



ZSL
LET'S WORK
FOR WILDLIFE

EVOLUTIONARILLY DISTINCT
& GLOBALLY ENDANGERED

Survival Blueprint

**Galaxy Frog,
Melanobatrachus indicus Beddome, 1878**



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1. STATUS REVIEW

1.1 Taxonomy:

Kingdom : Animalia
Phylum : Chordata
Class : Amphibia
Order : Anura
Family : Microhylidae
Sub-family : Melanobatrachinae
Genus : *Melanobatrachus*
Species : *indicus*

Scientific name: *Melanobatrachus indicus*

Common name: Galaxy Frog, Black Microhylid Frog

Local name: Cholakkarumbi (Malayalam)

In 1878, R.H. Beddome described *Melanobatrachus indicus* based on the specimens collected from Anamalai, Southern Western Ghats. The genus was also described by Beddome (1878) and until now *Melanobatrachus indicus* is the only species in the genus.

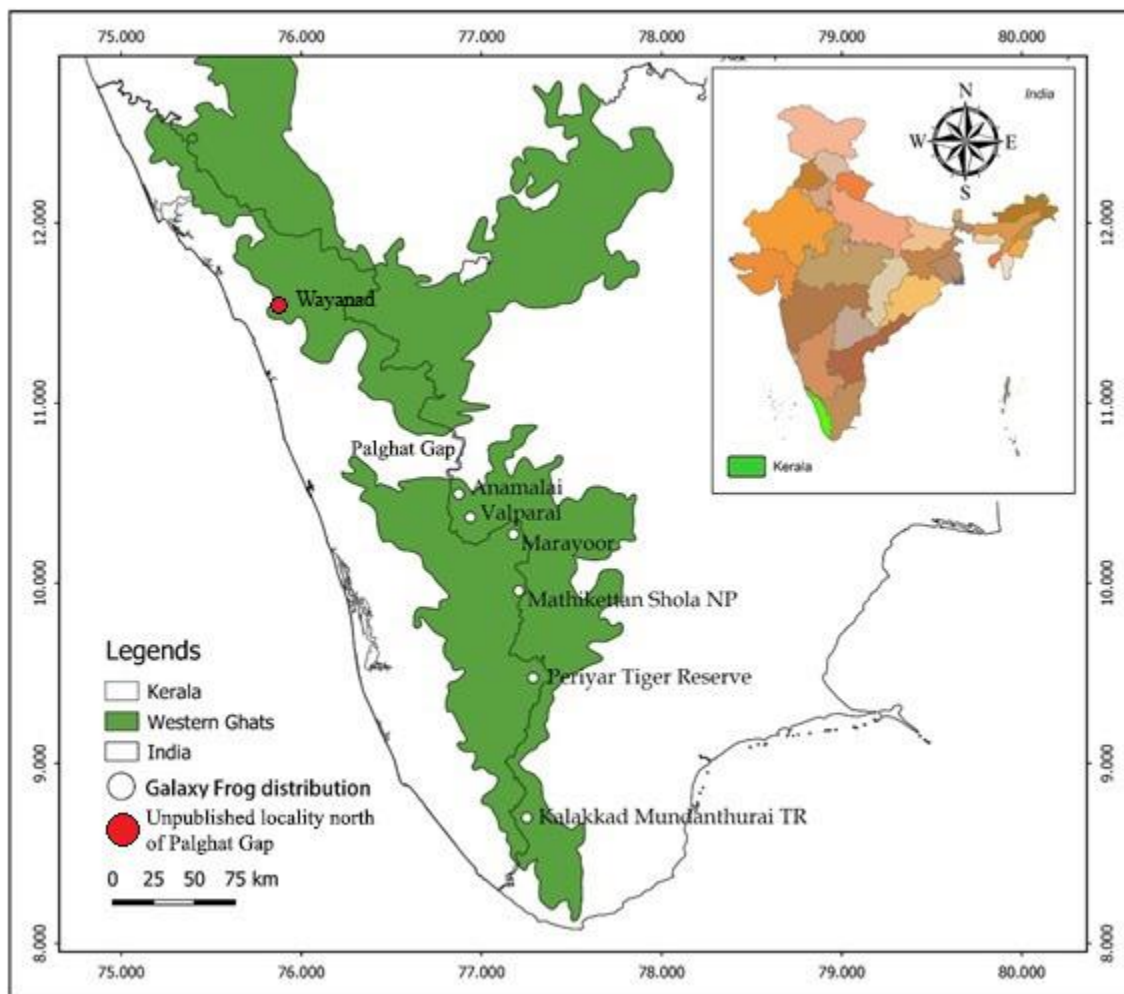
1.2 Distribution and population status: *Melanobatrachus indicus* is endemic to Southern Western Ghats. The species was first reported and described from Anamalai (Beddome, 1878). After 50 years the species was again spotted from Valparai (Anamalai hill range) (Roux, 1928). Later the species was recorded from Kalakkad-Mundanthurai Tiger Reserve (Vasudevan, 1997) and Periyar Tiger Reserve (Daltry and Martin, 1997), after 68 years. In 2004 it was again spotted from Mathikettan Shola National Park (Nixon and Bhuthy, 2007). After nine years the frog was again encountered in the Anamalai Tiger Reserve (Kanagavel and Tapley, 2013) and Marayoor (Palot and Sureshan, 2017). The population status in all the known locations is unknown. Most of the records are sightings of one or two individuals, only the records from Periyar (8 individuals) and Marayoor (20 individuals) are exceptions.

