhuvasa | 26.2822°N, 89.4345°E | Beel (ox-bow lake) |
| Uttar Dinajpur | Hemtabad | Balliadighi | 25.4410°N, 88.1260°E | Beel (ox-bow lake) |
| Purba Bardhaman | Jamalpur | Balarampur | 23.5500°N, 87.5932°E | Beel (ox-bow lake) |
| Nadia | Chapra | Padmamala | 23.3319°N, 88.3510°E | Fish Pond |
| North 24 Parganas | Habra II | Ashokenagar | 22.5070°N, 88.3652°E | Fish Pond |
| South 24 Parganas | Canning II | Canning | 22.3007°N, 88.6671°E | Tidal Creek, Matla River estuary |
| Purba Medinipore | Bhagbankhali | Chandipur | 22.1406° N, 87.8715° E | Paddy field |
| Jalpaiguri | Ambari | Rajgunge | 26.6388° N, 88.4971° E | Wetland |

so they are named Synbranchidae, which means fused gills; the dorsal and anal fins are reduced to ray less skin folds, and the caudal fin is reduced, pectoral and pelvic fins absent; scales may be present or absent; eyes small or vestigial; 4th aortic arch is complete and swim bladder is absent.

Class: Actinopterygii

Order: Synbranchiformes

Family: Synbranchidae

***Ophichthys cuchia* (Hamilton, 1822) (Image 1)**

Unibranchapertura cuchia (Hamilton, 1822)

Amphipnous cuchia (Hamilton, 1822) Muller 1839

Monopterus cuchia (Hamilton, 1822) Rosen & Greenwood 1976

Monopterus (Amphipnous) cuchia (Hamilton, 1822)

Talwar & Jhingran 1991

Ophichthys cuchia (Hamilton, 1822) Britz et al. 2020

Materials examined

2 exs., 03.iii.2019, 750–860 mm TL, Rice field (17.4291 N, 83.1805 E), Paschim Nararthali, Hindupara, Alipurduar, West Bengal, India, Coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae/1-2; 1 ex., 20.vi.2019, 380 mm TL, an oxbow lake (Beel) (26.2822N, 89.4345E), Madhuvasa, Alipurduar, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae/3; 1 ex., 13.i.2019, 710 mm TL, small ditches (26.2400N, 89.2993E), Kaljani, Baneswar, Cooch Behar, West Bengal, India, Coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae/4; 1 ex., 04.xi.2020, 460 mm TL, Bochamari beel (26.2500N, 89.4400E), Tufangunge, Cooch Behar, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae/5; 2 exs., 25.xi.2020, 680–700 mm TL, ditches (26.2048N, 89.2876E), Gosaierhat, Sitalkuchi, Cooch Behar, West Bengal, India, Coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /6–7; 1 ex., 06.xi.2020, 630 mm TL, Beel (ox-bow lake) (26.2292N, 89.2557E), Kharija Kakribari, Cooch Behar, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /8; 2 exs., 8.xii.2020, Beel (25.4410N, 88.1260E), Balliadighi, Hemtabad, Uttar Dinajpur, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /9–10; 2 exs., 22.ii.2021, 520–550 mm

TL, Beel (23.5500N, 87.5932E), Jamalpur, Balarampur, Purba Bardhaman, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /11–12; 2 exs., 10.iii.2022, 715–770 mm TL, seasonal fish pond (23.3319N, 88.3510E), Chapra, Padmamala, Nadia, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /13–14; 2 exs., 25.xii.2022, 600–630 mm TL, fish pond (22.5070N, 88.3652E), Habra, Ashokenagar, North 24 Parganas, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /15–16; 2 exs., 20.iv.2023, 465–565 mm TL, fish pond (22.3007 N, 88.6671 E), Canning, South 24 Parganas, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /17–18.)

Common name Gangetic mud eel.

Local name Kuchia, Kuichha, Kuche.

