

# Survival Blueprint

## Colombian Dwarf Gecko, *Lepidoblepharis miyatai*



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## 1. STATUS REVIEW

### 1.1 Taxonomy:

Neotropical sphaerodactylid lizards of the genera *Coleodactylus* Parker, 1926, *Chatogekko* Gamble, Daza, Colli, Vitt, & Bauer, 2011, *Pseudogonatodes* Ruthven, 1915, *Sphaerodactylus* Wagler, 1830, and *Lepidoblepharis* Peracca, 1897, are some of the smallest vertebrates in the continent (Vanzolini, 1968; Vitt, Sartorius, Avila-pires, Zani, & Espósito, 2005). The genus *Lepidoblepharis* contains 21 species of small geckos distributed across the Neotropics (Batista et al., 2015; Uetz & Hošek, 2019). These lizards show a greatly reduced body size compared with other lizards (from 23 to 56 mm in snout-vent length [SVL]; Calderón-Espinosa & Medina-Rangel, 2016; Meiri, 2008). *Lepidoblepharis* probably originated in South America (Batista et al., 2015; Vanzolini, 1968), and are specialized to life in the leaf-litter of forested areas (lowland, rain forest and semiarid coastal areas, Avila-pires, 2001; Avila-Pires, 1995; Ayala & Castro, 1983; Ayala & Serna, 1986; Batista et al., 2015; Calderón-Espinosa & Medina-Rangel, 2016; Miyata, 1985; Vitt et al., 2005).

Morphological characters that have proved useful in the species delimitation of this genus include: 1) presence of six scales in the claw sheath; 2) subdigital “lamellae” (thin scales under fingers and toes) count on toe IV; 3) dorsal scutellation (dorsal arrangement of the scales); 4) subventral scales (shielded scales, glandular scales) on the belly and subfemoral surfaces in some male individuals and present almost complete absence of surface pigment; 5) shape of posterior border of the mental plates (or mental scale, located on the chin); 6) size and shape of the postmental scales; and 7) the subcaudal pattern (arrangement of scales under tail; Batista et al., 2015; Calderón-Espinosa & Medina-Rangel, 2016; Markezich & Taphorn, 1994; Peracca, 1897). Despite this, little is known about the taxonomic status of this genus. Several taxa remain poorly defined due to the morphological similarities that many of the species can show at first glance and a lack of information on representative specimens for all described species that provide variation within or between populations (Batista et al., 2015; Miyata, 1985). Since the taxonomic keys proposed by Parker (1926), a new analysis of the systematics of *Lepidoblepharis* had not been carried out until 2015 with the review proposed by Batista et al., (2015); However, the latter focused mainly on the Central American clade and excluded several South American species, where the greatest *Lepidoblepharis* diversity is reported. Subsequently, Calderón-Espinosa & Medina-Rangel (2016) collected all the character states of lepidosis described in all the species of the genus, together with the description of an additional species.

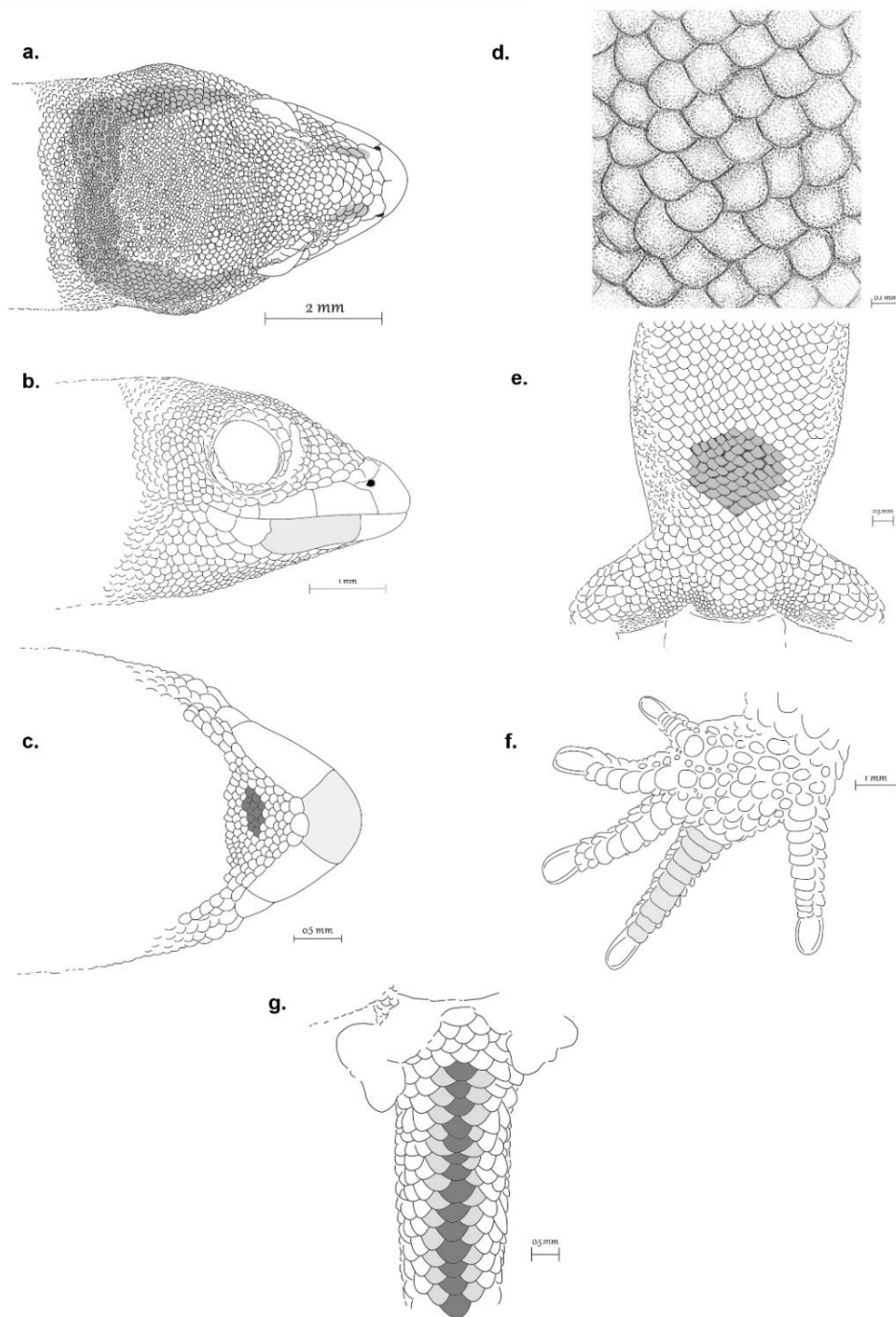
Colombia is the country with the highest diversity of *Lepidoblepharis*, with a total record of 12 species (Uetz & Hošek, 2019). Most of these species are distributed in the Andes, Pacific and Amazon region of Colombia. The only species reported for the Caribbean coastal areas of the country are *L. sanctaemartae* and *L. miyatai*. (Ayala & Serna, 1986; Lamar, 1985; Markezich & Taphorn, 1994; Rojas, Carvajal-Cogollo, & Cabrejo, 2015). *Lepidoblepharis miyatai* is one of the two smallest geckos found in the Caribbean region. A series of seven specimens was collected in the type locality (Ensenada Gairaca or Gayraca Bay, Departamento del Magdalena) in