During this study, I have recorded a total of 12 individuals of Galaxy Frog out of which 11 were from Marayoor and 1 from Mathikettan Shola National Park. The ventral colour patterns in all the individuals were photographed in case the images can be used for future population estimation. This is one of the rarest amphibians in India and it is one of the 13 robust priority EDGE amphibians around the globe (Gumbs et al., 2018).

The Galaxy Frog is assessed as Endangered (B1 ab(iii)) category of the IUCN Red List (Biju et al., 2004). (B1 - Extent of occurrence is less than 5000 km², a - severely fragmented habitat, and b (iii) – continuing decline in the quality of habitat).



Distribution map:



1.2.1 Global distribution: Only in the Southern Western Ghats, India

Country	Population estimate (plus references)	Distribution	Population trend (plus references)
India	Unknown	Southern Western Ghats (Mainly known from four subpopulations viz., Wayanad (north of Palghat Gap), Anamalai (Anamalai, Valparai, Marayoor, Mathikettan SNP), Periyar and Agasthyamalai (Kalakkad Mundanthurai TR) subpopulations in the south of Palghat Gap	Not known



1.2.2 Local distribution in India:

Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Tamil Nadu	Anamalai	High (Inside Anamalai Tiger Reserve)	Not known	Beddome, 1878	Mentioned a few specimens
Tamil Nadu	Valparai	Low (Outside Protected Area network)	Not known	Roux, 1928	--
Tamil Nadu	Kalakkad-Mundanthurai Tiger Reserve	High (Inside Protected Area)	1	Vasudevan, 1997	Recorded one individual
Kerala	Periyar	High (Inside Periyar Tiger Reserve)	8	Daltry and Martin, 1997	Recorded 9 individuals
Tamil Nadu	Valparai	Low (Outside Protected Area network)	1	Ishwar, 2000	Recorded one individual
Kerala	Mathikettan Shola National Park	High (Inside Protected Area)	2	Nixon and Bhupathy, 2007	Recorded 2 individuals
Tamil Nadu	Anamalai Tiger Reserve	High (Inside Protected Area)	2	Kanagavel and Tapley, 2013	Recorded 2 individuals
Kerala	Marayoor	Moderate (Outside Protected Area network but under Marayoor Sandalwood Division – high level of protection for sandalwood)	20	Palot and Sureshan, 2017	Recorded 20 individuals
Kerala	Marayoor	Moderate (Outside Protected Area network but under Marayoor Sandalwood Division – high level of protection for sandalwood)	1	Personal observation, 2013	Recorded one individual
Kerala	Chinnar Wildlife Sanctuary	High (Inside Protected Area)	1	Personal observation, 2015	Recorded one individual
Kerala	Eravikulam National Park	High (Inside Protected Area)	2	Personal observation, 2015	Recorded two individuals



Kerala	Wayanad	Moderate (Outside Protected Area network)	1	Personal observation, 2016	Recorded one individual
Kerala	Marayoor	Moderate (Outside Protected Area network but under Marayoor Sandalwood Division – high level of protection for sandalwood)	11	Current study	Recorded 11 individuals
Kerala	Mathikettan Shola National Park	High (Inside Protected Area)	1	Current study	Recorded one individual

1.3 Protection status:

So far, this species is not included in any of the schedules of the Wildlife (Protection) Act (1972) in India and also not listed under any appendices of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora).

There are no species-specific protection measures to conserve this frog, but it is protected under the National Forest Policy, 1998 and Biological Diversity Act, 2002. This act ensures the protection of the whole biodiversity in India. 90% of its known distribution range is inside Protected Areas so the species and its habitat is protected under the laws of Protected Area networks.

Proposed the Galaxy Frog as the flagship species of Mathikettan Shola National Park (MSNP) a Protected Area in Kerala, India. MSNP is one of the known locations of the Galaxy Frog. Two individuals of Galaxy Frog were recorded by Nixon and Bhupathy in 2004. During our fieldwork in MSNP in December 2019, we recorded the species again after 15 years. With the support from the Forest Department staff at MSNP I had submitted a proposal for declaring the Galaxy Frog as the flagship species. The proposal is almost accepted and if there are no last-minute objections the Galaxy Frog will become the flagship species of MSNP. This is only the second amphibian flagship species in the country and first for the State of Kerala. This status will help to improve awareness and increase conservation attention not only of Galaxy Frog but all the other amphibians in Kerala and potentially the country.