Description

The body is elongated, eel-shaped with a rounded/oval abdomen but laterally compressed at the caudal peduncle; upper lip with a characteristic overhanging or jowl-like structure (Image 2); fins absent; very minute cycloid scales at the posterior part of the body; pre-maxilla with a single row of teeth with 2–3 rows of teeth at symphysis, the maxilla is equal to pre-maxilla in length, without any teeth, palatine/ectopterygoid with a row of teeth, each half of mandible is with more than



Image 1. *Ophichthys cuchia* (Hamilton, 1822). Scale bar: 3.2 cm. © R.K. Das.



Image 2. Dorsal view of the head of *Ophichthys cuchia* showing sense organs. Scale bar: 5.23 cm. © R.K. Das.



Image 3. Lateral view of the head of *Ophichthys cuchia* showing eyes, gape of mouth, and gill slit. Scale bar: 2.59 cm. © R.K. Das.

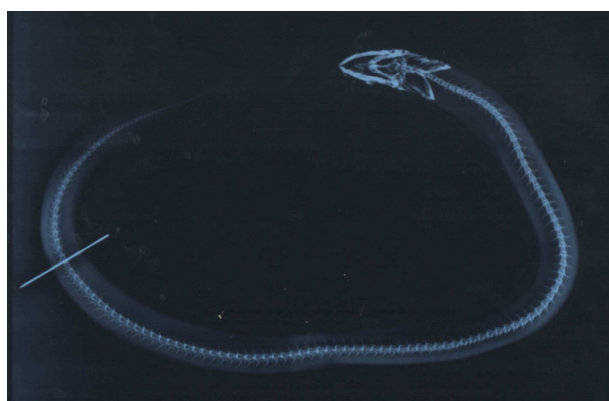


Image 4. X-ray radiograph of *Ophichthys cuchia* showing vertebrae.

Table 2. The list of swamp eels recorded from West Bengal.

| Swamp eel species | English name / Common name | Local name | Catch frequency | IUCN category |
|---------------------------------------|----------------------------|-------------------------|-------------------|---------------|
| <i>O. cuchia</i> (Hamilton, 1822) | Gangetic Mud Eel | Kuchia, Kuichha, Kunche | Abundant (85.71%) | LC |
| <i>O. bengalense</i> McClelland, 1844 | Bengal Mud Eel | Nona Kuchia, Kuchia | Rare (14.28%) | LC |



Image 5(a). Detection of swamp eels in a rice field in Alipurduar District. © R.K. Das.



Image 5(b). Harvesting of swamp eels from a rice field in Alipurduar District. © R.K. Das.



Image 5(c). Harvesting of swamp eel from a rice field in Alipurduar District. © R.K. Das.

one row of teeth anteriorly but a single row of teeth in posterior part; branchiostegal rays six in number; the triangular gill opening which is internally attached



Image 6(a). Mud holes in ditches in Cooch Behar District. © R.K. Das.



Image 6(b). Harvesting of swamp eel from ditches in Cooch Behar District. © R.K. Das.



Image 6(c). Harvesting of swamp eels in Cooch Behar District. © R.K. Das.



Image 6(d). Harvesting of a *Ophichthys cuchia* from Cooch Behar District. © R.K. Das.



Image 6(e). Detection of swamp eels in ditches in Cooch Behar District. © R.K. Das.



Image 6(f). Harvesting of swamp eels from ditches in Cooch Behar district. © R.K. Das.

with isthmus (Image 3); a single layer of gill filaments are present in 2nd and 3rd gill arches; 1st, 4th, and 5th gill arches are without any gill filaments, 5th ceratobranchial with several teeth-like structures. In the morphometric measurement, the head length 7.35–9.16 % of the total

length, pre-anal length is 70.83–78.87 % of the total length, depth of the body at vent 2.08–4.65 % of the total length, the width of the body at vent 1.25–2.20 % of the total length, snout length 13–20 % of head length, the distance between anterior and posterior

naris 15.71–22.50 % of head length, snout length 40–50 % of the gape length. The total vertebral count was 165 to 167 in which abdominal vertebrae was 97–98 and caudal vertebrae was 68–69 (Image 4). Morphometric measurements of the species are presented in Table 3.

