ZSL
LET'S WORK FOR WILDLIFE

EDGE

EVOLUTIONARILLY DISTINCT & GLOBALLY ENDANGERED

Survival Blueprint

Kottigehar dancing frog, *Micrixalus kottigeharensis*

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Suggested citation: Mudke, M., B. Tapley, NA Aravind (2021). A survival Blueprint for the Conservation of the Kottigehar dancing frog *Micrixalus kottigeharensis* in the Western Ghats of India. An output from the EDGE of Existence fellowship, Zoological Society of London. Pp - 27

1. STATUS REVIEW

1.1 Taxonomy:

The class Amphibia is a heterogeneous taxa containing amphibians. Within this class, the order Anura consists of tailless amphibians and move using all four limbs (Wells 2007).
The family Micrixalidae is known to have evolved during the Palaeocene epoch, more than 60 million years ago from the ancestral species and diversified at around 5 million year ago. The frogs in this family share ancient lineages and 'unparalleled evolutionary history' with no significant relatives in the world (Roelants et al., 2004).

Class: Amphibia > Order: Anura > Family: Micrixalidae > Genus: *Micrixalus* > Species: *Micrixalus kottigeharensis*

Common name: Dancing frog

Local name: Kottigehar dancing frog

1.2 Distribution and population status:

IUCN Redlist Category: Critically Endangered under criteria B2ab(iii) (assessment done in 2004).

The species was last assessed by the IUCN on the 30th April 2004, At that time, the population was said to be declining (Biju et al. 2004). However, I participated in the IUCN assessment of this species which was undertaken in 2020, with the update on the new sites, it is likely that the species might be down listed to the Vulnerable category because its extent of occurrence (EOO) is 7,149 km^2, it occurs in 10 or fewer threat-defined locations, and there is continuing decline in the extent and quality of its habitat (Fig 2).

The *M. kottigeharensis* is endemic to southern India (Rao, 1937) and is known from low elevation evergreen and semi-evergreen forests of the Western Ghats of India in the state of Karnataka. The species is also recorded from *Myristica* swamp forests which are freshwater swamps native to the Western Ghats of India.

Nine new sites were located where the *M. kottigeharensis* was found during 2019-21 (Mudke et al, 2021) (Figure 1). The presence of the *M. kottigeharensis* was confirmed using molecular analysis using 16S mitochondrial marker (The GenBank accession numbers for two sites KCRE and Unchalli Falls are MN891700, MN891701 and MT556015, MT556016 respectively).

