ZSL
LET'S WORK FOR WILDLIFE

EDGE

EVOLUTIONARILLY DISTINCT & GLOBALLY ENDANGERED

Survival Blueprint

Elvira rat
Cremnomys elvira

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1. STATUS REVIEW

1.1 Taxonomy:

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Rodentia
Family: Muridae > Old World mice and rats, gerbils, whistling rats, and relatives.
Subfamily: Murinae > Old World rats and mice.
Genus: Cremnomys > Indian rock rats.

Scientific name: *Cremnomys Elvira*

Common name: Large rock rat or Elvira rat

Local name: Not available

The genus *Cremnomys* is endemic to India and includes two described species, namely: *Cremnomys elvira* (Elvira Rat) and *Cremnomys cutchicus* (Cutch Rock Rat). *C. elvira* is sympatric in distribution and has a similar morphology to *C. cutchicus* in the Eastern Ghats of India. Its global distribution is restricted to a small area in Kurumbapatti, Salem District, Tamil Nadu, India. (Ellerman 1947; Agrawal 2000). It occurs only at the type locality and nowhere else in the World. It was presumed that the population size is very small and the habitat is highly restricted (Ellerman, 1947; Molur and Kennerley 2016). No recent studies have been conducted about the existence of this rat in the type locality after the Ellerman's study in 1947.

1.2 Distribution and population status:

IUCN Redlist Category: Critically Endangered under criteria B1ab(iii)+2ab(iii).

The Elvira Rat is endemic to the type locality, Kurumbapatti, Salem District in Eastern Ghats of Tamil Nadu (Ellereman, 1947).

Sir. John Ellerman described *C. elvira* based on two specimens which were collected by N.A. Baptista in 1929 from Kurumbapatti, Salem District, in Eastern Ghats of Tamil Nadu, India. Two specimens of *C. elvira* referred by Ellerman come from the rocky areas (as per the single available lithographic image of Zoological Survey of India).

No studies were conducted in the type locality till 2013. In the year of 2013 a team of researchers from Tamil Nadu tried to locate the Elvira rat and failed due to low trapping efforts and poor taxonomic identity (Kumar 2015). In 2019-21, the research team found individuals understood to be Elvira rats (based on morphological and genetic data) from the type locality with live photographs. A total of 19 individuals were recorded around the type locality in Salem, Tamil Nadu

(Brawin Kumar pers comm.). The populations are very small and believed to be rare and possibility of local extinction is high (Brawin Kumar pers comm.).

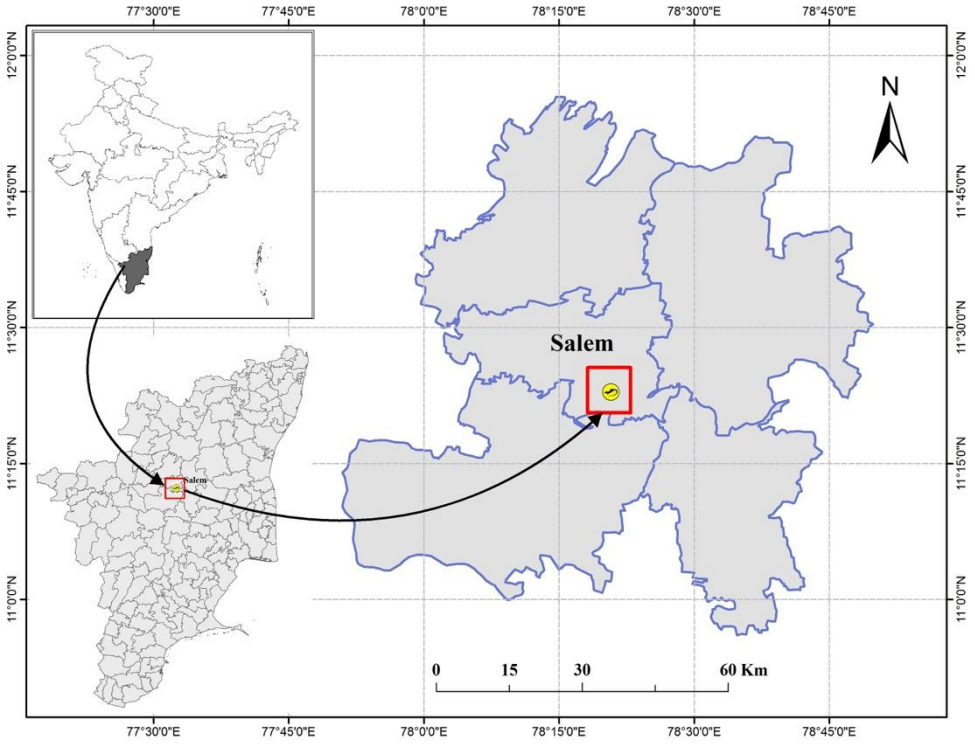

Fig 1. The distribution of the species is confined to the Salem district in Tamil Nadu, India