1.4 Ecology, behaviour and habitat requirements:

The Galaxy Frogs are found above 1000 msl (Palot and Sureshan, 2017) in the tropical evergreen forest, wet temperate forests and semi-evergreen forests (Beddome, 1878; Nixon and Bhupathy, 2007; Kanagavel and Tapley, 2013; Palot and Sureshan, 2017) up to 2000 msl. Most of its records were very close to perennial streams but Nixon and Bhupathy (2007) recorded it around 200 meters away from any perennial stream. During this study, the species was only recorded from under the rotting logs and the animals were inactive and motionless and no interactions between individuals were recorded. Kanagavel and Tapley (2013) reported its defensive behaviour to avoid injuries from predators by staying motionless and bending/arching its back and



keeping its limbs close to the body. There are no other studies or reports on any other behavioural observation of the Galaxy Frog.

Almost all the records (including my observations and personal communications) of this species were from under decaying or rotting logs. This frog exhibits a preference to certain types of rotting log. To understanding their microhabitat preference, I collected data on the condition of the rotting log, size of the log (girth), length of the log, distance to water from the log, soil depth, leaf litter depth, etc. I hope by end of this study I can provide details on its specific habitat requirements.

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
Firewood collection for house-hold use	The firewood was mainly collected for household use since most of the human settlements are far away from main roads and access to Liquefied Petroleum Gas is difficult. Small branches and twigs were collected for household use. Since the Galaxy Frog has not been associated with small branches or twigs, I feel it is not going to make major impacts. However, the disturbance created by the people during the firewood collection will be a problem for the species. A collection of small branches and twigs will open up its refugia.	Medium	5.3.3 Unintentional effects: subsistence/ small scale (species being assessed is not the target) [harvest]
Firewood collection for lemon grass oil extraction	Close to my major study area Marayoor, the local community is engaged in lemongrass oil extraction. For extracting 300-500 ml of lemongrass oil, one full barrel of lemongrass is needed as well as three hours of continuous fire, where large pieces of wood (close to 1-1.5 m length with more than 50cm girth) are burnt. Therefore, the main trunk portion of fallen trees were collected from the forest area close to their field to meet their need. Even though the oil extraction is seasonal the freshly fallen logs were completely removed from the habitat. This is one of the major threats since the animal is mostly recorded from under the rotting logs.	Critical	5.3.4 Unintentional effects: large scale (species being assessed is not the target) [harvest]
Disease-chytridiomycosis	<i>Batrachochytrium dendrobatidis</i> is the causative agent of the infectious disease chytridiomycosis and which is reported from the amphibians in the Western Ghats, but so	Critical	8.1 Invasive non-native/ alien species/ diseases



	<p>far, a lethal strain and connected amphibian decline was not reported from India. This fungal disease is fatal to amphibians and known to be one of the major threat which leads to decline of 48% of the amphibian species with extinction. Therefore, the disease surveillance is really important to safeguard the biodiversity.</p>		8.1.2 Named species
Pesticide	<p>In the cardamom and tea plantations the usage of pesticide is very high. The natural vegetation inside the plantations and the forest areas below the plantations will be affected. We don't know the level of impact but the soil and water quality is affected from the pesticide usage.</p>	Unknown	<p>9.3 Agricultural & forestry effluents</p> <p>9.3.3 Herbicides & pesticides</p>
Conversion of forest area or habitat modification	<p>The similar kind of habitats in Galaxy Frogs distribution range (outside protected area) is severely fragmented because of the monoculture plantations. The remaining smaller natural habitats were cleared for expanding tea, cardamom and coffee plantations.</p> <p>We don't know whether the Galaxy Frog is present outside protected areas or not and there are restrictions in clearing shola forests inside the plantations.</p>	Medium	<p>2.1.3 Agro-industry farming</p> <p>7.3 Other ecosystem modifications</p>
Landslide	<p>In the recent past, the weather patterns changed drastically especially the rainfall pattern. Every year we are receiving an almost similar amount of rainfall but now we are receiving it in a short period. Sometimes continuous heavy rainfall lasts for more than a week and this leads to soil piping effect and further landslides. The shola forests are mostly affected by landslides because the sholas are only found in valleys within grassland. When the landslide occurs the entire valley will be damaged. Sometimes the entire shola will be cleared due to the slide happening above the shola patch, and if it is a larger shola then the major part close to the streams will be affected. Since the Galaxy Frog is frequently found under the rotting logs which are close to the streams, this will be a major issue to its remaining population.</p> <p>The farming activities, alterations to the habitat like making new roads, widening the existing road by cutting the edges, uprooting of plants/trees (plants like lantana and trees like eucalyptus and black wattle plantation), or</p>	High	<p>10.3 Avalanches/ landslides</p>