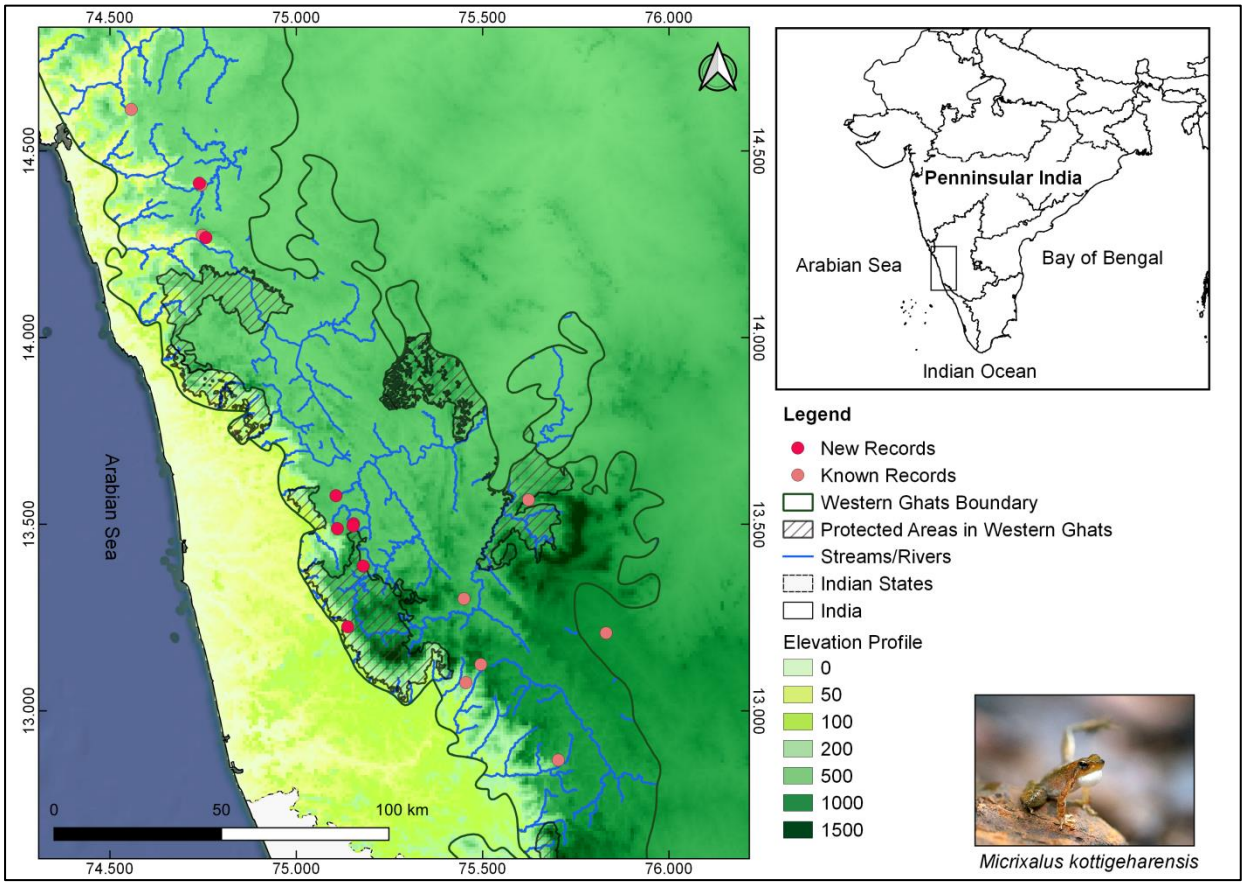

***Figure 1**. Map showing all reported locations of Micrixalus kottigeharensis including new localities*

There is currently no published information on the abundance of species from these areas. There is also no information on population trends of the species.

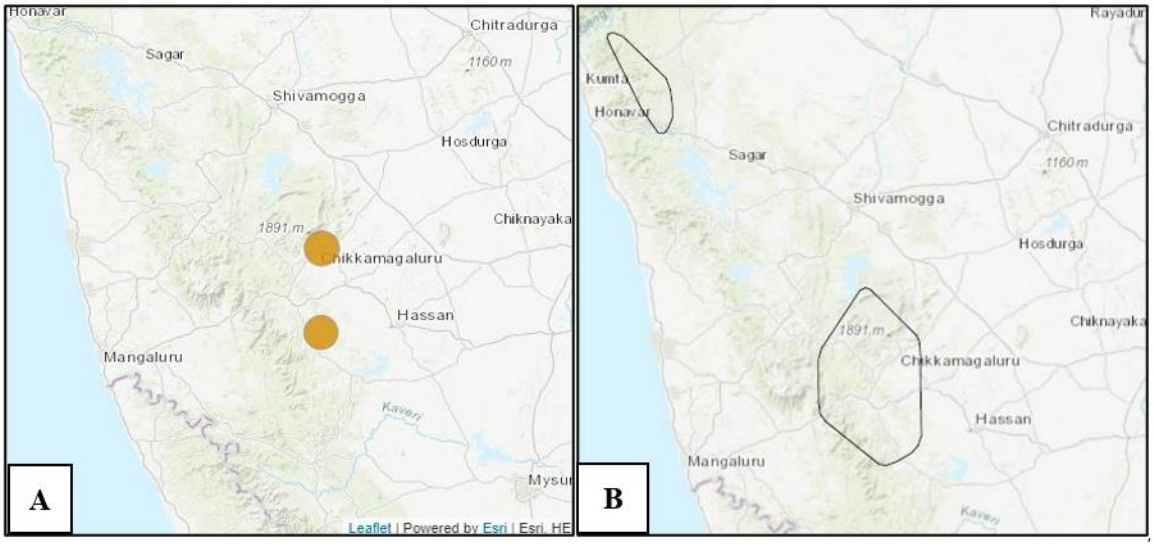

Fig 2. Previous (A) and new (B) geographic range maps as per IUCN assessments in 2020

It is worth highlighting that not only all the new localities but also some of the old known locations with *M. kottigeharensis* presence are outside the protected area network (Figure 1). Two sites (Sirimane Falls and Jogi Gundi) are tourist attractions and promoted as ecotourism sites.