1.2.1 Global distribution:

Country	Population estimates (plus references)	Distribution	Population trend (plus, references)	Notes
India	Not estimated.	Known from a small area (10 km) in the Shervaroyan Hills, Salem, Tamil Nadu, India.	Unknown	The species is known from its type locality with the very small range and low population size.

1.2.2 Local distribution in India:

Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Salem District / Tamil Nadu	Shervaroyan Hills, Salem, Tamil Nadu. 1). Kurumbapatti RF 2). Kiliyur RF 3). Ghat road RF 4). Kapputhi RF 5). Puliyankadai RF 6). Arasankadai RF 7). Narthananedu RF	Reserved Forests with low level of protection	Not estimated	Brawin Kumar unpub. data	Totally recorded 19 Elvira rats after a yearlong survey at the type locality.

1.3 Protection status:

The only known habitat of the Elvira rat species is located in a small single range in Shervaroyan Hills, Salem District, Tamil Nadu, India. The Elvira rats are not protected by any local or national laws, presumably due to lack of information and importance. This indicates the urgency to establish a conservation plan, understanding the threats, monitor the remaining populations, increase the local awareness, and protect the habitats. On the Indian Wildlife Protection Act, 1972, the *C. elvira* is listed in Schedule V (Vermin) with all other Indian rodents. It mentioned "Rats" as vermin meaning animals harmful for crops, along with all rats, mice and crows. https://legislative.gov.in/sites/default/files/A1972-53_0.pdf.

The Elvira rat is the only IUCN Red List Critically Endangered mammal present in Tamil Nadu (Kamalakannan and Nameer 2019). No conservation actions are currently in place for this species and urgent research are necessary to understand its ecological needs (Sarkar, 2011) and existing threats. *C. elvira* distribution is known from a single location in India and it qualifies in the Alliance for Zero Extinction list (AZE). *C. elvira* is an evolutionarily distinct species (EDGE Rank 125) and one of the high priority conservation mammals in India (Isaac et al. 2007).

1.4 Ecology, behaviour and habitat requirements:

Very little is known about the ecology of *C. elvira*. As noted earlier, Ellerman informed that, Elvira rat habitats are very similar as Cutch rock rats.

Behaviour: The behaviour of the Elvira is unknown as the species was not studied in the past because of its rarity. The recently caught specimens of *C. elvira* were trapped in the rocky areas. The larger rocky cervices with multiple openings are the only known habitat of Elvira rats in Shervaroy hills. Elvira rats are nocturnal, they hide and shelters inside the rock holes. At least five individuals of Elvira rat were trapped from vicinity of rocky areas and with a nest inside cervices, indicating that they use the concealed rocky areas to protect their nests. The long tail is very useful for the movements in rocks and also for balance, as the rats jump and move very quickly around the rock

habitat. The ears are the most used part for sensing the surroundings, and it is noted that, Elvira rats are often rotate the ears to sense the sounds. B. Kumar directly observed the self-grooming of Elvira rats in the natural habitat- first animal licked hind foot and using the wet hindfoot it started grooming the body fur, whiskers, tail and genitalia. Further, they trying to find a highest rock slope or flat surface and again started the grooming. Grooming continued for 10-15 minutes. Further, sleeping on the top of the rock was observed, while sleeping both the forehands and hind foots are inside the body. If any small sounds occurred, they are not in a hurry to run, rather they rotate their ear to observe and respond it to the sounds. But they are very sensitive to sound (B Kumar, unpub. data).

Habitat requirements: These obligate rock specialists live exclusively within rocks or rocky crevices in few isolated areas in Shervaroys, Salem, India. The vegetation includes, moisture deciduous forests, with the rocky, cave dominated mountains. Temperature ranges from 25°C -30 °C. From the observations recorded the minimum percentage of grass cover was observed in large rocks and boulders (0 %) and the maximum percentage of grass was observed in the plantation (60 %). The Elvira rats prefer mostly in minimum grass cover rocky sites with dense bushes dominated by rocks. Elvira rats prefer stones (20 – 60 cm); Boulders (61 cm – 2 m) and Large boulders (more than 2 m) in the rocky habitats. Based on the field work, it is clear that, Elvira rats mostly prefer big rock boulders with many entrances (Brawin, unpub. data).