Colour

In living conditions, the dorsal side of the *O. cuchia* was yellowish/greenish/brownish with black spots. Whereas the ventral side was yellowish or whitish in colouration. However, the formalin preserved specimens were dark/blackish in colour.

Remarks

O. cuchia (Hamilton, 1822) differs from all the species of synbranchidae except *O. hodgarti* (Chaudhuri, 1913), *O. ichthyophthoides* (Britz, Lalremsanga, Lalrotluanga & Lalramliana, 2011), *O. fossorius* (Nayar 1951), *O. indicus* (Silas & Dawson, 1961) and *O. desilvai* (Bailey & Gans, 1998) by the presence of scales. *O. cuchia* differs from the latter five species having scales in the posterior part of the body. It also differs by having the highest vertebral count (165–167) compared to the remaining species of the genus *Ophichthys*.

Habitat

The study revealed the occurrence of *O. cuchia* in diverse aquatic habitats in the study area. They were found to live in the mud holes of rice fields in the Alipurduar and Purba Medinipore districts (Image 5a–c). However, most of the specimens were found to inhabit the marginal areas of ditches in Cooch Behar and Uttar Dinajpur districts (Images 6a–f). Some individuals were also found to live in the weed-infested wetlands in Alipurduar and North 24 Parganas districts (Oxbow lake) (Image 7), and fish ponds in Nadia and South 24 Parganas district (Image 8). Higher density of the individual was observed in the clayey soils and weed-infested water bodies. During drying seasons, they move to a greater depth of soil, having a very small amount of water. Some specimens were also observed to live in subterranean water. They create a characteristic canal located in deep soils in the marginal areas of water bodies (Image 9). All of the *O. cuchia* were collected from the freshwater region of the study area.

Distribution

India (West Bengal, Assam); Bangladesh; Nepal; Myanmar; Pakistan; and USA.



Image 7. Harvesting of swamp eel from a weed-infested wetland (oxbow lake) in Alipurduar District. © R.K. Das.



Image 8. Harvesting of swamp eel from a fish pond in Nadia District. © R.K. Das.



Image 9. Canal of swamp eels below the soil in the marginal area. © R.K. Das.

Status

According to catch frequency, the species can be categorised as an abundant species (Table 2). On the other hand, the species is recognized as a 'Least Concern' (LC) category as per the IUCN Red List of Threatened Species (Dahanukar 2010).

Ophisternon bengalense McClelland, 1844 (Image 10)

Materials examined

1 ex., 20.iv.2023, 330 mm TL, Tidal creek of Matla river estuary (22.3007 N, 88.6671 E), Canning, South 24 Parganas, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /19; 2 exs., 22.iv.2023, 381–487 mm TL, Tidal creek of Matla river estuary (22.3007 N, 88.6671 E), Canning, South 24 Parganas, West Bengal, India, coll. R.K. Das, Reg. No. AABM/IFF/AC/Fish/Synbranchidae /20–21.

Common name: Bengal Mud Eel.

Local name: Nona kuchia, Kuchia.

Description

Body elongated, eel-like, abdomen rounded; eyes visible through skin (Image 11), vent in the posterior part of the body; head short, compressed; mouth wide,

terminal, the gap of mouth extending to some distance behind the posterior border of the eye (Image 11); both the jaws equal with villiform teeth; four branchial arches with well-developed gills; scales absent; pectoral and pelvic fins absent; dorsal, anal, and caudal, fins are rudimentary; dorsal originates ahead of anal; dorsal, caudal and anal fins are confluent with each other. The snout length (SL) is 40% of the gape length; the head length is 9.65–9.71 % of the total length; the pre-anal length is 74.01–75.75 % of the total length, the depth of the body at vent 2.87–3.67 % of total length, the width of the body at vent 1.43–2.36 % of total length, snout length 9.4–10.8 % of head length, the distance between anterior and posterior naris 12.50–16.21 % of head length, snout length 44.40–45.45 % of the gape length. The total vertebral count was 128–132 in which abdominal vertebrae was 73–75 and caudal vertebrae was 55–57 (Image 12). The morphometric measurements of the species are presented in Table 3.