1.2.1 Global distribution:

Country	Population estimate (plus references)	Distribution	Population trend (plus references)	Notes
India	Unknown (Biju et al. 2014)	The state of Karnataka, the Western Ghats of India	Unknown	There are currently no known estimates of the population size for the study species

1.2.2 Local distribution:

Region / province	Site	Level of Protection	Population size	Reference(s)
India/ Karnataka	Mannapapumane	None. Private property	Unknown	Mudke et al (2021)
India/ Karnataka	Sirimane Falls	An ecotourism site; under the state forest department	Unknown	Mudke et al (2021)
India/ Karnataka	Kalinga Center for Rainforest Ecology (KCRE)*	None. Private property	Unknown	Mudke et al (2021)
India/ Karnataka	Suligadde*	None. Private property	Unknown	Mudke et al (2021)
India/ Karnataka	Unchali falls	An ecotourism site; under the state forest department	Unknown	
India/ Karnataka	Unchalli Myristica*	Myristica swamp which is also a 'sacred grove' legally under the control of the community	Unknown	Mudke et al (2021)
India/ Karnataka	Kathlekan	Yes. Myristica swamp which is also a 'sacred grove' – a protected area (relic forest type)	Unknown	Mudke et al (2021)
India/ Karnataka	Western Café at Mavungundi*	None. Forested area on the edge of a private property	Unknown	Mudke et al (2021)
India/ Karnataka	Western Café Mavungundi Site 2	None. Private property	Unknown	Mudke et al (2021)
India/ Karnataka	Ullumadi*	None. Private property	Unknown	Mudke et al (2021)

India/ Karnataka	Jogi Gundi*	None. An ecotourism site; under the state forest department	Unknown	Mudke et al (2021)
India/ Karnataka	Wadighat	None. Likely to be an ecotourism site; under the state forest department	Unknown	Mudke et al (2021)
India/ Karnataka	Maranahalli	None. An ecotourism site; under the state forest department	Unknown	Biju et al. 2014
India/ Karnataka	Charmadi Ghat	None. An ecotourism site; under the state forest department	Unknown	Biju et al. 2014
India/ Karnataka	Muthodi	Yes. A site on the edge of Muthodi Widllife Sanctuary in Chikkamagaluru	Unknown	Biju et al. 2014
India/ Karnataka	Kemmanagundi	None. Hill station and tourism site in Tarikere, Chikkamagaluru	Unknown	Biju et al. 2014
India/ Karnataka	Kottigehara 1	None. A stream near a highway	Unknown	Biju et al. 2014
India/ Karnataka	Kottigehara 2	None. A stream near a highway	Unknown	Biju et al. 2014

1.3 Protection status:

The species is not listed under CITES Appendix. In India, the species is not listed in the Indian Wildlife Protection Act 1972 specifically, presumably due to lack of information on its status, however all freshwater frogs in Western Ghat are protected under Schedule IV which prohibits hunting or trade of the species and its part. Presently the species lacks any specific protection status in the state of Karnataka. Although most sites where the species was recorded do not fall under any of the legal protection status, the Sirineri and Unchali sites are protected as local tourists often visit these sites.

1.4 Ecology, behaviour and habitat requirements:

The ecology of the species is yet to be studied in detail. The present description of the species is based on anecdotal observations made in various studies. It is observed that the species exhibits axillary amplexus and at times may have a third satellite male present with an amplectant pair. The frogs lay fossorial eggs under the first layer of gravel in streams. The males show visual signalling in the form of foot-flagging (Preininger et al. 2013). The reasons for foot-flagging need further research (Preininger et al. 2013). However, most mature male individuals foot flag to other males in the territory. The males are seen foot-flagging towards other males of the same species (Gururaja 2010). Mudke et al (2021) observed male *M. kottigeharensis* visually signalling males of other congeneric (e.g., *M. niluvasei*).