1. **Kiliyur RF**: (800-1120 m Altitude) The area holds a few large mountains with a natural vegetation and the area consists of large rock boulders, caves, cliffs and few open hill tops. The edges hold a large rows of rock boulders and they are the one of the main suitable habitats of the Elvira rats.

   Rocks and Rock rats: The rocks are in the RF are mostly called as Charnockite. They are very high-grade metamorphic rocks. These rocks are very old and they are pre Cambrian. The water holding capacity of these rocks are higher than any other rocks, and also these rocks are very cool in nature. Because of the coolness, Elvira rats are adapted to here, based on my assumption. Further, the rocks are developed before the Himalayan formation and Western Ghats formation. This indicates that, the high-altitude rocks are very important and old biological heritage sites. Also noticed that the Elvira rats are completely depending on these rocks for their daily life. I had seen an Elvira rat, licking a small piece of rock. As per the suggestion from local geologists, the rocks here are source of minerals for few animals. Because of the minerals and salts, Elvira could lick these rocks.

   High elevation rock rat and body size: Many rodents live at high altitude, including deer mice, guinea pigs (Storz et al., 2010). Many mechanisms help them to adapt in harsh conditions, including altered genetics of the haemoglobin (Hsia et al., 2005). Increased breathing rate in rodents in high altitudes, larger lungs with more capillaries and large size heart for gas exchange (Hsia et al., 2005). Highland mice have evolved a metabolic process to economise oxygen usage for physical activities in the hypoxic conditions (Schippers et al., 2012). Body size plays a major role in evolution and adaptation in rodents. The fur of the Elvira rats is very soft, also it is an important adaptation to change with the climatic condition in high altitudes.

2. **Arasankadai RF:** (700-900 m) Elvira rats are living in this area and that are visible from the Ghat road of this RF. The rocks in the areas are Granitic gneiss. Gneiss is a metamorphic rock formed by changing schist, granite, or volcanic rocks through intense heat and pressure. Gneiss is foliated, which means that it has layers of lighter and darker minerals. These layers are of different densities and come about as a result of the intense pressure used to form gneiss. A total of two male Elvira rats were trapped from this particular rock type in the Ghat road with an elevation of 750m. Few observations were made from this animal in the field (Brawin, unpub. data).
3. **Kaputhi RF:** (1200 – 1250m) Trapped rodents in this RF shows a very good rocky habitat with a sparse vegetation. Trapping conducted in November 2020 to assess the presence of the Elvira rats. A total of 4 Elvira rats trapped in the site. A total of 40 large size Sherman traps were used. The habitat in these are areas are mostly sparse bushy, large forest trees with open hill tops. Traps set in the high-altitude hill tops, rocks and cliffs in the site. The rocks in these areas are called as Garnetiferous-Charnockite. They are metamorphosed rocks, formed during the late Cambrian.
4. **Kurumbapatti RF:** (100-250 m) This site is located in the lower elevation of the Yercaud hills. This area holds a vast amount of 25 small patches of medium sized rocks with a sparse vegetation. Few rodents were trapped including the *C.cutchicus* and one sub species of *C. cutchicus*. The rocks in this region are called as Shonkinite. It is an intrusive igneous rock found in few places in the world. It is unique in having little silicates and large blocky crystals of black augite. We haven't recorded Elvira rats from Kurumbapatti RF. But this RF is originally the type location for the Elvira rats. Like this, we have found a 43 Elvira rats absence sites and locations in an around the type locality and in the Shervaroyan Hills.

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**
Forest Fires	The bamboo patches are predominant in few of the rocky sites in an around the Elvira habitat. The bamboo is one of the medium elevation forest dwellers, with the highly important one for maintaining the forest ecosystem. The frequent fire incidents have an adverse effect on the complete loss of the plants and	High	7 Natural system modifications 7.1 Fire & fire suppression 7.1.1 Increase in fire frequency/intensity