1964. It was described by Lamar in 1985, by the following diagnostic characteristics: 1) short toes, with 8–10 lamellae (thin scales under fingers and toes) under fourth toe 2) swollen and subimbricate dorsal scales; 3) large mental scale (or mental plate located on the chin) without medial cleft and the transverse posterior margin nearly straight; and 4) ventral scale row 18-20,. The principal traits mentioned by Lamar (1985) that may distinguish *L. miyatai* from *L. sanctaemartae* are: a) large first infralabial (or lower-labials, located along the mouth on the lower jaw); b) gular (or throat) scales small and granular from second posmentals row; c) mental with posterior edge nearly straight and lacking a cleft; d) lateral edge of mental nearly parallel; e) scales on top of head minute and conical; and f) one postnasal (the scale located in the posterior part of the nostril), among others (for more detail review Lamar, 1985 p 130). Recently, Montes-Correa et al. (2018) determined that the subcaudal pattern consisting of the continuous sequence of enlarged medial scales in contact laterally with a single smaller lateral scale is a useful character to differentiate *L. miyatai* from its congeners (Figure1).

Although the description of Lamar (1985) is very detailed, the sample size available at that time was small. The type series comprised just two males (holotype UTA-11004, paratype MCZ 156973) and five females (alloparatypes: UTA 11005, MCZ-154447, MCZ 154448, MCZ 154449, MCZ 156974) did not reflect the strong variation to which some characters are subjected. For example, Lamar (1985) stated that the absence of clefts in the mental scale was a diagnostic character for *L. miyatai*, but our review of additional specimens revealed that such clefts might be present. This and other findings on the morphological variation of *L. miyatai* and *L. sanctaemartae* were found thanks to the revision of specimens from several museums and the collection of new individuals in the field during the development of the EDGE fellowship. The morphological variation detected for both species is so remarkable as to propose their redescription in the near future.





**Figure 1.** **a)** Dorsal view of the head scales on top of head minute and conical. **b)** Lateral view of the head. Large first infralabial (soft grey). **c)** Ventral view of the head: mental with posterior edge nearly straight and lacking a cleft (soft grey); gular (or throat) scales small and granular from second posmentals row (dark grey). **d)** Shape of the dorsal scales: swollen and subimbricate **e)** Schutcheon scales (dark grey) **f)** Foot: short toe with a number of lamellae under the fourth toe between, 8-10. (soft grey) **g)** Detail of tails in dorsal view: subcaudal pattern consisting of the continuous sequence of enlarged medial scales (dark grey) in contact laterally with a single smaller lateral scale (soft grey). Illustration by López-Caro AJ. (Figures a-c from specimen IAvH 5087 and d-g ACM 201).