	clearing vegetation close to the shola forests are triggering the landslips and slides.		
Flood	Due to the rainfall pattern changes and receiving heavy rainfall in a short period leads to floods. Especially the marshy areas between mountain ranges in the forest. This will inundate the fallen logs and microhabitat suitable for Galaxy Frog in that area.	Medium	11.4 Storms & flooding
Fire	In the current scenario, the chance for natural fire incidents is uncommon and most of the incidents are human-induced or manmade. In most of the Protected Areas, the managers' practice controlled burning activity to maintain a buffer zone between the forest and private lands every year before summer (fire season). In some parks, for the conservation of higher taxa like herbivores, controlled burning is used to ensure the supply of fodder. This reduces the habitat quality. Many of the sholas are impacted by fire management regimes.	High	7.1.1 Increase in fire frequency/intensity
Scientific collection pressure	There are very few preserved specimens of this species in museums when compared to other frog species, which could be because of its rarity. Though the species faces collection pressure (Kanagavel and Tapley, 2013). Since we don't know the population size and status of this species, the collection of one or two individuals also will be a problem and if they were collecting all the individuals then this is going to be a major threat.	Medium	5.1.1 Intentional use (species being assessed is the target)
Photographers/human induced disturbances	The wildlife photographers especially the herp enthusiasts and macro photographers are really interested in this beautiful frog. The photographers are visiting one of the Galaxy Frogs known distribution range for getting photographs. Since the species is found under rotting logs, to take photographs they have to disturb the animal and its microclimate. This will be deleterious to the animal. Since we don't know the population size of Galaxy Frog, threats to each and every individual will be a problem for conservation.	High	6.1 Recreational activities 6.3 Work & other activities



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)
India	Local community	They are dependent on the Galaxy Frogs habitat for non-timber forest products collection	Firewood collection, honey collection, amber collection	Negative	High/Critical
India	Kerala Forest Department Staff	In one of the Galaxy frogs distribution range, we have proposed a flagship species plan and the authorities accepted it and added it to the Management Plan	I have done capacity-building training for the staff and including conservation challenges and measures to protect Galaxy Frog. They are very interested and motivated to monitor and preserve the fallen logs and microclimates in their protected area	Positive	Critical
India	Researchers	Herpetofaunal and ant researchers are sampling the microhabitats suitable for Galaxy Frog. Through the protection of the Galaxy Frog, its entire habitat will be protected therefore their	Field surveys in Galaxy Frogs distribution range (Negative: Disturbance to the Galaxy Frogs habitat; Positive: Opportunistic sighting record will be shared)	Both	High



		interested fauna will also be protected			
India	School and College Students	The students are getting awareness classes, it helps them to understand their surrounding in a much better way and benefitted to become researchers, naturalists and forest department staff	Receiving awareness classes	Positive	Medium
India	Naturalists	Naturalists are interested in taking herp enthusiasts and macro photographers to the Galaxy Frogs location for taking pictures and earning money. The stable population of Galaxy Frog is a chance for earning more money in the long run	Taking other naturalists and photographers to the distribution area with forest department staff	Both	High/ Medium
India	Wildlife Photographers (especially herp or macro enthusiasts)	Photographers are interested in getting photographs of this rare and beautiful species	Visiting the Galaxy Frog distribution area for taking pictures with forest department staff	Both	High/ Medium
India	Plantation owners	Interested in plantation management	Expanding the tea, cardamom and coffee	Both	High/ Medium



		and more yield. Plantation owners can use the presence of Galaxy Frog in their property as pride to get more attention and business	plantation area some of the smaller natural habitats are cleared. For improving the road network new roads were created and some roads are widened. The pesticide usage in plantations like cardamom and tea.		
India	Plantation workers	Plantation workers are more in to the management activities in the plantation	Some plantation workers believe that the frogs eat their yield like the cardmom and they don't like the frogs, this was reported by Kanagavel <i>et al.</i> , 2017 from areas close to the distribution range of Galaxy Frog	Negative	High/ Medium
India	Kerala Forest Research Institute	Researcher from the institute is involved in this project	The institute is well known to the forest department staff therefore getting permission to conduct field trips and arranging logistics in the field are comparatively easy	Positive	High
Switzerland	Fondation Segre	Supporting and giving funding for studying lesser-known EDGE species	Giving funding and scale-up awards	Positive	Critical



		and helps to protect species with a long and strong evolutionary history			
United Kingdom	EDGE, ZSL	Gathering funds and creating opportunities to study and protect lesser-known evolutionarily distinct and globally endangered species like Galaxy Frog	Moulding the fellows to do better conservation projects. Giving training, online courses to improve our skills, getting contacts from different parts of the globe, supporting to get further funding, giving support to improve our research and to publish the results. The tools course helped us to mould our projects into a great project and also moulded us to become better human beings, we got chance to know different cultures, values and life	Positive	Critical
United Kingdom	ZSL	ZSL founded and hosts the EDGE of Existence programme	Giving support to the EDGE team and through that, the fellows are getting support	Positive	Critical