	associated environment in the rocky sites, thus this could directly affect the Elvira rat populations. Fires are slow to bring under control. The increased forest fires in the recent years could eliminate the native small mammals and the natural vegetation.		
Cattle grazing movement	There are intensive grazing in Elvira habitats and its surroundings. Most of the habitats are heavily threatened by activities such as cattle grazing. The grazing directly alter the natural vegetation in to a low/poor plant cover, this leads the unavailability of vegetation in certain areas. Further, the gazing indirectly affects the forest cover-reproduction ratio.	Critical	2 Agriculture & aquaculture 2.3 Livestock farming & ranching • 2.3.1 Nomadic grazing • 2.3.2 Small-holder grazing, ranching or farming
Plantations	The natural habitats are modified in most of the areas and used the areas for coffee plantations and estates. The fragile habitats are shrinking in a faster rate due to expansion of human settlements, and plantations (Molur & Kennerley 2016).	High	2 Agriculture & aquaculture 2.2 Wood & pulp plantations 2.2.2 Agro-industry plantations
Roadkill	The Yercaud- Salem Ghat roads are the one of the roads with a frequent rodent roadkill. Approximately 45 rodent road kills were observed every month in this particular road.	High	4 Transportation & service corridors • 4.1 Roads & railroads
Rodent Diseases	Ectoparasites (mites, fleas, ticks, and lice) are regularly found on small mammals. Severe ear tissue destruction and many ecto parasites were observed during the fieldwork in Elvira rat habitats. The extent to which this negatively impacts the species is yet to be established.	Critical	8 Invasive & other problematic species, genes & diseases 8.2 Problematic native species/diseases • 8.2.1 Unspecified species

Chemical pollution	The usage of chemical powders / soaps for 'washing cloths' inside the forest streams by the local people. This directly affects the local streams and have a huge impact of the fauna and flora. The locals prefer to carry out their washing on flat rocky surface that are in an around the Elvira rat habitats, which greatly increases the potential exposure of the rats to these chemicals	Unknown	9 Pollution 9.1 Domestic & urban waste water • 9.1.1 Sewage
Logging	The continuous usage of the local forest trees for the firewood and construction purposes degrades the habitat that the rats are found in – potentially removing their food sources, shelter and nesting materials.	High	5 Biological resource use 5.3 Logging & wood harvesting • 5.3.3 Unintentional effects: subsistence/small scale (species being assessed is not the target) [harvest]
Climate Change	Climate Change is having a big impact on small mammals, especially the wild rodents. Particularly, the heatwave and prolonged drought may alter the rat habitat.	Unknown	11 Climate change & severe weather • 11.1 Habitat shifting & alteration

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	Salem Nature Club – an NGO	Interested in networking with various agencies in the district, assisting in forest protection and general biodiversity awareness related works.	Presently the club is helping in establishing the rocky area identification and promoting Elvira rat conservation research to a wider audience. Helping in plastic cleaning campaigns in few rocky sites.	Positive	Critical
India	Elvira Conservation Initiative (ECI) Team	Field research, conservation activities, training volunteers & forest officials, engaging public and establishing long term conservation action and management	Presently, carrying out field works in type locality by using Sherman traps. Increasing knowledge of the species, documenting the ecology and promoting the species conservation locally.	Positive	Critical
India	Tamil Nadu Department of Forests	Establishing policy level interventions, expanding protected areas in the state, guidance and support in Elvira conservation through the officers.	They are Government official's team, helping in saving the threatened species via law and management.	Positive	Critical
India	Annamalai Tiger Reserve (Dr. Peter)	Training in handling and usage of the radio transmitters	Involving the large animal movement study and promoting	Positive	Critical

		and collars for home range study	species conservation. Already training sessions planned.		
India	District Forest Office, Salem	Establishing the Core zone for the Elvira rats, and help in establish a sanctuary or conservation reserve	Data compilation is in progress.	Positive	Critical
India	IUCN Small Mammal Specialist Group (SMSG)	Main interest of the group is to estimate the population of Elvira rats and understand the threat status in its known range	Advising various aspects and help in species conservation planning and management	Positive	High
India	Village Forest Committee (VFC), Salem, Tamil Nadu	The committee majorly working with local communities for sustainable utilisation of forest resources and promoting habitat conservation values.	Identified the site-specific threats and associated village forest committee to work closer to mitigate it.	Positive	Critical
India	Zoo Outreach Organisation (ZOO)	Zoo outreach communicates science for conservation to all target audiences through the conservation projects and workshops	Initial dialogues have started regarding the work on the Elusive rodent habitat and local camps with the forest department	Positive	High
India	IUCN Asia	Asia is a land full of natural and cultural wonders. But the region faces critical challenges, including poverty, water shortages	Initial dialogues are initiated in the local conservation efforts and the support of IUCN Asia.	Positive	High