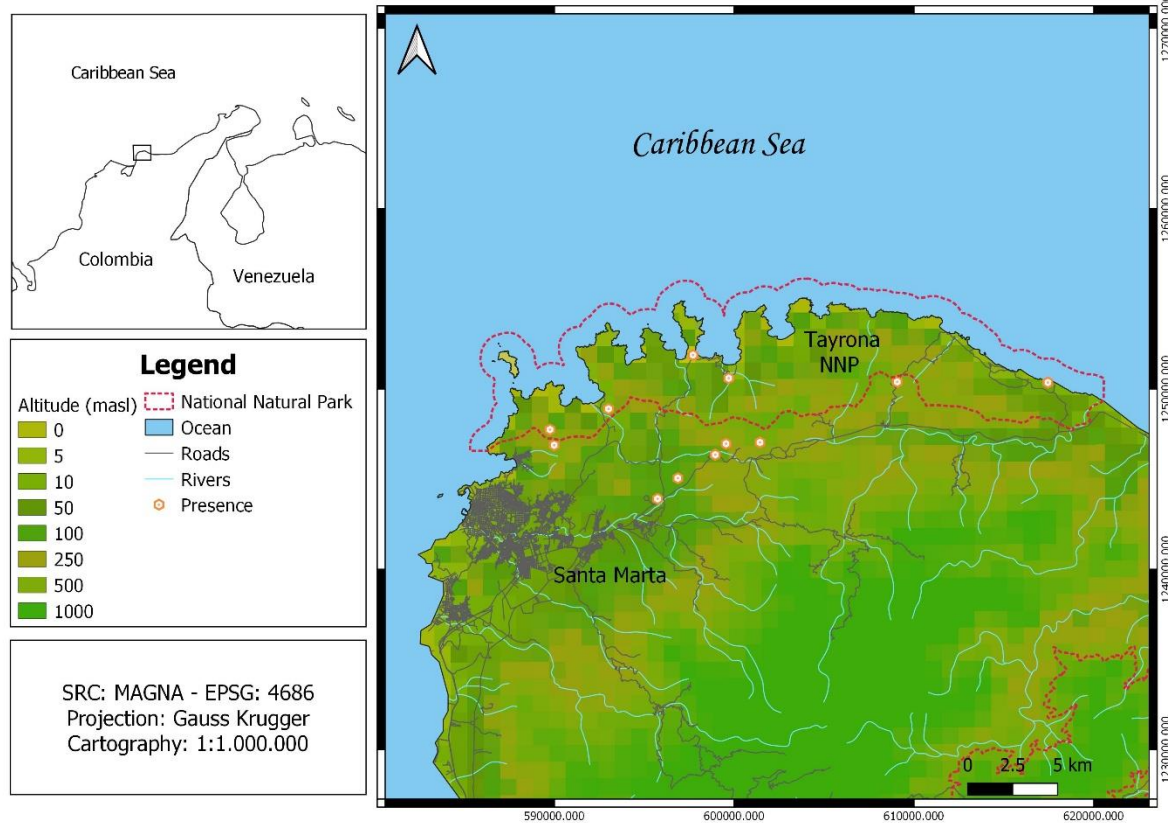


## 1.2 Distribution and population status:

The populations described for *L. miyatai* are located in the northwestern tropical dry forest of the Sierra Nevada de Santa Marta (SNSM), Colombia (Figure 1). The locality type of *L. miyatai* is inside the Tayrona Natural National Park (Tayrona NNP) in the Gayraca Bay (Ensenada Gairaca) (Lamar, 1985). In the tropical dry forest *L. miyatai* could be considered as an abundant species in the forest leaf-litter (Montes-Correa *et al.*, 2018; Rueda-Solano & Castellanos-barliza, 2010). Calderón-Espinosa & Medina-Rangel (2015) included a new locality in the southeastern side of the SNSM in “Santuario de Vida Silvestre Los Besotes”. However, reviewing these vouchers, this latest locality does not correspond to *L. miyatai* but to *Lepidoblepharis* cf. *sanctaemartae* (specimen MHUA-R 10996-10997). Montes-Correa *et al.*, (2018) include new localities inside Tayrona NNP: “Concha” Bay (or “Ensenada Concha”), Neguanje Bay; and one locality outside the protected area, Las Tinajas village and Kalashe Kalavria Natural Reserve. Currently, there is no information published about population trends in *L. miyatai* besides information that the species has higher abundance in tropical dry forest formation than in thorn scrubs (Montes-Correa *et al.*, 2018).

According to information obtained by reviewing museum collections and field expeditions conducted during my EDGE of Existence fellowship, the occurrence of this species is limited to Tayrona NNP and surrounding areas with no significant anthropogenic pressures (urbanised or agricultural areas). During our project, we found the species in four new localities within the Tayrona NNP: 1) “Bonito Gordo” Bay 2) Pueblito Village, 3) Dumbira Creek and 4) “Castilletes” in “Los Naranjos” Bay. In addition to these, the species was also found in three new localities surrounding the protected area: 1) Thermoelectric plant “Termonorte”; 2) Palangana Farm; and 3) “La Neverita”, near Las Tinajas Village (Figure 2; Table 1).





**Figure 2.** Localities where the species have been reported. This map includes the new localities documented during the EDGE fellow project near the Tayrona Natural National Park (Tayrona NNP) and Santa Marta City.

Localities	X	Y
Dumbira Creek	-74.17416	11.27459
Bonito Gordo Bay (Tayrona NNP)	-74.17892	11.28707
Concha Bay (Tayrona NNP)	-74.14729	11.27991
Palangana Farm	-74.12621	11.24331
Thermoelectric plant "Termonorte"	-74.10491	11.26163
Kalashe Kalavria Natural Reserve	-74.08541	11.27182
Las Tinajas Village	-74.06968	11.27013
Gayraca Bay (Tayrona NNP)	-74.10719	11.31354
Neguanje Bay (Tayrona NNP)	-74.08319	11.30655
Pueblito village (Tayrona NNP)	-73.97277	11.31660
"Castilletes", in Los Naranjos Bay (Tayrona NNP)	-73.91935	11.91935
"La Neverita" near Las Tinajas Village	-74.06697	11.27320

**Table 1.** Geographical references where the species has been reported



It is important to mention that currently, several of the localities that are outside the protected area of the Tayrona NNP (e.g. Las Tinajas village, La Neverita, Palangana Farm), could be considered within the buffer zone of the park. However, Tayrona NNP does not have a “buffer zone” defined, therefore these localities lack a status of protection before the law. Currently Tayrona NNP presented the proposal to define a buffer zone to the Colombian Ministry of Environment and Sustainable Development. According to Colombian law, a buffer zone is “*the area in which disturbances caused by human activity in areas surrounding the different areas of the national natural park system are mitigated in order to prevent large-scale riots or ecology and wildlife from these area*” (UAESPNN, 2005).