M. kottigeharensis have very specific habitat requirements. The frogs inhabit freshwater, first order streams of moist evergreen to semi-evergreen forests of the Western Ghats, restricted to elevations of 270-725 meters above mean sea level. Apart from these streams, they also inhabit relic forests called the '*Myristica* swamps'. *Myristica* swamp forests are freshwater wetlands with exclusive evergreen, flood resistant trees largely belonging to the family Myristicaceae (nutmeg family). They were recognised as a special type of habitat in 1960.

Currently, most of these swamps are also recognized as ‘sacred groves’ and are directly under the control of a temple or a nearby community (Chandran et al. 2010). In this study, we found the dancing frogs in two *Myristica* swamps across the Ghats.

The stream water had an average pH of 7.4 and a water temperature of 23.5 degree Celsius (Mudke et al 2021). All the streams had a clear colour with average alkalinity of 0.51 mEq/L, ammonia (NH3) of 0.2 mg/l and phosphates (PO4) of 0.006 mg/l. It is also seen that most of the streams with the dancing frogs had a canopy cover of approximately 70%. At sites where, the canopy cover was less for example in areca plantations, the number of *M. kottigeharesis* also reduced.

1.5 Threat analysis:

Threat	Description of how this threat impacts the species	Intensity of threat *(low, medium, high, critical or unknown)*	IUCN Threat category
Habitat change and conversion	The land outside designated protected areas is now converted into areca nut and coconut plantations along with horticulture crop farming. Findings from Mudke et al (2021), show that plantations do not have adequate canopy cover suggesting the disappearance of frogs. One such instance was noted in this study at Western Café Site 2 (14.2685, 74.7580) where the stream was flowing through a forest towards an areca nut plantation. When the stream reached the plantation the number of frogs reduced from 4 to only 1.	High	**2** Agriculture & aquaculture 2.2 Wood & pulp plantations • 2.2.2 Agro-industry plantations
Barriers within the water shed and streams	Several check-dams are built to retain water upstream or downstream. Studies show that such modifications to flowing streams can impact species diversity, water channels, river-sheds, vegetation and sediment dynamics (Bombino et al. 2014, Boix-Fayos et al. 2008). This will have direct impacts on the target species, since basic activities like breeding require specialised habitat consisting of continuous slow moving water, canopy cover and specific habitat and environmental conditions as highlighted in Mudke et al., 2020.	High	7 Natural system modifications 7.2 Dams & water management/use • 7.2.4 Abstraction of surface water (unknown use)
Tree felling	Illegal tree felling is common outside protected areas for various reasons like infrastructure development or farming or household usage. Throughout our surveys we have noted that canopy cover of at least 70% is essential for the survival of the species. At a site where canopy cover was lacking, Western Café Site 2 (14.2685, 74.7580), only one calling male of *M. kottigeharensis* was recorded.	High	5 Biological resource use 5.3 Logging & wood harvesting • 5.3.1 Intentional use: subsistence/small scale (species being assessed is the target [harvest]

Inadequate management of private property	A number of private properties are either tourist friendly or have existing farms. Because of unawareness of the presence of frogs in the streams, increased disturbance from human activities can lead to disappearance of frogs and may even spread diseases or cause malformations.	High	6 Human intrusions & disturbance • 6.1 Recreational activities
Garbage and other solid waste	Most of the sites are promoted as tourism sites due to their location and scenic beauty of the Ghats. The waste is not properly disposed and hence there are high chances of people throwing garbage and plastic litter, using the streams for washing and cleaning purposes or even bathing leaving soap residue that eventually enters the stream and likely pollutes aquatic habitat.	High	9 Pollution • 9.4 Garbage & solid waste
Disturbance from uncontrolled tourism	With increased number of people visiting the sites, activities like leisurely walking within the streams are common. People are largely unaware of the biodiversity and the harm they may be doing with such activities. Even at places where people are aware of the presence of frogs, wildlife filmmakers and photographers can pose a threat via disturbance and trampling of oviposition sites.	Critical	6 Human intrusions & disturbance • 6.1 Recreational activities
Climate change	From our data we found that the average atmospheric humidity was 86.3 % and 25.11 degree Celsius where the frogs were present. We suspect that variations in temperature and humidity followed by extreme events like floods and increased rainfall as suspected due to the climate change can pose a threat to the species and its habitat (Priti et al. 2016; Sharannya et al. 2018; Sinha et al. 2020).	Critical	11 Climate change & severe weather • 11.3 Temperature extremes
Disease and malformations	Since the streams see mixing of waste water and freshwater, people, barriers and linking of streams, diseases might be easily transmitted. In our study itself, we found one malformed individual of the *M. kottigeharensis* indicating that long term surveys may lead to more reports on malformations.	Medium	8 Invasive & other problematic species, genes & diseases • 8.6 Diseases of unknown cause