		and climate change. IUCN works with states and civil society in the region to build solutions together			
India	National Biodiversity Authority	The NBA is a Statutory body and that performs facilitative, regulatory and advisory function for Government of India on issue of Conservation, sustainable use of biological resource and fair equitable sharing of benefits of use.	The NBA will provide technical advice, and management and species conservation issues.	Positive	Critical
Switzerland	Fondation Segre	Funding body that supports, least studied rare EDGE species and protecting species conservation globally	Fund is for EDGE species and follow up awards	Positive	Critical
United Kingdom	EDGE of Existence Programme, ZSL	Main purpose is to inspire, inform and empower people to stop wild animals going extinct. Directly making efforts through the EDGE fellowship to support the rare animal's recovery and conservation.	Empower communities, leaders and influencers by giving them methods, evidence and tools to enable people and wildlife to thrive together. Directly useful in conservation of Elvira rat and the habitats. Supporting the EDGE team and conservation.	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	They are nocturnal rodents and the recent community interviews failed to locate the species via the people based traditional knowledge. People are not aware of this rat and the Elvira rats are extremely rare with few populations exists in the rocky habitats in the forest and the private estates.	The people in the region are not aware of the general rodents and in particular the Elvira rats. In India, the rodent conservation related research is getting less attention, less scientific exploration and involvement is low. Rats are considered as pests and getting support for conservation is a hard task and time taking process. Involvement and interest of the local forest officials towards the rat conservation is poor. Different stakeholders are utilising the habitat and involving everyone towards the one goal of Elvira Rat conservation looks a long-term goal. The gap in scientific knowledge also hinders the conservation efforts at the site.	The Tamil Nadu Government is very supportive in the rodent conservation project. As the Elvira rats are endemic to this area, and it is the first priority to protect and preserve the habitat and the species. Establishing research on the local endemic Elvira rat fauna could open up doorways to initiate a lot of small mammal species and its conservation. Increasing the awareness with the local hunting groups, grazing groups and the forest dependent people are the priority to sustainable utilisation of the forest resources. As the local forest teams are very supportive in field-based research, the goal of conservation of Elvira rat and its associated research is possible.

Economic implications	The Elvira rat habitats are directly used by the local people and their livestock for food and fodder collection. Elvira habitats are continuously degraded for the local non timber forest plants collection, illegal hunting, habitat fragmentation, modification, encroachment and increased tourism to a nearby hill station (Yercaud). Shervaroyan hill is mostly composed of Archaean crystalline rocks like amphibolites, garnetiferous granites, leptinites and charnockites. It is also rich in archean charnockites with a few granites' gneiss belts. Mining of minerals has more effects, and it is damaging the fauna, flora, hydrological relations and the biological properties of soil.	The species are not located in any of the protected areas. The rats failed to draw conservation attention in comparison to the larger charismatic animals.	The confirmation of Elvira rat existence from the Shervaroyan Hills will increase the conservation attention of the flora and fauna in this region. Once the area is established as a habitat to the endangered Elvira, there may be tourist influx from the nearby hill station (Yercaud) which may assist in local tourism industry to grow and reduce local's pressure on the site (firewood collection, use of water)
Existing conservation measures	The Elvira rats are known from a small patch (Single location) in the mountain with a various ongoing threat. No conservation measures are at place. The Elvira rats are not protected under the Wildlife protection	There are no existing conservation measures at the present site. The population is very low.	The species is known to be one of the rarest animals with the declining population trend. The Elvira rats are the only Critically Endangered mammal in Tamil Nadu and it can be declared as

	Act 1972. The rats are known from a small, restricted area and thus the immediate conservation is needed. The site is not protected, and the site is a Reserve Forests with no protection or legislation.		'**State Priority Conservation Fauna'** with higher level of protection. In addition to this, as the range of the species is confined to a very small area, government should implement conservation tactics with great success.
Administrative/political set-up	The present management responsibility of the area lies with the District Forest Office in Salem. Although there is local interest on the species conservation, this must be expanded to the higher level. Present political set-up in the state need to focus more on small mammal conservation. The region also had minimum manpower in terms of staffs on ground, however, recent staff recruitment could serve as positive impact on the ground.	Shifting of conservation focus from large animals to small mammals is a huge task. As there are no previous plans for the Elvira rat conservation, it is difficult to establish one.	As mentioned above, the Tamil Nadu Government is very supportive in the rodent conservation project. However, this needs to be translated into policy level decisions. Almost 95% of the local forest staffs are aware of the rat, which would help with setting up a well-directed conservation effort.
Local expertise and interest	As the species is very rare, presently there is lack of local expertise and interest on the species. Almost, 90% of the locals interviewed had never sighted the rate in the landscape. The	The Elvira rats and its sister species are looking like same with a few differences. And both are living the vicinity of the study site. Generally, the researchers may misidentify the	As the species is now located in the region, there is sufficient scope to build capacity of the locals to identify the animal.