Colour

In living conditions, the dorsal side of the fish was deep brownish, and the ventral side was light brownish with small spots. Whereas the formalin preserved specimens were reddish/brownish in colour.

Table 3. Selected morphometric data for *Ophichthys cuchia* and *Ophisternon bengalense*.

| | <i>O. cuchia</i> (n = 18) | | <i>O. bengalense</i> (n = 3) | |
|-----------------------------------|---------------------------|---------------|------------------------------|--------------|
| | Range | Mean±SD | Range | Mean±SD |
| Total Length (TL) in mm | 340–860 | 600.27±141.60 | 330–487 | 399.33±80.08 |
| In percent of total length | | | | |
| Head length (HL) | 7.35–9.16 | 8.49±0.48 | 9.65–9.71 | 9.68±0.03 |
| Pre-anal length | 70.83–78.87 | 74.82±2.26 | 74.01–75.75 | 75.03±0.91 |
| Body depth at the vent | 2.08–4.65 | 3.39±0.57 | 2.87–3.67 | 3.19±0.42 |
| Body width at the vent | 1.25–2.20 | 1.60±0.25 | 1.43–2.36 | 1.76±0.51 |
| In percent head length | | | | |
| Snout length | 13.33–20.00 | 16.77±1.52 | 9.37–10.81 | 10.27±0.78 |
| Distance anterior-posterior naris | 15.71–22.50 | 19.20±1.82 | 12.50–16.21 | 13.82±2.07 |
| In percent gape length | | | | |
| Snout length(SL) | 40–50 | 44.17±4.61 | 44.40–45.45 | 44.93±0.50 |
| Ratio | | | | |
| Depth/Width of body | 1–1.66 | 1.23±0.22 | 1.00–1.06 | 1.02±0.03 |
| Total length/Head length | 10.90–13.60 | 11.80±0.71 | 10.29–10.36 | 10.32±0.03 |
| Total length/Body depth | 20–28.88 | 23.19±2.41 | 30.43–33.00 | 31.72±1.28 |
| Vertebrae | | | | |
| Abdominal | 97–98 | 97.5±0.70 | 73–75 | 74±1.41 |
| Caudal | 68–69 | 68.5±0.70 | 55–57 | 56±1.41 |