## 1.2.1 Global distribution:

Country	Population estimate (plus references)	Distribution	Population trend (plus references)	Notes
Colombia	Unknown (Lamar, 1985).	Santa Marta, Gayraca Bay, Tayrona NNP.	Unknown (Lamar, 1985).	This is the species description site and there is no data about population size only reports on individuals.
Colombia	Abundant (Rueda-Solano & Castellanos-barliza, 2010) the authors did not report raw abundance data.	Santa Marta, Neguanje Bay, Tayrona NNP.	Unkown (Rueda-Solano & Castellanos-barliza, 2010).	Herpetological inventory. In this work the authors reported <i>L. sactaemartae</i> instead of <i>L. miyatai</i> , which is the species actually encountered in this area.
Colombia	Unknown (Calderón-Espinosa & Medina-Rangel, 2015).	Valledupar, Cesar Department.	Unknown (Calderón-Espinosa & Medina-Rangel, 2015).	The presence of <i>L. miyatai</i> on the south-eastern foothills of the SNSM was recorded, approximately 125km away from the type locality. This is the only known record of the species outside of Tayrona NNP and its surroundings.
Colombia	88 individuals /72hours per observer (Montes-Correa <i>et al.</i> , 2018).	Santa Marta, Las Tinajas Village.	Unkown (Montes-Correa <i>et al.</i> , 2018).	This study included a preliminary description of the habitat use of the species in one zone outside the Tayrona NNP.



## 1.2.2 Local distribution:

Country	Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Colombia	Caribbean	Gayraca Bay, Tayrona NNP	Inside a Protected area: Tayrona NNP	Unknown	(Lamar, 1985)	This study is the original description of the species.
Colombia	Caribbean	Gayraca Bay, Tayrona NNP	Inside a Protected area: Tayrona NNP	Density of 1 individuals / 2 m <sup>2</sup>	Current EDGE fellow study	This study describes the species' ecological relationship with the environment where it is distributed.
Colombia	Caribbean	Los Besotes Ecopark, Valledupar, Cesar Department	Private reserves of civil society.	Unknown	(Calderón-Espinosa & Medina-Rangel, 2015)	This work describes a range extension on the species to the southern areas of SNSM. The species reported in this work correspond to <i>Lepidoblepharis cf. sanctaemartae</i> .
Colombia	Caribbean	Neguanje Bay, Tayrona NNP	Inside a Protected area: Tayrona NNP	Unknown	(Rueda-Solano & Castellanos-barliza, 2010)	This work describes an inventory inside the Tayrona Park in Neguanje bay. However, the authors report <i>L. miyatai</i> as <i>L. sanctaemartae</i> .
Colombia	Caribbean	Concha Bay and Las Tinajas Village and Kalashe Kalavria Natural reserve	Concha Bay or Ensenada concha is partly inside the Tayrona NNP. Las Tinajas Village doesn't have any protected status. Kalashe Kalavria is a private protected area.	88 individuals / 72 hours per observer	(Montes-Correa <i>et al.</i> , 2018)	This work report preliminary information on geographic distribution and habitat use of the species.
Colombia	Caribbean	Las Tinajas Village.	Las Tinajas Village doesn't have any protected status, but is located in the proposed buffer area of the Tayrona NNP.	Density 0.7 individuals / 2 m <sup>2</sup>	Current EDGE fellow study.	This work describes the species' ecological relationship with the environment where it is distributed.
Colombia	Caribbean	Concha Bay, Tayrona NNP	Inside a Protected area: Tayrona NNP.	Density 0.95 individuals / 2 m <sup>2</sup> .	Current EDGE fellow study.	This work describes the species' ecological relationship with the environment





						where it is distributed.
Colombia	Caribbean	Bonito Gordo Bay, Tayrona NNP.	Inside a Protected area: Tayrona NNP	Density 0.15 individuals / 2 m <sup>2</sup> .	Current EDGE fellow study.	This work describes the ecological relationship with the environment where it is distributed.
Colombia	Caribbean	Dumbira Creek, Tayrona NNP.	One side of Dumbira Creek is inside a "District environmental system" form Santa Marta City. And the other side correspond to the protected area: Tayrona NNP	7 individuals / 8 hrs per observers.	Current EDGE fellow study.	This information corresponds to the Taxonomic objective of the present EDGE project. This work found the north-occidental limits of this species.
Colombia	Caribbean	Pueblito Village, Tayrona NNP.	Inside a Protected area: Tayrona NNP	Unknown.	Current EDGE fellow study.	This information corresponds to the Taxonomic objective of the present EDGE project.
Colombia	Caribbean	Thermoelectric plant "Termonorte".	This area is outside Tayrona NNP and doesn't have any protected status. This area is far from the proposed buffer zone of Tayrona NNP.	3 individual / 8 hrs per observers.	Current EDGE fellow study.	This information corresponds to the Taxonomic objective of the present EDGE project. This work confirms the presence of the species in areas outside the Tayrona NNP.
Colombia	Caribbean	Palangana Farm.	Palangana Farm is near Concha Bay (Tayrona NNP). This area doesn't has any protected status.	2 individuals / 4 hrs per observers.	Current EDGE fellow study.	This information corresponds to the Taxonomic objective of the present EDGE project. This work confirms the presence of the species in areas outside the Tayrona NNP
Colombia	Caribbean	Los Naranjos.	Inside a Protected area: Tayrona NNP.	Density 0.2 individuals / 2 m <sup>2</sup> .	Current EDGE fellow study.	This work describes the species' ecological relationship with the environment where it is distributed.



## 1.2 Protection status:

*L. miyatai* is considered by The IUCN Red List of Threatened Species as Critically Endangered (Possibly Extinct) B1ab(v)+2ab(v) (Ortega & Caicedo, 2015). Until the last assessment made by the IUCN in 2013, there were no new field observations or new specimens in herpetological collections since 1964. For this reason *L. miyatai* was include in CR category and possibly extinct. At a national level, in Colombia, this species is categorized as Endangered, EN B1ab(i,iii) in the Red Book of Colombian Reptiles. In this study, Calderón-Espinosa & Medina-Rangel (2015) report a new locality for the southeastern side of the SNSM in “Santuario de Vida Silvestre Los Besotes”, increasing the distribution range of the species, however these collected specimens do not correspond to *L. miyatai* but to *Lepidoblepharis cf. sanctaemartae* (specimens reviewed: MHUA-R 10996-10997). The criteria used in this assessment were: 1) small distribution range (1214km<sup>2</sup>); 2) the age of its records; and 3) the highly endangered vegetation types found within its habitats.