	remaining interviewees might misidentify the species.	Elvira rats and the issues with identification make it harder to involve local expertise in conservation	
Resources	The state government has separate budget allocated for wildlife and forest management, however, there is lack of funds for small mammal conservation.	Lack of fund and lack of general interest can hamper the conservation actions on ground.	Local NGOs can come forward to work for the species conservation and draw attention from the conservation world. This will attract more funds to the groups as well as to the species.

2. ACTION PROGRAMME

Vision (30-50 years)	
To protect the rocky habitats and sustain conservation of *Cremnomys elvira* in the Eastern Ghats of Salem, Tamil Nadu, India	
Goal(s) (5-10 years)	
Protecting the rocky sites for conserving the Critically Endangered Elvira rats through participatory stakeholder approach in Eastern Ghats of Tamil Nadu	
Objectives	**Prioritisation** *(low, medium, high or critical)*
1). To study the Elvira Rock Rat distribution, population dynamics in rocky cliffs and high altitude private estates in Shervaroyan Hills, Salem, Eastern Ghats of Tamil Nadu.	Critical
2). Diet Patterns of Elvira Rock rats in the few isolated patches in the Shervaroyan Hills, Salem, Tamil Nadu	Critical
3). Molecular approaches for answering the origin and evolution of saxatile Elvira Rats	Critical
4). To use radio telemetry to identify the home range and daily movement of Elvira Rock rat	Critical
5). Conservation and management of declining Elvira rat species	Critical

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: **To study the Elvira Rock Rat distribution, population dynamics in rocky cliffs and high altitude private estates in Shervaroyan Hills, Salem, Eastern Ghats of Tamil Nadu.**								
Activity 1.1: Drone based-aerial surveys in rocky areas in an around type locality to find the suitable Elvira habitats.	Shervaroyan Hills, Tamil Nadu	Critical	2000 GBP	One year	Salem Nature Club and EDGE mentors/biologists	Maps of the suitable high elevation rocky areas; Videos of the potential trapping site.	Maybe high wind in few valleys could delay the works.	Field work
Activity 1.2: Trial an Elvira Ear tagging field sessions and rodent trapping in the previously known populations in the 9 locations.	Shervaroyan Hills, Tamil Nadu	Critical	1500 GBP	Two years	EDGE mentors, IUCN SMSG and Tamil Nadu Forest Department	Photographs of the tagged animals, its recapture index table, and age/sex classification. Scientific publications.	Animals may become stressful or they may afraid of the new ear tag device. Elvira rat maybe very sensitive to ear tags and may create a wound on ears and suffer.	Field Work
Activity 1.3: Rodent trapping and Capture-mark	Shervaroyan Hills, Tamil Nadu	Critical	2500 GBP	Three years	EDGE mentors, IUCN SMSG and Tamil Nadu	Distribution maps of Elvira Rats in Shervaroyan Hills,	Pandemic lockdown. Few cliffs maybe	Field Work

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
recapture in new rocky outcrops, cliffs within the Reserved Forests in high altitudes of the Shervaroyan Hills					Forest Department	Capture-mark recapture datasets, Rocky substrates utilisation percentage by Elvira rats' graphics. Scientific publications.	inaccessible by humans.	
Activity 1.4: Rodent trapping in 45 priority rocky sites/ Private estates in the Shervaroyan Hills and adjacent hills ranges to find the populations / range extensions	Shervaroyan Hills and Kolli Hills (11°44'56.1"N 78°21'19.0"E), Salem District, Tamil Nadu	Critical	2800 GBP	Three years	EDGE mentors, IUCN SMSG and Tamil Nadu Forest Department	Elvira rat photographs, habitat data sets, rocky datasets, microhabitat data, new range extension map if any. Approximate number of Elvira Rats in the Private Estates. Scientific publications.	-	Field Work
Objective 2: **Diet Patterns and substrate utilization of Elvira Rock rats in the few isolated patches in the Shervaroyan Hills, Salem, Tamil Nadu**								
Activity 2.1: Habitat suitability map	Shervaroyan Hills, Salem	Critical	500 GBP	One Year	GIS lab, Periyar University, Salem	Habitat maps, Digital elevation maps	Maybe could not get the exact rocky sites	Fieldwork
Activity 2.2: List of plants that are directly used by	Shervaroyan Hills, Salem	Critical		Three Year	IUCN SMSG and ZSL EDGE	A total of 25 rocky sites and there den	The areas are dry; wrong time to visit; animal	Field work and botanical analysis