1.6 Stakeholder analysis:

Country	**Stakeholder**	**Stakeholder's interest in the species' conservation**	**Current activities**	**Impact** *(positive, negative or both)*	**Intensity of impact** *(low, medium, high or critical)*
Global	General Public and Nature enthusiasts, Citizen Scientists	Educational and curiosity to learn more about nature, forests and biodiversity Contribution to scientific knowledge	Documenting sightings of the dancing frog and reporting them to the concerned scientist via social media channels or phone	Positive	Medium
India	Tourists and travellers	Interested in tourism and education on biodiversity as well visiting the site	Tourism	Positive and negative	Low
India	Students	Educational and curiosity to learn more about nature, forests and biodiversity	Educational excursions and study	Positive	High
India	Locals/villagers	Educational and well-being of the biodiversity that concerns the village and its surroundings	Visit to forest and streams	Positive and negative	High
India	Local *Panchayats* (Village council)	May not be interested on the conservation as a whole	At Mallandur village the panchayat is interested in field data collection and educational activities such as placing posters around the village, involved in developmental activities in villages	Positive	Medium
India	State Forest Department (FD)	Interested in expanding protected area network, enhance protection mechanism in the existing areas.	Patrolling, monitoring of wildlife and forests	Positive	Medium
United Kingdom	Zoological Society of London (ZSL)	EDGE species conservation	Funding at local sites for conservation of the species and also capacity building of young biologists	Positive	High

India	Ashoka Trust for Research in Ecology and the Environment (ATREE)	Species conservation, ecology, research and scientific collaborations; community conservation	Research and conservation of wildlife	Positive	High

1.7 Context and background information that will affect the success of any conservation action for this species:

	Description	Barriers to conservation	Opportunities for conservation
Socio-cultural effects and cultural attitudes	A 'sacred grove' is a patch of forest dedicated to deities or deified ancestors and is controlled by the community or a temple. During this project we found the species in two 'sacred groves' which are also existing protected areas (Kathalekan Forest) and community reserves (Unchalli *Myristica*). The forests are known as climax forests or relics. Many local farmers and plantations owners in the sampled area have kept the practise of keeping primeval forests alive, protected as sacred groves for better water supply and refurbishing of rivers downstream. People in other areas where surveys were carried out have shown interest in learning more about the project, the species, their role in conservation and also involving in field data collection. At most places, men were more outspoken and wanted to learn more and get involved. Women in general were not very keen to be involved since we were speaking of 'frogs' that are regarded to be disgusting and dangerous. In my observation, these opinions of disgust	People are generally friendly however there can be some hesitation due to past experiences of the local people with scientist teams and film makers, where scientists and photographers/film makers have exploited the boundaries of the forest, entered illegally and left waste on the forest floor, the temple priest was very apprehensive to permit entry to yet another team. No one can guarantee when local people will change their attitudes and restrict outsiders from entering the area (especially places like Unchalli *myristica*). Lack of inclusion of all stakeholders in	Due to the historic practice of conserving sacred groves, the species within these two areas will acquire a positive attitude from people and since there are existing norms of keeping away from the sacred groves or not entering the forest without utmost need, the biodiversity is conserved from any external anthropogenic disturbances. Since, we were able to establish local contacts with the people and the temple, we as researchers were able to follow the norms and request entry to collect data. In the future, for any scientific team/filmmakers to enter, the laid out norms of cleanliness and cultural believes must be respected to access any 'sacred groves'. Also, building healthy contacts with the local communities and explaining the nature of work is extremely crucial. Also, such community maintained forest must always be entered with a local