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	The species is very rarely encountered and is not well known by most of the local communities so well (Kanagavel et al., 2020). Kanagavel et al., 2020 reported the Kadar community is using this species as a cure of differently-abled who can't walk, putting this frog in a sack and wearing it around the neck. Most of the indigenous community people believe in god and their god lives in the forest close to their settlements. During their festival times, they are used to visit holy spots inside the forest and they do the rituals and worship. Some shola forests are believed to be under the control of evils and people don't even get inside that forest.	Since the local people do not know the species and its microhabitat it is difficult to stop the local community from participating in activities that may have deleterious effects on the species and its habitat.	Through CEPA campaigns we can improve their understanding of the Galaxy Frog and its habitat and how the conservation of Galaxy Frog will support the local community. Create a sense of pride among the indigenous community in Galaxy Frogs' presence in the forest close to them. We can give the Galaxy Frog a god's impression and making it an ambassador of a healthy shola ecosystem. Improve their awareness of healthy sholas and goods and services they are receiving from it through CEPA. This will help to improve the awareness and getting support for this project and conservation.
Economic implications	Since most of the known distribution range of Galaxy Frog is from Protected Area's the presence of Galaxy Frog should be highlighted in their websites, brochures/leaflets to attract more people to these destinations. Especially	If the frog is distributed in the tourism zone then the conservation of that sub-population would be challenging. So the Galaxy	Its presence can attract more tourists and photographers who are interested in herpetology and macro photography and this will improve the revenue from tourism and this can be used for more and more



	the people who are interested in photography and herpetology. This boosts the eco-tourism opportunities and revenue.	Frog is not recorded from the tourism zone of any of the Protected Areas and its distribution range is away from tourism zones.	CEPA campaigns and to create a sense of pride (its presence is a sign of healthy habitat) among the protection staff and naturalists and biologists associated with the respective Protected Area.
Existing conservation measures	<p>There is no species-specific conservation measure for this species but it is protected under the National Forest Policy, 1998 and Biological Diversity Act, 2002 (all the biodiversity is protected under this act in India but not as strong as the Wildlife (Protection) Act, 1972).</p> <p>Since most of its known distribution range is inside Protected Areas the species and their habitat is protected from manmade deleterious activities.</p> <p>So far there are no species-specific protection strategies or protocols for the conservation of the Galaxy Frog.</p>	<p>Since the species is very rare to see its micro-habitat is not given any priority while doing smaller management interventions in the forest like building pores check dams, removing or replacing fallen logs for controlled burning activities.</p>	<p>We proposed the Galaxy Frog as the Flagship Species of one National park in Kerala from where we found this frog during our surveys. More than 90% of the procedures are over. Once it is declared as the flagship species then we can use the Galaxy Frog as the ambassador of amphibians in the region to create awareness and ensure the protection of Galaxy Frog and other amphibians in the region and subsequently in the country itself. We can conduct pride campaigns too. I am planning to submit a request to protect this species under Wildlife (Protection) Act, 1972.</p>
Administrative/ political set-up	Any wildlife in India is protected under Forest Policy, 1998 act and Biological Diversity Act, 2002. But if the species fall under the schedules of the Wildlife (Protection) Act, 1972	The majority of the field staff are not aware of the important flora and fauna present in the Protected Area where they are	Capacity building training is the best way to avoid these kinds of issues. Creating posters of the important species that facing severe threat and protected under