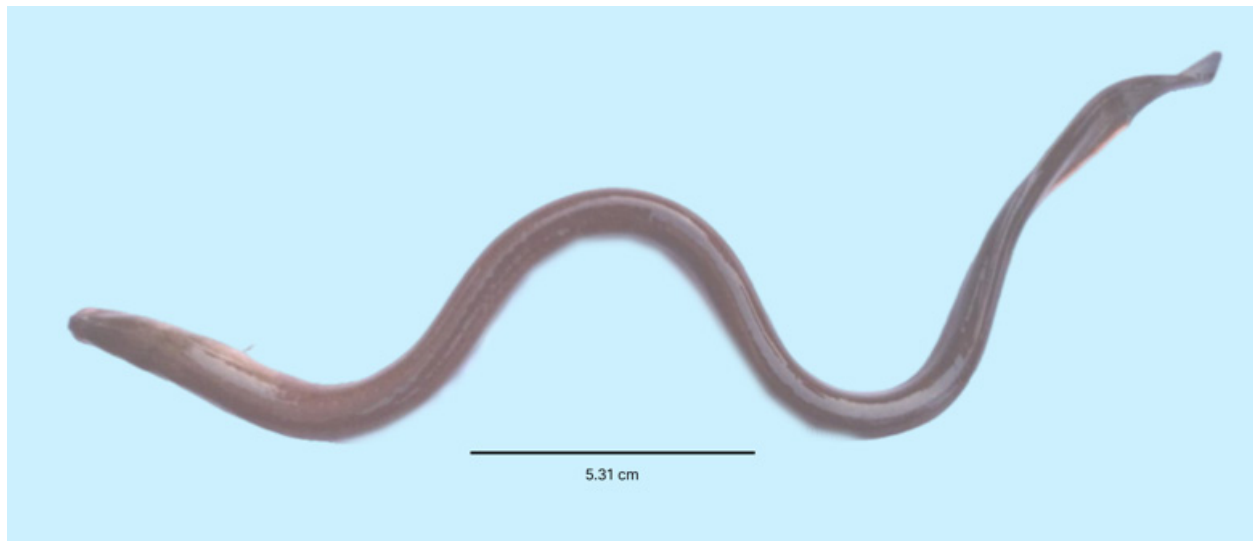


Image 10. *Ophisternon bengalense* McClelland, 1844. Scale bar: 5.31 cm. © R.K. Das.



Image 11. Ventral view of the head of *Ophisternon bengalense*. Scale bar: 2.46 cm. © R.K. Das.

Remarks

O. bengalense McClelland differs from all the species of the genus *Ophisternon*, having caudal vertebrae of 55–57, and a snout length of 40% of the gape length. In *O. bengalense*, pectoral and pelvic fins are absent; dorsal, anal, and caudal fins are rudimentary; dorsal originates ahead of anal; dorsal, caudal and anal fins are confluent with each other.

Habitat

The specimens of *O. bengalense* were collected from the mud holes located in the marginal areas of the tidal creek of the Matla River estuary (Image 13), Canning, South 24 Parganas, West Bengal, India. Thus, the results of the present study reveal that *O. bengalense* is a brackish water swamp eel.



Image 12. X-ray radiograph of *Ophisternon bengalense* showing vertebrae.

Distribution

India (West Bengal); Sri Lanka; Bangladesh; Indo-Malayan region; Philippines.

Status

According to catch frequency, the species can be categorized as a rare species (Table 2). On the other hand, the species is recognized as a 'Least Concern' (LC) category as per the IUCN Red List of Threatened Species (Dahanukar et al. 2019).



Image 13. Harvesting of swamp eel, *Ophisteron bengalense*, from the Tidal Creek of Matla River estuary, South 24 Parganas. © R.K. Das.

DISCUSSION

The swamp eel species, *O. cuchia*, was originally described as *Unibranchapertura cuchia* by Hamilton in 1822 using the type locality of the Ganges river in southeastern Bengal. Later, Muller (1839) transferred the species *U. cuchia* to the genus *Amphipnous*. Rosen & Greenwood (1976), in their well-known revisionary work on the taxonomy of swamp eels, placed the species in the genus *Monopterus*. Recently, Britz et al. (2020) again revised the taxonomy of this fish, placing the species in the genus *Ophichthys*. On the other hand, *O. bengalense* was described by McClelland in 1844 with the type locality of Hooghly River, West Bengal, India. The swamp eels identified in the present study are in accordance with the holotype of the species. In an earlier study, Mishra et al. (2003) recorded the *O. cuchia* in the rivers Kansai, Subarnarekha, and Shilabati of West Bengal. Recently, Mishra & Gopi (2017) recorded both species in the Sundarban Biosphere region of West Bengal, India.

The results of the present study showed that *O. cuchia* is widely distributed in the state of West Bengal. The adaptive features like air breathing organs, the ability to tolerate a wide range of salinity, the capacity to

withstand extreme draught and cold by living in burrows, the ability to survive without feeding for considerable periods, and the crawling type of movement are evident in the swamp eel species *O. cuchia*, which possibly caused the wide distribution of the species in the state of West Bengal (Nico et al. 2019). However, *O. bengalense* has been recorded only in the tidal creek of the Matla River estuary, demonstrating brackish water of living habit, thus showing a very restrictive distribution of the species in the state compared to the *O. cuchia*.