	came out to be stronger among women than those among men.	conservation activities linked to a lack of interest.	community member and must be rewarded.
Economic implications	There are opportunities for ecotourism and adequate handling of the landscape with biodiversity concerns in mind. Most land conversion of forests and streams to plantations is done by both lower income groups of farmers and large farmers who have the resources. So if more ecotourism opportunities are created there are chances of reversing the trend and promoting responsible tourism thus giving economic benefits to people.	People do not consider that tourism and/or educational activities can be an economically viable option since safety is a major concern. No one wants to open their property for tourists. Local people have complained that most tourists are rich people from the cities and want to enjoy themselves with drinks and dance giving rise to litter and chaos. Given the pandemic, it may take even longer for tourism of any kind to flourish in remote areas of the country.	Local women and men can serve as 'guides' to conduct nature walks around private properties which might add to additional incomes that could add to the income generation. This will enable better conservation of the species along with the maintenance of the habitat.
Existing conservation measures	The species range mostly falls outside protected area networks and in some cases within private lands. There is no sufficient protection mechanism exists. Government has various schemes for locals outside the forest areas for their livelihood and reducing their pressure on the forest.	During the study (Mudke et al 2021) we noted that many of the locals have jobs outside their villages they may not want a long term association for conservation unless they recieve direct benefits.	With the help of local people, it is easy to devise and implement conservation action plans like placing posters in the village or carrying out workshops. It is also a lot safer to visit the sites for field data collection without worrying of any kind of problem from locals for intruding private property.

		In order to have them on board for a longer term, opportunities where they get some form of monetary benefits for conserving and keeping an eye on the habitat and the frogs in crucial along with educational workshops and posters.	
Administrative/political set-up	The present management of the forests as well as the wildlife and its habitats lie under the local Divisional Forest Officer. In most areas, the department suffers from lack of sufficient staff which results in reduced amount of patrolling hours. Some of the forest patches (at least 2 from this study) are directly under the control of the community that resides beside (the local gram panchayat takes care of any new developments in such areas).	The overall development agenda of in the state is harmful to not only people but also the forests. Navigating through this to promote conservation of species is challenging since conservation often lacks funds and simply 'conservation education' will not provide what people want.	There are village panchayats, religious leaders and other people who hold powerful positions at a village level. Connecting to them and working with them and their existing committees is proving beneficial to further conservation activities. Women researchers are more likely to be issued with the relevant permits if they are working in collaboration with an established local institution(s) (e.g. ATREE) and if they have the support of senior advisors in the permit application process.

Local expertise and interest	People living in the rural areas have knowledge on the importance of aquatic habitats. They also know that all small streams feed into larger streams. However, they are often unaware of the biodiversity. They know basics like fish, frog and bird but nothing more apart from that. Only a few nature-enthusiasts know about the presence of frogs and fish and the importance of the habitat they are in. At some sites, where ecotourism is being promoted, some filmmakers and photographers are regular visitors and give the dancing frogs their due limelight on social media and other platforms via films, photos and educational content.	The biggest barrier is maintaining a long-term association with local people. Since the species is active only for a few months post monsoons, activities need to be planned and spaced out throughout the year to continue association. This will not only require creative insights for engagement with people but also financial support. Increasing number of misinformed tourists also need to be educated by placing sign boards which will require collaborations with forest department and associated finances. Bringing all of them on board with the idea will take time and is one of the biggest barriers in regulating and informing tourists	Building a local network with the experts can be useful in maintaining the relationship at the species habitat which might indirectly benefit the species. Through social media outreach and popular articles, a number of responsible tourists, private property owners and other nature enthusiasts are taking part in conservation activities and learning more about the dancing frog and its habitat.

Resources	There are limited resources in terms of manpower and finance for the conservation of the species. ZSL and ATREE are also providing mentorship and guidance for data analysis of existing data and for managing the project long term. Apart from that, I do not have any other resources in terms of funding for carrying out long term studies on this species.	Field and lab work needs a lot of finances and unless those are provided for, the lab facilities are often useless and will lead to a break in the pursuing the project long term. Other funding agencies are available but they are highly competitive. The ones that are less competitive have very limited funds to provide and those aren't enough for processing more than 60-100 samples. For working towards creating a conservation reserve and actionable conservation plan, the team and the project will be needing additional funding	Great opportunity for the local NGOs to work for the conservation and raise funds.