## 1.4 Ecology, behaviour and habitat requirements:

*Lepidoblepharis miyatai* is a terrestrial, oviparous and diurnal lizard with a distribution restricted to the dry ecosystems of the northwestern foothills of the SNSM (Carvajal-Cogollo, 2019; Montes-Correa *et al.*, 2018). Lugo-Rugeles (1981) maintained two males and five females in ex-situ conditions with the objective to observe behavioural aspects like shedding, reproduction and aggression. In captive conditions it is common to observe two or three individuals grouped, with multiple females or males and females in a group, but never more than one male together. Females deposited one egg with a length of 4.4 - 5.0 mm per clutch, and probably two eggs per year. In relation to habitat and microhabitat use, Montes-Correa *et al.* (2018) reports the species to be found in thorn-scrub formations and tropical dry forest (TDF). Their observation suggests that this species could show greater abundances in TDF than in other habitats and present more records in the leaf-litter than in other microhabitat categories described here as ‘fallen trunks and bare floor’.

## 1.5 Threat analysis:

Threat	Description of how this threat impacts the species	Intensity of threat (low, medium, high, critical or unknown)
Infrastructure projects development	<p>The ecosystems of Tropical Dry Forest and thorny scrub nearby the area of “Concha Bay” where we found population of <i>L. miyatai</i>, have been deforested for the construction of the sanitary landfill called Palangana, which is one kilometre from the limit of the Park. Approximately 15 Ha. of forest have had to be cleared to build this sanitary landfill. The impacts of this threats are related with other factors that can affect the population of <i>L. miyatai</i> such as fragmentation, edge effects as well as possible infectious corridors along the road that may lead to the introduction of diseases in native species (UAESPNN, 2005). The environmental management plan of Tayrona NNP, mentioned that this project has also created greater access for the extraction of wood and fauna by residents of the area.</p> <p>Inappropriate design of infrastructure can generate habitat quality decreases due to forest fragmentation. This problem could indirectly affect small reptiles like <i>L. miyatai</i> through a</p>	High (Concha bay sector)



	<p>cascade of effects related with microhabitat parameters like temperature and relative humidity, leaf litter depth, canopy cover, among others (Carvajal-Cogollo &amp; Urbina-Cardona, 2015).</p>	
<p>Agriculture &amp; Cattle</p>	<p>The rural surrounding areas of the Tayrona NNP are made up of thirteen villages whose main economic activity is agriculture (“pancoger” crops for subsistence farming) and agroforestry arrangements where the main crop is cocoa. The other activity present in the region is small-holder grazing and ranching (mainly for meat and milk). This activity is concentrated in small farms located in the “Troncal road” (which connect Santa Marta to La Guajira department) in the villages: Las Tinajas, Cacahualito, Calabazo, La Estrella and Los Cocos (UAESPNN, 2005).</p> <p>The small-holder farming includes extractive activities that generate deforestation and logging. Deforestation in the area is mainly associated with these type of activities (agriculture and cattle) which increases forest edge effects and exacerbates habitat loss and degradation. On the other hand, introduction of cattle generates natural system modification due to changes in the physical environment, including changes in soil and vegetation structure (Cano &amp; Leynaud, 2010).</p> <p><i>L. miyatai</i> needs leaf litter and conditions provided by forest or shrubs formation. This species is an ectothermic organism and its temperature is regulated by external sources of heat. This species also has a small body size which makes it dependent strictly on the conditions provided by the forest and the microhabitat present in there. As a result of the deforestation the leaf-litter disappears together with the vegetal covering (Meiri, 2008; Meiri <i>et al.</i>, 2018) rendering previously suitable areas not inhabitable to the species anymore.</p>	<p>High (outside Tayrona NNP)</p> <p>Low (inside Tayrona NNP)</p>
<p>Transportation &amp; service corridors</p>	<p>Inside Tayrona NNP, the existence and creation of roads or uncovered paths in areas such as Concha Bay, Gayraca Bay and Neginaje Bay, among others, have deteriorated the ecosystems and has allowed a greater number of visitors (legal or illegal) and their vehicular traffic, resulting in an increase in solid waste. Another problem associated with the generation of roads and highways is the facilitation of the process of human settlements and even the establishment of illegal activities such as crops and “guaqueria” (looting of an archaeological sites), both inside and outside the protected area (UAESPNN, 2005).</p> <p>Observations in the field have allowed us to appreciate that <i>L. miyatai</i> is not registered in areas where the vegetation cover has disappeared or is highly intervened. Many of the activities that generated loss of vegetation cover (logging and deforestation) have been associated with transportation and service of corridors in other areas in the country (Armenteras <i>et al.</i>, 2017).</p>	<p>High (Inside and outside Tayrona NNP)</p>