Swamp eels occur in a variety of habitats, both freshwater and brackish water. Although some species live in clear flowing streams, most inhabit sluggish or standing waters, often with low oxygen content, like swamps or marshy areas, ponds, and lakes, where borrowing and amphibious habits are commonly displayed. They are admirably adapted for cave life, and some species from both the New World and Old World are cavernicolous (Rosen & Greenwood 1976; Bailey & Gans 1998). In addition, some species, like *M. eapeni* Talwar and *R. roseni* (Bailey & Gans 1998), are blind cavernicoles living in subterranean waters (Gopi 2002).

Overall, swamp eels are not usually considered to be heavily threatened or endangered. So, that is the reason IUCN is listed as the 'Least Concern' category. However, the populations of both species are declining rapidly in the state. Habitat loss due to urbanisation, agricultural expansion, and pollution of freshwater systems is probably responsible for the reduction of the population of swamp eels in West Bengal. Barman (2007) also considered habitat loss to be the chief threat to the fish in West Bengal. Overexploitation for food and trade can also impact local populations of these fish. As agricultural land or rice fields are considered one of the habitats for swamp eel, the indiscriminate use of pesticides and chemical fertilisers also causes the decline of the swamp eel population in West Bengal. Thus, localised threats such as habitat loss, water pollution, and overexploitation can affect the populations of swamp eels, especially in areas where human activities significantly impact their habitats.

CONCLUSION

The present study documented two species of swamp eels, *O. cuchia* (Hamilton, 1822) and *O. bengalense* McClellands, 1844 within the region of West Bengal, India. These swamp eels inhabit diverse environments, including mud holes of the rice field, ditches, fish ponds, wetland or oxbow lakes, and tidal creeks. Based on the

catch statistics, *O. cuchia* is notably abundant, whereas *O. bengalense* is relatively rare species. Nevertheless, it is noteworthy that both species are categorized as 'Least Concern' category as classified by the IUCN Red List of Threatened Species. The decline in swamp eel populations in West Bengal can be attributed to habitat loss due to urbanisation, and indiscriminate use of pesticides and other agro-chemicals. Further studies endeavors are warranted to delve into the biology of the swamp eels for the development of commercial swamp eel fisheries in West Bengal.

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Articles

Echolocation call characterization of insectivorous bats from caves and karst areas in southern Luzon Island, Philippines

– Renz Angelo Duco, Anna Pauline de Guia, Judeline Dimalibot, Phillip Alviola & Juan Carlos Gonzalez, Pp. 23931–23951

Seasonality, diversity, and forest type associations of macro moths (Insecta: Lepidoptera: Heterocera) in the Shiwalik landscape of northern India and its conservation implications

– Arun Pratap Singh & Lekhendra, Pp. 23952–23976

Vertebrate assemblages on fruiting figs in the Indian eastern Himalaya's Pakke Wildlife Sanctuary

– Akangkshya Priya Gogoi, Janmejey Sethy, Awadhesh Kumar, Dipika Parbo, Murali Krishna Chatakonda & Ajay Maletha, Pp. 23977–23989

Communications

From the Arabian Peninsula to Indian shores: Crab Plover *Dromas ardeola* Paykull, 1805 (Aves: Charadriiformes: Dromadidae) breeding at Point Calimere, India

– H. Byju, N. Raveendran & K.M. Aarif, Pp. 23990–23995

Assessing avian diversity and conservation status in Dighal Wetlands, Haryana, India

– Parul & Parmesh Kumar, Pp. 23996–24008

Studies on the response of House Sparrow *Passer domesticus* to artificial nest-boxes in rural Arakkonam and Nemili taluks, Vellore District, Tamil Nadu, India

– M. Pandian, Pp. 24009–24015

Threat assessment and conservation challenges for the herpetofaunal diversity of Dampa Tiger Reserve, Mizoram, India

– Sushanto Gouda, Ht. Decemson, Zoramkhuma, Fanai Malsawmdawngliana, Lal Biakzuala & Hmar Tlawmte Lalremsanga, Pp. 24016–24031

Taxonomy and conservation status of swamp eels (Synbranchiformes: Synbranchidae) of West Bengal, India