	<p>which will make a great difference in its protection. All illegal collection and keeping it in captivity and even collection for the scientific purpose will also restricted.</p> <p>The Protected Areas are well protected and managed. Each Protected Area will be managed by at least one Wildlife Warden (WW) and under that, there will be one or more Assistant Wildlife Wardens (AWW), next to that Deputy Forest Range Officer and then there will be many Section Forest Officers, the number is based on the size of the Protected Area, Under the Section Forest Officer (SFO) there will be 5-10 Beat Forest Officers (BFO) and next to that there will be many Forest Watchers. The SFO's, BFO's and Forest Watchers are the main strength of field-level protection activities like perambulation, doing surveys, camping, border protection, checking wildlife crimes, doing check post duties, etc. The WW and AWW are mostly in the administrative works but they are also used to involve in the protection activities like perambulation, camping, border checking, etc. State biodiversity boards are providing funding for scientific studies.</p>	<p>working. But some of the staff are in charge or involved in nature education training and camps for students (school and college) and these staff are mostly well studied about the biodiversity wealth. These staff can identify some of the important and rare flora and fauna but the other staff can't. The Wildlife (Protection) Act, 1972 restricts the collection of animals in the certain schedule even for scientific studies. Since many of the staff can't identify the lesser fauna at to species level it is hard to take action against illegal collection. Very hard to getting funding for conducting species-specific studies and studying very rare species.</p>	<p>Wildlife (Protection) Act, 1972 with photos and messages like 'it is restricted from collection and handling' etc. and displaying it in each forest office including anti-poaching camps. Giving capacity building training to all the forest department staff including WW and AWW to identify the scheduled species from the field. There should be follow-up programmes to improve their skills. Adding the photographs of these species in the posters, pamphlets, or in the entry tickets of the Protected Area. Therefore the staff will get a chance to get familiar with the species. Pride campaigns and setting rare species as an ambassador for conservation will change their views of rare species and may provide funding for studies.</p>
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Local expertise and interest	<p>Some of the local naturalists and wildlife photographers are aware of some of Galaxy Frogs' locations. These naturalists are taking photographers to the place where it is found for taking photos. Since we don't know the population size and population trend of this species threat to one individual frog or its habitat counts.</p>	<p>If this is creating any threat to the habitat or to the animal itself, the forest department can't restrict this activity by using the Forest Policy, 1998 and Biological Diversity Act, 2002 acts. Even in the Wildlife Sanctuaries, the laws are allowing the photographers to go inside the Protected Area for photography since it supports conservation and creating awareness. If the species is protected under the Wildlife (Protection) Act, 1972 then this kind of act can be restricted and even the populations outside Protected Areas will also get protection.</p>	<p>Creating awareness among the naturalists about the importance of conserving each individual of Galaxy Frog and its microhabitat from threat and joining hands with them to benefit the conservation of Galaxy Frog. There is an opportunity for naturalists to act as Galaxy Frog guardians if they become aware of and interested in this species.</p>
Resources	<p>The state biodiversity board provides funding for conducting scientific studies. This is the only funding source from the state government. For conducting long-term conservation activities with the help of local communities we need more funding.</p>	<p>Getting the government funding for a species-specific study is a hard task and the fund provided is not enough for conducting long term studies. Moreover, the fund can be</p>	<p>Once the Galaxy Frog is declared as the flagship species then there is a very high chance of conducting pride campaigns. Making the Galaxy Frog an ambassador for the conservation of other amphibians in the state and the country. This will be a</p>



	<p>Funding from international agencies like the EDGE Fellowship, Mohamed bin Zayed Species Conservation Fund, The Rufford Foundation, World Wide Fund for Nature, National Geographic Society, Conservation Leadership Programme, etc.</p>	<p>stopped in difficult situations like any natural calamities (like a flood), COVID, etc. It is difficult to raise funds for studying very rare species like Galaxy Frog, EDGE fellowship and Mohamed bin Zayed Species Conservation Fund are some of the options for getting funding support.</p>	<p>pride for the state biodiversity board too. Therefore there is a chance for getting funding from the state biodiversity board to sustain short-term goals. Pride campaigns, CEPA campaigns, publications from the current study can be used as stepping stones for receiving international grants.</p>
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2. ACTION PROGRAMME

Vision (30-50 years)	
Achieving a stable population of Galaxy Frog through the conservation of its habitat by supporting and getting support from local indigenous communities	
Goal(s) (5-10 years)	
Improving the protection of Galaxy Frog and it's habitat (all the flora and fauna) both inside and outside Protected Area network through flagship species conservation initiatives in collaboration with the Forest Department and local community	
Objectives	Prioritisation (low, medium, high or critical)
Study the detailed distribution range of Galaxy Frogs across the Western Ghats and validating the sub-populations using molecular taxonomic tools	Critical
A detailed study on the Galaxy Frogs microhabitat, breeding behaviour, and communication	Critical
A detailed study on the local ecological knowledge and mapping local indigenous community	Critical
Understanding the major means of revenue generated by local communities and its impact on the Galaxy Frog and its habitat	Critical
Study the major threats faced by the Galaxy Frog and its habitat	Critical
Prepare threat specific control measures to protect the Galaxy Frog and its habitat	Critical
Monitoring the population size and status of Galaxy Frog in each sub-populations	Critical
Submit a proposal to schedule the Galaxy Frog under the Wildlife (Protection) Act, 1972	High
Forming the Guardians of Galaxy Frog group and give capacity building training	Medium
Preparing a more specific IUCN assessment and submitting it to the concerned authorities	High