2. ACTION PROGRAMME

Vision (30-50 years): Long term and evidence-based conservation of amphibian diversity in the Western Ghats of India focussing on *Micrixalus kottigeharensis* as target species	
Goal(s) (5-10 years): Increased scientific and public knowledge on *Micrixalus kottigeharensis* and its habitat in India and globally that can be directly applied for conservation activities	
Objectives:	**Prioritisation** *(low, medium, high or critical)*
To determine species distribution range	High
To understand the microhabitat requirements of *Micrixalus kottigeharensis*	High
To determine the breeding behaviour of *Micrixalus kottigeharensis*	Medium
To identify major anthropogenic pressures for *Micrixalus kottigeharensis*	High
Designing social media campaign to raise public awareness and level of understanding of *Micrixalus kottigeharensis* using various social media tools.	Low
To create partnership with local stakeholders and design a comprehensive guideline for amphibian conservation in the state	High
To initiate policy level dialogues with higher authority to declare the species habitat as 'local biodiversity heritage sites'	High

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: **To determine species distribution range**								
Getting maps/toposheets with streams and other details of the area from relevant labs + ATREE's Eco-informatics Lab	India	Low	100 GBP	1 year	ZSL and ATREE	Relevant Maps + Toposheets were obtained by May 2019	Delay in gathering the maps and creating necessary outputs	Modelling using computers in ATREE lab
Obtaining BioClimatic and other necessary layers for MaxEnt analysis from relevant websites	India	Low	100 GBP	1 year	ZSL and ATREE	All environmental layers were collected by May 2019	Collected layers may be faulty	Modelling using computers in ATREE lab
Carry out species modelling using MaxEnt	India	High	--	1 year	ZSL and ATREE	Species distribution modelling (SDM) was conducted with preliminary data points	Faulty SDM leading to wrong prediction and overestimation of the range	Modelling using computers in ATREE lab

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Planning second survey after obtaining species distribution map from MaxEnt	India	Low	2500 GBP	1 year	ZSL and ATREE	Surveys were carried out and 8 new sites were added to the existing list of data points	Overestimation and likely faulty model outputs	Modelling using computers in ATREE lab
Redefining the MaxEnt Model and also trying out ensemble model using BioMod2	India	High	--	2 years	ZSL and ATREE	Output in form of improved maps was obtained, however map still predicts overestimation but after refining the final output is likely to be ready by February 2021	Overestimation and likely faulty model outputs	Modelling using computers in ATREE lab
Objective 2: **To understand the microhabitat requirements of *Micrixalus kottigeharensis***								
Activity 2.1: Getting permissions from the state forest department	India	Low	100 GBP	1 year	Forest Department	Written and signed permits from concerned officials	Delays in getting the permits and travel restrictions imposed due to COVID	Government office visits and presentations in front of the committee

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Activity 2.2: Carry out preliminary surveys in monsoons (May – June 2019) at five known study sites and up to 15 additional study sites. Characterising the study site X2 Randomly identifying 10 meter study transects along first order streams and marking them.	India	Low	2000 GBP	2 years	ZSL and ATREE; general public and local communities, tourists and students	Cleaned data sheets, analysed data and reports/notes in the form of publications	Delays in data cleaning and analysis	Field work followed by laboratory work and data processing on computers
Activity 2.3: Preparing identification key to correctly identify the species that can be used in the field to	India	Low	10 GBP	6 months	ZSL and ATREE	Identification key available	Futile exercise where identification of species is impossible through the identification guide	Field work + Lab work to process DNA through buccal swabs

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
separate closely related species like *M. saxicola* and *M. specca*.								
Activity 2.4: Visual encounter surveys – data collection on morphometric measurement of frogs, number of frogs per transect, area of first sighting, human signs/anthropogenic pressures will be recorded. Along with Environmental Variables described in detail below.	India	Low	2000 GBP	6 months	ZSL and ATREE	Data sheets, Monthly report and photographs	Delays in collecting data and unfavourable weather conditions Due to COVID restrictions, second season of sampling was impossible	Field work + Lab work to process DNA from buccal swabs
Activity 2.5: Data cleaning and analysis	India	Critical	--	6 months	ZSL and ATREE	Data sheets	Inability to clean data or present it in a way favourable for analysis	Computer processing