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Elvira rats for food and nest preparation			1500 GBP			sites and the plants list	breeding seasons are unknown.	
Activity 2.3: Investigate how the distribution of rocky substratesinfluencing the Elvira Rat population density and group size	Shervaroyan Hills, Salem	Critical	1500 GBP	Three Year	Salem Nature Club, Tamil Nadu Forest Department	A total of 45 Den sites and the maps of the nesting populations, male female group details. Scientific publications.	The areas are dry; wrong time to visit; animal breeding seasons are unknown.	Field work
Objective 3: **Molecular approaches for answering the origin and evolution of Elvira Rats**								
Activity 3.1: Whole-genome sequencing	Shervaroyan Hills, Salem	Critical	1500 GBP	Three year	Rodent research lab, India	Single nucleotide variants, insertions/deletions, copy number changes, and large structural variants from the genetic datasets of Elvira Rats. Scientific publications.	Maybe a very few samples may risk of getting few results to compare	Lab work
Activity 3.2: Genetic admixture studies	Shervaroyan Hills, Salem	Critical	1000 GBP	One year	Rodent research lab, India	Results of the interbreeding between populations or species	Less samples may provide a	Lab work

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
						who had been genetically isolated and developed unique gene pool if any	poor analysis results	
Activity 3.3: Bottle neck effect analysis	Shervaroyan Hills, Salem	Critical	1000 GBP	One year	Rodent research lab, India	No risks	No risks	Lab work
Activity 3.4: Study the rock sites and genetic diversity, genetic structure of Elvira Rats	Shervaroyan Hills, Salem	Critical	2000 GBP	Two years	Molecular lab, India	DNA fragments to NCBI, map of variation in a population, map of different genotypes of Elvira rat species. Scientific publications.	No risks	Lab work
Activity 3.5: To understand the inbreeding depression and effective population size	Shervaroyan Hills, Salem	Critical	1000 GBP	Two years	Rodent research lab, India	Evidence of any genetic drift of allele frequencies, loss of heterozygosity and loss of genetic variance	No risks	Lab work
Activity 3.6: Single Nucleotide Polymorphism (SNP) study	Shervaroyan Hills, Salem	Critical	2100 GBP	Two years	Indian Lab	The variation at a single position in a DNA sequence among individuals	No risks	Lab work

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Activity 3.7: Understand the 'long tail evolution' in high altitude Cremnomys rats	Shervaroyan Hills, Salem, Tamil Nadu	Critical	6000 GBP	Two years	IUCN SMSG, Local Molecular analysis Lab, EDGE Mentors	Approximately 80 non-invasive samples of Cremnomys rats will be ready for phylogenetic, evolutionary based analysis. Scientific publications	The inclusion of the juveniles, adults to the data analysis may provide a bias. Ear clips may cause a wound in rats.	Field work and Lab analysis work
Activity 3.8: Elvira rat- acoustics study	Shervaroyan Hills, Salem, Tamil Nadu	Critical	5000 GBP	Five to seven years	IUCN SMSG, ZSL EDGE	Echolocation / or not. Novel study to find the interesting behaviour. Elvira rat species localisation and spatial hearing details. Scientific publications	No risks	Field work and lab work
Objective 4: **To use radio telemetry to identify the home range and daily movement of Elvira Rock rat**								
Activity 4.1: To study the seasonal variations, movements and home range size of the Elvira rock rats through radio	Shervaroyan Hill, Salem, Tamil Nadu	Critical	2000 GBP	Four years	IUCN SMSG, EDGE mentors, Salem Nature Club and Tamil Nadu Forest Department	Initially 2 males and 2 female track data available. Home range size maps. Scientific publications.	Radio waves could be heavily affected by cliffs, hillsides, trees and rocks and exhibited unwanted	Field work and monitoring