Activities	Country / region	Priority (low, medium, high or critical)	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: Study the detailed distribution range of Galaxy Frogs across Western Ghats and validating the sub-populations using molecular taxonomic tools								
1.1: Conducting background research and species distribution modelling	India/ Southern Western Ghats	Critical	500 GBP	2021 Refining it in every two years for better prediction	Researcher	Maps prepared after species distribution modelling Additional distribution records based modelling	Very low number of distribution details to run a better prediction model	Lab work
1.2: Extensive distribution surveys	India/ Southern Western Ghats	Critical	30,000 GBP	5 years	Researcher RA's Forest Department Staff	New distribution records Updated distribution maps Photographs from field Scientific publications	Getting permission to conduct field surveys in respective states in India Surveys getting delayed or conduct surveys in very less area due to natural calamities like flood, landslide, etc. and due to Pandemics like COVID-19, and due to political issues between different states	Fieldwork



1.3: Collecting specimens from sub-populations separated by major geographical barriers and testing the genetic variations	India/ Southern Western Ghats	High	5,000 GBP	5 years	Researcher RA's	Photographs and preserved specimens collected from different sub- populations GeneBank submission details Research and popular articles	Unable to get collection permission Unable to find Galaxy Frog from different locations There is no genetic variation among sub- populations	Fieldwork and lab work
Objective 2: Detailed study on the Galaxy Frogs microhabitat, breeding behaviour and communication								
2.1: Collecting all the different microhabitat variables and environmental variables during each sighting	India/ Southern Western Ghats	Critical	200 GBP	5 years	Researcher RA's	Photographs taken from field during data collection Datasheets	Not enough Galaxy Frogs were recorded during the surveys	Fieldwork
2.2: Collecting data on the breeding biology	India/ Southern Western Ghats	Critical	200 GBP	5 years	Researcher RA's	Photographs of breeding pairs and eggs	If the breeding is not observed, since it is an extremely rare species Getting collection permission	Fieldwork
2.3: Collecting tadpoles and describing it	India/ Southern Western Ghats	Critical	1000 GBP	5 years	Researcher	Photographs of collected tadpoles Results of description	No eggs or tadpoles observed Getting collection permission	Fieldwork and lab work



2.4: Description of vocalization	India/ Southern Western Ghats	Critical	500 GBP	5 years	Researcher RA's	Spectrograms prepared Research articles	No recordings or very low number of recordings to do the analysis	Fieldwork and lab work
Objective 3: Detailed study on the local ecological knowledge and mapping local indigenous community								
3.1: Survey and mapping of local indigenous community settlements close to the Galaxy Frog's distribution	India/ Southern Western Ghats	Critical	3,000 GBP	5 years (it can be done along with the activity 1.2 Galaxy Frog distribution surveys)	Researcher RA's Local community members Government officers (like Village, Scheduled Tribes Development Department)	Materials of background research Maps prepared after the indigenous community settlement surveys	Lack of cooperation of local community members and government officers Remoteness of community settlements Landslides or any large mammals in the access route will also delay the surveys	Fieldwork and lab work
3.2: Local ecological knowledge surveys and preparation of reports and dissemination of results	India/ Southern Western Ghats	Critical	5,000 GBP	5 years (it can be done along with the Galaxy Frog distribution surveys)	Researcher RA's Local community members Key informants Government officers (like Village, Scheduled Tribes Development Department)	Materials of background research Results of questionnaire surveys Publications both scientific and popular	Lack of cooperation of local community members and government officers Remoteness of community settlements Struggles to find key informants Landslides or any large mammals in the access route will also delay the surveys	Fieldwork and lab work



Objective 4: Understanding the major means of revenue generated by local communities and its impact on the Galaxy Frog and its habitat								
4.1: Questionnaire surveys and field surveys to quantify the positive and negative interactions and dissemination of results	India/ Southern Western Ghats	Critical	5,000 GBP	8 years (questionnaire surveys can be done along with the LEK surveys but need more fieldwork to find out and quantify the positive and negative interactions)	Researcher RA's Local community members Key informants Government officers (like Village, Scheduled Tribes Development Department)	Materials of background research Results of questionnaire surveys Photographs from field	Lack of cooperation of local community members and government officers Remoteness of community settlements Struggles to find key informants Landslides or any large mammals in the access route will also delay the surveys	Fieldwork and lab work
Objective 5: Study the major threats faced by the Galaxy Frog and its habitat								
5.1: Extensive field surveys to study the threats to the habitat and to the animal and quantifying the identified threats (including details from activity 2.2 and 3.1)	India/ Southern Western Ghats	Critical	2,000 GBP	5 years (it can be done along with the activity 1.2 Galaxy Frog distribution surveys)	Researcher RA's Local community members	Datasheets collected during surveys Photographs collected during surveys Publications on threats both scientific and popular	Getting permission to conduct field surveys in respective states in India Surveys getting delayed or conduct surveys in very less area due to natural calamities like flood, landslide, etc. and due to Pandemics like COVID-19, and due to political issues between different states	Fieldwork