– Ram Krishna Das, Pp. 24032–24042

Sacred river of Pune: boon or bane for the diversity of aquatic beetles (Insecta: Coleoptera)

– Rita Deb, Pallavi Takawane & K.A Subramanian, Pp. 24043–24053

Fine structure of sensilla on the proboscis of the Indian Honey Bee *Apis cerana indica* Fabricius (Insecta: Hymenoptera: Apidae)

– A.G. Suhas Krishna, Shamprasad Varija Raghu & Rajashekhar K. Patil, Pp. 24054–24062

A compendium of *Aphelenchoides* (Fischer, 1894) (Nematoda: Tylenchina: Aphelenchoidea) nematodes with the description of a new species from Manipur, India

– Loukrakpam Bina Chanu & Naorem Mohilal, Pp. 24063–24078

Efficacy of levamisole and oxclozanide treatment on gastrointestinal nematodes of ungulates at the Central Zoo, Nepal

– Pratik Kiju, Amir Sadaula, Parbat Jung Thapa & Chiranjibi Prasad Pokheral, Pp. 24079–24085

Ocimum gratissimum L. ssp. *gratissimum* var. *macrophyllum* Briq. (Lamiaceae: Nepetoideae: Ocimeae) a new record from northeastern India

– Mamita Kalita, Nilakshee Devi & Diganta Narzary, Pp. 24086–24091

The study of biogeographic patterns of the genus *Parmotrema* in Wayanad District, Kerala with a new record in India

– Bibin Joseph, Edathum Thazhekuni Sinisha, Valiya Thodiyil Jaseela, Harshid Pulpambil & Nediaparambu Sukumaran Pradeep, Pp. 24092–24103

Review

Diversity of Calliphoridae and Polleniidae (Diptera) in the Himalaya, India

– Meenakshi Bharti, Pp. 24104–24115

Short Communications

First photographic evidence of mangle manifestation in Panna Tiger Reserve, India

– Supratim Dutta & Krishnamurthy Ramesh, Pp. 24116–24119

New locality record of Forest Spotted Gecko *Cyrtodactylus* (*Geckoella*) cf. *speciosus* (Beddome, 1870) (Reptilia: Squamata: Gekkonidae) from Thanjavur, in the eastern coastal plains of Tamil Nadu, India

– Gopal Murali, Pp. 24120–24124

Preliminary observations of moth (Lepidoptera) fauna of Purna Wildlife Sanctuary, Gujarat, India

– Preeti Choudhary & Indu Sharma, Pp. 24125–24130

On the occurrence of *Audouinella chalybea* (Roth) Bory, 1823, a rare freshwater red algae (Florideophyceae: Acrochaetiales: Audouinellaceae) from eastern Himalaya, India

– Jai Prakash Keshri & Jay Mal, Pp. 24131–24134

Addition of four invasive alien plant species to state flora of Mizoram, India

– Lal Tlanhlu, Margaret Lalhlupui, Sanatombi Devi Yumkham & Sandhyarani Devi Khomdram, Pp. 24135–24139

Notes

First sighting record of Western Reef-Heron *Egretta gularis* (Bosc, 1792) (Aves: Pelecaniformes: Ardeidae) from Jammu & Kashmir, India

– Parvaiz Yousuf, Semran Parvaiz, Nisheet Zehbi, Sabia Altaf, Showkat Maqbool, & Mudasir Mehmood Malik, Pp. 24140–24143

Rare desmid genus *Bourrellyodesmus* Compère (Chlorophyceae: Desmidiaceae) in India with description of a new species (*Bourrellyodesmus indicus* Das & Keshri sp. nov.) from eastern Himalaya, India

– Debjyoti Das & Jai Prakash Keshri, Pp. 24144–24147

Threats faced by *Humboldtia bourdillonii* Prain (Magnoliopsida: Fabales: Fabaceae), an endangered tree endemic to the southern Western Ghats, India

– Jithu K. Jose & K. Anuraj, Pp. 24148–24150

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