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
telemetry and camera trap based surveys in sites and presence rocky cliffs							reflection. Finding difficulty in setting up receiver stations in higher elevation of few rocky areas.	
Activity 4.2: Site Use Behaviour of Elvira Rock Rats Inhabiting Rock Outcrops in Shervaroyan highlands	Shervaroyan Hills, Salem, Tamil Nadu, India	Critical	5000 GBP	Four years	IUCN SMSG, EDGE mentors, Salem Nature Club and Tamil Nadu Forest Department	Locations used by male and female Elvira rats in the study site as images or radio telemetry datasets. A Summary table with locations used by Elvira Rock Rats in Shervaroyan Hills. Scientific publications.	Less access by the researchers to the fewer sites may give a risk of less data to process further.. Trapping maybe delayed due to weather issues.	Field work
Objective 5: **Conservation and Management of Declining Elvira Rat Species through indigenous communities**								
Activity 5.1: Mapping the conservation priority sites for protection and management	Shervaroyan Hills, Salem	Critical	500 GBP	Five to Seven years	Tamil Nadu Forest Department, IUCN SMSG, ZSL EDGE	Priority sites and the Elvira core area zone GIS maps	No risks	Conservation Action

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Activity 5.2: Policy level interventions with the Tamil Nadu State Forest Department and Inclusion of Elvira rats on the Salem District Working Plan – Forest Department	Shervaroyan Hills, Salem	High	1000 GBP	Two years	Tamil Nadu Forest Department, ZSL EDGE	Policy documents, Working plan report and approved actions	The process may take longer period.	Conservation Action
Activity 5.3: Work to achieve the -Elvira site as "Biodiversity Heritage Site"	Shervaroyan Hills, Salem	Critical	1000 GBP	Five years	Tamil Nadu State Biodiversity Board, ZSL EDGE and local conservation organisations	Draft letter and final letter	The process may take longer period. The each and every department associated with this have their own agenda.	Conservation Action
Activity 5.4: Establishing Village Forest Committee in all the Elvira presence nearby villages for habitat	Salem, Tamil Nadu	Critical	1000 GBP	Four years	Salem Nature Club, Tamil Nadu Forest Department	10 village forest committee will be formed	-	Conservation Action

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
monitoring and local conservation								
Activity 5.5: Removal of Elvira rats from Vermin of Indian Wildlife Protection Act	Sheervaroyan Hills, Salem, Tamil Nadu	Critical	200 GBP	Three years	Tamil Nadu State Biodiversity Board, National Biodiversity Authority, Ministry of Environment, Forest and Climate Change, Tamil Nadu Forest Department	Draft letter	The officers may change frequently and delay in processing.	Conservation Action
Activity 5.6: Impact of cattle grazing on the rodent populations or their habitats	Shervaroyan Hills, Salem, Tamil Nadu	High	3000 GBP	Two years	EDGE team	A total of 56 villages already covered previously. The remaining 62 villages in an around the study site. Grazing intensity map	Cattle grazers may have a different seasons and plans. Poor planning may lead to a false data collection.	Fieldwork/community interviews
Activity 5.7: Adding Elvira rats on the Asian Species Action	Tamil Nadu	High	1000 GBP	Five years	Director of Asian Species Action Partnership, AZE,	An approval letter	Proposed core site map/Integrated	Writing / Meetings/ Follow up/ Visits

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Partnership (ASAP) priority species list and Setting up Elvira Rat working group, establishing the AZE Site as Key Biodiversity Area (KBA) to establish a Sanctuary in Salem					IUCN SMSG, KBA, ZSL EDGE, Tamil Nadu Forest Department, Salem Nature Club, Tamil Nadu Biodiversity Board, National Biodiversity Authority, District Administration of Salem District, National Biodiversity Mission, Government of India and Ministry of Environment Forest and Climate Change (Govt of India).		RF boundary map with the Elvira present site.	
Activity 5.8: Strengthen the	Salem, Tamil Nadu	High	1700 GBP	Two years	Tamil Nadu Forest	Plans, meeting outputs, agreed	Locals may not be interested	Meetings/ Discussion/Workshops

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (GBP)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Village forest committee through meetings/workshops					Department, Chester Zoo (Mike Jordan), IUCN CEC Environmental Education Specialist Group and Tamil Nadu Department of Environment	concerns, pre-post assessments and action plans.		
Activity 5.9: Collaborative preparation of a draft National Recovery Plan for the Elvira Rock-rat and submit it to Government of India and Tamil Nadu	Salem, Tamil Nadu, India	High	2000 GBP	Three years	IUCN SMSG, EDGE mentors, Tamil Nadu Forest Department	Draft recovery plan	The process may take a longer time.	Field work/Meetings/ letter submission

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