5.2: Pathogen surveillance including <i>Batrachochytrium dendrobatidis</i>	India/ Southern Western Ghats	Critical	2,700 GBP	5 years (data can be collected along with the activity 1.2 Galaxy Frog distribution surveys and the screening done in labs)	Researcher RA's	The swabs collected from different locations Scientific and popular articles published based on the results	Getting permission to conduct field surveys in respective states in India Very few individuals of Galaxy Frog were recorded during the surveys Surveys getting delayed or conduct surveys in very less area due to natural calamities like flood, landslide etc. and due to Pandemics like COVID-19, and due to political issues between different states	Fieldwork and lab work
Objective 6: Prepare threat specific control measures to protect the Galaxy Frog and its habitat								
6.1: Prepare database for area specific threats to the Galaxy Frog and its habitat (with the help of activity 3.1, 4.1 and 4.2)	India/ Southern Western Ghats	Critical	1,500 GBP	5 years	Researcher RA's Local community members Key informants	Materials prepared after analysing the data collected from activity 3.1, 4.1 and 4.2	Not enough quantitative data collected from activity 3.1, 4.1 and 4.2 to list out area-specific threats Any issues in the successful completion of activities 3.1, 4.1 and 4.2 will affect the study on area-specific threats	Fieldwork and lab work



6.2: Finding out long term preventive measures to each area-specific threats with the help of activity 6.1 and implementing them in the field and choosing the most successful ones (the control measures will be added to the database (activity 6.1) for each area)	India/ Southern Western Ghats	Critical	10,000 GBP	10-15 years	Researcher RA's Local community members Forest Department Local Cooperative societies Eco development committees	Materials prepared on the preventive measures Photographs from field Reports on failure and success of different preventive measures	Not enough quantitative data to find out the threats Lack of cooperation from the local community members and other related departments like Forest Department, Village Office, Agriculture Development Office, etc.	Fieldwork and lab work
6.3: Giving the flagship status to Galaxy Frog for getting more support and better conservation (95% of the flagship species proposal is over) and giving capacity building training to the Forest department staff (with continuous monitoring and follow up surveys), pre and post-evaluation questionnaire surveys	India/ Southern Western Ghats	Critical	5,000 GBP	7 years	Forest Department	Materials prepared for trainings Registration details of trainees Photographs taken during the capacity building training	Lack of cooperation from Forest Department	Fieldwork and lab work



Objective 7: Monitoring the population size and status of Galaxy Frog in each sub-populations								
7.1: Collecting ventral markings of all the Galaxy Frogs recorded during the survey	India/ Southern Western Ghats	Critical	1,000 GBP	5 years	Researcher RA's	Photographs of ventral markings of collected	Not enough or no Galaxy Frog were recorded during the surveys	Fieldwork and lab work
7.2: Capture mark-recapture studies to monitor population status and trend	India/ Southern Western Ghats	Critical	10,000 GBP	15-20 years	Researcher RA's	Photographs of recaptured Galaxy Frogs Results of capture mark- recapture studies	Not enough or no marked Galaxy Frog were recorded during the surveys	Fieldwork and lab work
7.3: Dissemination of results with marking the sub-populations which need immediate attention	India/ Southern Western Ghats	High	200 GBP	Less than 1 year, after completing the activity 6.2	Researcher RA's	Research articles Popular articles	Not enough or no marked Galaxy Frog were recorded during the surveys	Lab work
Objective 8: Submit a proposal to schedule the Galaxy Frog under the Wildlife (Protection) Act, 1972								
8.1: Preparing a proposal considering its distribution range, threats, breeding biology, population status and collection pressure	India/ Southern Western Ghats	High	500 GBP	6 years	Researcher Forest Department National biodiversity authority	Prepared proposal	Not enough data prepare strong proposal	Lab work



Objective 9: Forming the Guardians of Galaxy Frog group and give capacity building training								
9.1: The members will be selected based on their interest (marked during questionnaire surveys, CEPA campaigns) and giving capacity building training	India/ Southern Western Ghats	Medium	3,000 GBP	7 years	Local indigenous community Forest Department School and college students and teachers Naturalists Researchers/biologists Photographers	Meeting minutes Photographs taken during capacity building training	People not showing interest to cooperate	Fieldwork and social surveys
Objective 10: Preparing a more specific IUCN assessment (including EOO) and submitting it to the concerned authorities								
10.1: Drafting a new updated IUCN assessment based on new distribution details, population size, population trend, extent of occurrence, more details on its biology and threats	India/ Southern Western Ghats	High	200 GBP	6 years	Researcher Supervisor Funding agency members IUCN panel	Prepared assessment	Not enough data generated during the study to draft a IUCN assessment	Fieldwork and lab work



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