<p>Conflicts of land tenure</p>	<p>95% of the Tayrona NNP's land area, presents conflict for possession and improper use due to the overlapping of property titles, occupation of privately owned property, vacant property or public use (UAESPNN, 2005). This conflict can promote disorderly tourism, extraction of resources, and illegal construction, which can contribute to the deterioration of the habitat.</p> <p>On the other hand, problems such as armed conflict have generated the displacement of new residents to sectors mainly in the village of Las Tinajas and Calabazo. Displacement generates land appropriation and the creation of settlements.</p> <p>In areas with conflicts of land tenure, we are registered habitat degradation and in some case construction and presence of people makes it difficult to conduct fieldwork, and investigate the status of population of <i>L. miyatai</i> or ecosystems where the species lives.</p>	<p>High (Inside and outside Tayrona NNP)</p>
<p>Residential &amp; commercial development</p>	<p>There is a human population growth trend in recent years in the city of Santa Marta. Nowadays, a large number of projects related to the expansion of the Santa Marta urban area (creation of residential, neighbourhoods and buildings in peripheral areas) are already in place. The effects associated with urbanization that will affect <i>L. miyatai</i> could be quantified from the changes in the physical environment (change in land cover, habitat loss and change in landscape pattern) and the urban-rural gradient that this process generates (Chown &amp; Duffy, 2015).</p>	<p>Unknown (Santa Marta peripheral zones)</p>
<p>Fire management of crops</p>	<p>The mismanaged use of fire to renew crops can generate habitat loss and degradation of nearby forested areas. Possible direct effects are also ecosystem conversion, and local extirpation of population of the species. The local distribution and abundance of <i>L. miyatai</i> could be restricted due to fire (James &amp; M'Closkey, 2003) and some established populations could be threatened by the activity.</p>	<p>Medium (outside Tayrona NNP)</p>
<p>Tourism</p>	<p>The uncontrolled tourism in many areas inside and outside the National Park generates human disturbance in the habitat of the species. During the last seven year the number of visitors to Tayrona NNP have increased 34.23% (MINCIT – CITUR, 2020). The total number of visitors to the park who are legally accounted for are recorded goes through the sectors of "Palanga – Neginaje" and "El Zaíno", but there is a very important part of tourist who enter through the sectors of Concha Bay, Calabazo, Méjico and Los Naranjos or seaway, entering mostly illegally without being accounted for. This important fraction contributes to the disorderly development of tourist activities that cause impacts and deterioration on ecosystems, communities and populations of wild species (UAESPNN, 2005).</p> <p>The environmental management plan of Tayrona NNP, mentioned that some touristic operator promote attitudes environmental unfriendly like contamination by solid waste, extraction of plant material, establishment of bonfires on the beach and noise.</p>	<p>Unknown (Inside and outside Tayrona NNP).</p>



## 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)
Colombia	Tayrona NNP	Increase the knowledge of endemic species by the park staff.  Create monitoring areas primarily in Tayrona NNP buffer zones to survey endemic species.	Inclusion of research knowledge in the Management plan of the Park.  Creation of the master plan, a strategic framework with all the research that is developed in Tayrona NNP. This document has been created in conjunction with the university.	Positive	Medium
Colombia	Rural community of Las Tinajas.	Increase their knowledge about the biodiversity in their region with objective to organize ecotourism activities.	Overseeing of the field activities, active participation in the interviews and survey design to collect information about the land use change in the area.	Positive	High
Colombia	Rural community of Gayraca.	Increase their knowledge about the biodiversity in their area.	Active participation in the interviews.	Positive	Medium
Colombia	Rural community of Calabazo.	Increase their knowledge about the biodiversity in their region.	Active participation in the interviews and questionnaires.	Positive	Medium
Colombia	Rural community of Colinas de Calabazo.	Increase their knowledge about the biodiversity in their region.	Active participation in the interviews and questionnaires.	Positive	Medium
Colombia	Rural community of Palangana.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown



Colombia	Rural community of Cacahualito.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown
Colombia	Rural community of Nuevo México.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region	None	Unknown	Unknown
Colombia	Rural community of La Estrella.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown
Colombia	Rural community of La Esmeralda.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region	None	Unknown	Unknown
Colombia	Rural community of La Revuelta.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown



Colombia	Rural community of El trompito.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown
Colombia	Rural community of Aguas frías.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region	None	Unknown	Unknown
Colombia	Rural community of Los Cocos.	We have no contact with this community, due to the response with the other community nearby their area we think this person would be interested to increase their knowledge about the biodiversity in the region.	None	Unknown	Unknown
Colombia	Rural community of Los Naranjos.	Increase their knowledge about the biodiversity in their region.	Active participation in the interviews and questionnaires.	Positive	Medium
Colombia	Gonowindua Indigenous Community.	Include environmental educational content with information about reptiles in schools' programs.	The community gave us permission to work in the schools and to assess the knowledge of the children about reptiles and <i>L. miyatai</i> .	Positive	Low
Colombia	School zalamemaku Suga.	Include environmental educational content with information about reptiles in schools' programs.	Drawing and writing workshops.	Positive	Medium
Colombia	School of "Las Tinajas".	Include environmental educational content with information	Drawing and writing workshops.	Positive	Medium



		about reptiles in schools' programs.			
Colombia	School "Simon Rodriguez" Santa Marta	Include environmental educational content with information about reptiles in schools' programs.	Drawing and writing workshops.	Positive	Medium
Colombia	Kalashé Kalavria Natural reserve	Increase their knowledge about the biodiversity in their region.	Issued visitor permits to search for <i>L. miyatai</i> in the area.	Positive	Low
Colombia	Autonomous Regional Corporation - CORPAMAG	Institution in charge of supervising field research activities of endangered species, including handling and collection of specimens. This entity checks that the investigation is within the legal regulations of the country.	After this institution issued the permits to work in the field not many activities have been developed with it due to lack of interest from the institution.	Positive	Low
Colombia	Universidad del Magdalena	Institution that support all of the activities of the project: collection of samples, field trips, facilities for reviewing of museum material and applying for research permit from ANLA (National Agency of Environmental License). The research group involved in management and conservation of fauna, flora and Neotropical strategic ecosystems (MIKU) has been the main support for the realization of this project.	Loan of office space and equipment for fieldwork and laboratory activities. Support for legal proceedings to national environmental entities.	Positive	Critical