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Activity 2.6: Calculation of relative abundance in the study area. Analysis of which environmental variables are associated with species presence (or higher abundance if possible with the data), using occupancy models or GLMs. N-mixture models to estimate population size at sites with multiple individuals observed.	India	Critical	200 GBP	2 years	ATREE and ZSL; General Public; students; Forest department; tourists	Analysis and results in final report and publications	Delay in carrying out the analysis remotely and inability to understand the analysis done – causing delays and substandard publications	Computer processing and writing
Objective 3: **To determine the breeding behaviour of *Micrixalus kottigeharensis***								
Activity 3.1 Field based observations - variables to be measured during the survey – Oviposition	India	Low	5000 GBP	2 years	ATREE and ZSL; General Public; students;	Data sheets + photographs + videos, Monthly report and	Inadequate data for further processing	Field work

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
sites, oviposition time, amplexus time and type, territorial defence, nest building if any, egg-clutch size, egg size, relative abundance/presence of predators, foot-flagging – proximity to male/female					Forest department; tourists	EDGE final report		
Activity 3.2 : Analysis of behaviours	India	High	1000 GBP	3 years	ATREE and ZSL; General Public; students; Forest department	18 month report	Inadequate and substandard data set	Computer + Lab processing
Activity 3.3: Larval description – Understanding the growth and development of tadpoles	India	High	1000 GBP	3 years	ATREE and ZSL; General Public; students;	Data sheets + photographs, 18 Month report	Inability to locate tadpoles in an ethical way	Field work + Lab processing for DNA extraction through tail tips

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
					Forest department			
Objective 4: **To identify major anthropogenic pressures for *Micrixalus kottigeharensis***								
Activity 4.1: Directly record the density and diversity of threats in the study site during visual surveys.	India	Low	1000 GBP	2 years (Can be continued for a longer term if funds exist)	ATREE and ZSL; General Public; students; Forest department; tourists	Data sheets and photographs	Inability to record the variables in an effective way	Field work
Activity 4.2: Using remotely sensed data to study the proximity to roads and distance to settlements – whether the species relative abundance has any impact with proximity of roads and settlements	India	Low	1000 GBP	2 years	ATREE and ZSL; General Public; students; Forest department; tourists	Data sheets	Inability to obtain necessary data for processing this information since the sites are close by and fall under the Western Ghats boundary – so country wise restrictions may make this exercise challenging	Computer processing and collaborating with the eco informatics lab of ATREE

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Activity 4.3: Conducting facilitative questionnaire survey to understand local people's and tourist's concerns towards the dancing frog	India	Low	2500 GBP	2 years	ATREE and ZSL; General Public; students; tourists	Data sheets and survey questionnaire	The lack of time and funds to perform this task given that field work and processing takes the whole day during field season	Carrying out surveys with people in field
Activity 4.4: Include threat data in GLMs/Occupancy models (activity 2.5) to analysis association with frog presence/relative abundance	India	Critical	--	2 years	ATREE and ZSL; General Public; students; Forest department; tourists	Analysis and results from the data collected	Inability to understand the analysis and substandard data giving unsatisfactory results	Computer processing
Objective 5: **Designing social media campaign to raise public awareness and level of understanding of *Micrixalus kottigeharensis* using various social media tools**								
Activity 5.1: Pre and post evaluation to assess whether awareness raising	Global	Low	1000 GBP	1 year	General Public; students; Forest	Final report	None	Processing the data/reach on computers

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
activities have had an impact					department and villages			
Objective 6: To create partnership with local stakeholders and design a comprehensive guideline for amphibian conservation in the state								
Activity 6.1: Conducting workshops with various stakeholders to design guideline.	India	High	1000 GBP	1 year	Scientists, NGOs, community members and forest department	Outline guidelines for conservation in a readable and accessible document	Administrative delays	Workshops
Objective 7: Initiate policy level dialogues to declare the species habitat as 'local biodiversity heritage sites'								
Activity 7.1: Identify potential habitats for the species that require urgent protection attention	India	High	10000 GBP	2 years	Scientists	List of identified sites	Unavailability of resources, pandemic delay	Field work
Activity 7.2: Initiating a dialogue with the forest department to mark the identified areas as heritage sites	India	High	1000 GBP	1 year	Scientists and forest department	Number of meetings and workshops with the forest department and concerned policy officials	Administrative delays	Virtual meeting and stakeholder discussions

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