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

	<b>Description</b>	<b>Barriers to conservation</b>	<b>Opportunities for conservation</b>
<b>Socio-cultural effects and cultural attitudes</b>	<p>Indigenous communities have their own agenda when comes to their inclusion in action plans of the Tayrona National Park and other key zones in the Sierra Nevada de Santa Marta, and also activities related with land purchase and regulation of tourism inside National Parks. These activities have greater relevance in their agenda than activities related to specific programs in species conservation (for example programs focused on one endangered species). For this reason, the inclusion in conservation programs of the indigenous communities has been slow.</p> <p>People of rural communities in the distribution area of the species have shown an interest to learn about this project which led them to participate in all of the activities proposed for the social work (interviews, surveys and workshops).</p>	<p>Specifying work agendas with the communities can be a difficult activity due to the organization of spaces and availability of the participants.</p> <p>Education programs (social, economic, environmental etc.) in the past, that do not have continuity, have generated discontent in the indigenous communities, which is why initial engagement with them is difficult.</p> <p>The leaders of the community have low interest in providing information about traditional knowledge on reptiles.</p>	<p>To establish partnerships with the indigenous groups, receiving permission and support to carry out activities in their area. One of the first steps is to obtain permission from the community to carry out activities in the school, and some indigenous professors have showed interest in learning more about objectives of the project.</p> <p>People from “Las Tinajas” community show a willingness to participate in future monitoring programs and other activities related with the protection of the species, including works with schools in the area.</p>
<b>Economic implications</b>	<p>The activities related with deforestation, cattle farming and fire management of crops are related with smallholder farming. These activities can increase the frequency or intensity in fires.</p>	<p>Although the Tinajas community has expressed interest in maintaining conservation areas, periodic burning and timber extraction are still frequent in the area.</p>	<p>Leaders of Las Tinajas are interested in get involved in all the projects developed in the community. They want to participate in all the activities that permit them to learn about their biodiversity, and also permit greater connections with other sectors (academics or</p>



	<p>The tourism and ecotourism that is currently being promoted in the area can result in the transformation of the landscape if adequate monitoring is not conducted to avoid long-term impacts on the biodiversity of the area.</p>		<p>economists) in the city of Santa Marta and in other communities.</p> <p>A good relationship with the community can open dialogue to discuss management of the land, including issues such as land sharing in which they can keep patches of forest for conservation within the agricultural landscape. The implementation of ecotourism activities that includes wildlife sighting, recording of ecological survey trails is an option that the communities in the area want to explore as an economic opportunity. The communities contacted would be interested in being accompanied in the elaboration of the routes of the trails and in the generation of knowledge in tourists about the reptiles of the region.</p>
<p><b>Existing conservation measures</b></p>	<p>The main area where the species is recorded is inside a National Park.</p> <p>Outside the Tayrona NNP there is another designation of protected area known in Colombia as Civil Society reserves. This reserve is the Kalashe Kalavria and we reported a <i>L. miyatai</i> population in this area.</p> <p>Other designation of protection outside Tayrona NNP is the District environmental system of Dumbira. This protected area was created by the Santa Marta government as a conservation</p>	<p>Nowadays, the main area of distribution of the species is inside the Tayrona Park, but few members of staff get involved in research activities. The support provided with logistics of schedule environmental workshops, project results presentation and specific engagement with the project (reunions, talks) is bureaucratic and not very efficient. This prevents the execution of many activities as initially planned.</p>	<p>Undoubtedly, Tayrona NNP as an environmental institution, has expressed interest in the conservation of this endemic species. A meeting had been achieved with the director of the park and he express his interest in all the conservation programs that are being developed inside the Tayrona NNP. Currently we are working with them to draft a “Master Plan” document which will include all the investigations that The University of Magdalena are conducting in the protected area. This is an agreement that will identify new opportunities for research and resourcing in the Tayrona Park (e.g. conservation genetics for the</p>



	<p>plan for subxerophytics formation in the municipality.</p> <p>The communities in the surrounding areas of the park, including “Las Tinajas” region created their own rules for the use of the land which includes preservation of forest zones.</p>	<p>The Natural reserve Kalashe Kalavria has few people working with them and the indigenous group that temporarily occupy the reserve use this space sporadically when they need to hold community meetings. For this reason, it is difficult to achieve consistent environmental education work with them.</p> <p>Outside the protected areas (Tayrona NNP, Kalashe Kalavria and Dumbira) there are rules within the communities to preserve some forests areas but these rules are not very strict and in some cases are not respected by the members of the community.</p>	<p>species, prioritization of technical staff for monitoring areas that include reptiles). We also are looking for an agenda with the staff of Tayrona Park to share our experiences and teach them how to monitor this lizard species. The <i>Lepidoblepharis</i> project would be one of the first projects to be accepted in this plan.</p> <p>The director of the Natural Reserve Kalashe Kalavria is interested in increasing the knowledge of the endemic species inside their land. Support for lodging and accommodation is possible from them during fieldwork activities.</p>
<p><b>State of knowledge of species delimitation, gene flow and distribution limits</b></p>	<p>Throughout the EDGE fellowship, it was possible to identify gaps in the information related to the distribution of the species and its taxonomic identity. For a long time this species was confused with its congener <i>Lepidoblepharis sanctaemartae</i> and in some biological collections in Colombia specimens classified as <i>L. sanctaemartae</i> actually corresponded to <i>L. miyatai</i>. In addition, some specimens were reported to the south of the Sierra Nevada de Santa Marta, this record increased the range of distribution of the species to 1021 km<sup>2</sup>. After reviewing these</p>	<p>The lack of information on these aspects does not allow the development of a concrete monitoring work plan with institutions and communities in the areas where the species is distributed, to detect risks and threats and implement other analyses in conservation genetics, demographics or ex-situ reproduction programs.</p>	<p>Identifying the information gaps has been a good starting point to design sampling in the field and in biological collections to increase knowledge about the distribution of the species. This search led to more visits to different local communities beyond even the possible range of distribution of the species. Developing a better understanding of the distribution limits of the species and the congeners present in the area has opened the door to investigate other research questions related to the processes that caused this species to currently have such a small distribution range and work hand in</p>



	specimens, they were found to not be <i>L. miyatai</i> suggesting that the distribution range of this species may be much less.		hand with institutions like National Parks to build conservation strategies for the species (e.g monitoring programs led by official from Tayrona NNP, delimitation of areas of importance to increase connectivity between populations, among others)
<b>Administrative/political set-up</b>	<p>In Colombia, there are different regulations designed to control the manipulation and collection of wildlife. Within these regulations exists the Decree No. 1376 of June 23, 2013, which regulates collection permits in the country.</p> <p>In contrast, for the manipulation or collection of endemic or threatened species, it is necessary to work directly with regional institutions, or protected areas such as the Natural National Parks. In the study area of <i>Lepidoblepharis miyatai</i>, we have had to contact the regional institution of Magdalena and Tayrona NNP</p> <p>It is important to note that if the research is linked to an educational institution, the University might have the necessary permits required within the legal framework for the collection of biological material.</p>	<p>The principal barrier associated with the administrative or political set-up, is the time that the bureaucratic processes can take, involving different institutions, which can affect the commencement of field activities.</p> <p>Without obtaining permits, no field activity can be initiated. In many cases, the procedures are delayed due to bureaucracy and poor communication between institutions. Some documents must be requested from different institutions, which delays the process. For example, for the specimen collection process, another certificate (the Ministry of the Interior) is required to request a certificate of presence of indigenous and black communities.</p>	<p>The administrative process encourages you to look for collaborative networks within educational institutions. It is through these entities that the biological collection framework permits can be generated.</p> <p>This understanding allowed us to directly partner two professors from the University of Magdalena within the project. Similarly, the research group to which we are linked (MIKU) has provided workspace and equipment for field trips, or review of material from biological collections.</p>
<b>Local expertise and interest</b>	The knowledge about reptiles in the region is small; furthermore, the fears associated with this group of animals generate resistance to	The main barrier is the ability to form a work team in the community. Although it is possible to have a good initial reception by the local	Many of the local people, mainly the key informants that we have identified, have shown enthusiasm in talking about their territory and the conservation problems present there. The



	<p>achieve greater conservation commitments from local people, mainly rural communities.</p> <p>The local residents have a good knowledge of the history of land use and transformation that the area has undergone in recent years.</p> <p>In the University of Magdalena some biology students are showing more interest in the activities of the project</p>	<p>community, their relationship with the project is not strong. Long-term work with communities is needed to integrated the knowledge of forest conservation, and changing behaviour that may negatively affect <i>L. miyatai</i> populations' survival.</p> <p>This work requires long-term support and generation of strategies (workshops, community monitoring) in which communities can be involved in long-term conservation.</p>	<p>relationship built with these key informants demonstrates the viability to consolidate working teams consisting mainly of local people either from rural communities or indigenous communities.</p> <p>Some members of both the community of “Las Tinajas” and Tayrona Park have expressed interest in sharing their experiences related to reptile surveying and learning more about the biology of these animals. We want to involve them in talks that also include citizen science in the Santa Marta City</p> <p>The capacity built at the University of Magdalena through the purchase of equipment and the use of spaces for sample analysis have generated greater interest on the part of researchers and students in knowing and interacting more with the project. Thanks to this we have been able to include new students in the research and formation of the work team.</p>
<p><b>Resources</b></p>	<p>The University of Magdalena has considerable equipment, expertise (biologists and anthropologists) and workspace to conduct laboratory analyses. However, economic resources are scarce. It has not yet been possible to engage local companies or NGOs in projects with the species that can somehow contribute financially to sustain future conservation activities.</p>	<p>The lack of economic resources will hinder the development of future in-situ field activities, including the sampling of species, community engagement, and visits to schools.</p>	<p>The search for funds helps to generate networks and relationships with other projects, promoting future projects and the awareness of the species more broadly.</p>



<p><b>Political and security</b></p>	<p>In the last year, territorial conflict by illegal armed groups has restricted access to some areas where it was intended to search for species samples.</p>	<p>This situation generates significant security problems.</p> <p>Some armed groups do not allow work in certain areas that are covered in the study.</p>	<p>The security situation has helped improve communication channels with community leaders. These leaders are in charge of serving as a communication bridge with other members of the communities where these armed groups have a presence and have facilitated work with these communities.</p>
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## 2. ACTION PROGRAMME

<b>Vision (30-50 years)</b>	
<i>L. miyatai</i> populations protected throughout the species distribution range, being supported by community monitoring programmes	
<b>Goal(s) (5-10 years)</b>	
Generate information on the population status, genetic structure and historical colonization processes of <i>L. miyatai</i> in order to establish priority-monitoring areas inside and outside the protected area involving the local communities in the process.	
<b>Objectives</b>	<b>Prioritisation</b> (low, medium, high or critical)
Determine genetic diversity, population structure, gene flow, and potential bottlenecks of <i>L. miyatai</i>	Critical
Identify the historical processes that determined the contemporary distribution of <i>L. miyatai</i> from a phylogenetic and phylogeographic approach	Critical
Evaluate the potential effects of land-use on the extent of suitable habitat of <i>L. miyatai</i>	Critical
Generate a programme of environmental education at the communities surrounding the Tayrona NNP	Critical
Implement a monitoring system through participatory action research approach (PAR)	Critical
Create an environmental education program about tropical dry forest lizards of the Tayrona NNP with the staff of the protected area and tourist enterprises that work in the area	High
Expand work networks in tropical dry forest that include other institutions such as: Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (IAvH)	High
Consolidate a working team composed of different experts for the creation of a National Program for Reptile Conservation	Medium
Promote academic research to investigate ecological knowledge gaps of the species including: functional ecology, demography, interactions predator-prey, reproduction, changes in population structure due to seasons, and diet	Medium
Generate an <i>ex-situ</i> reproduction program in conjunction with the Botanical and Zoological Foundation of Barranquilla, Colombia	Low



Activities	Country / region	Priority (low, medium, high or critical)	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
<b>Objective 1: Determine genetic diversity, population structure, gene flow, and potential bottlenecks of <i>L. miyatai</i>.</b>								
Collection of tissue samples from seven zones (each zone include 2-3 localities) where <i>L. miyatai</i> populations have been reported	Colombia / Caribbean region, Tayrona NNP and surrounding areas	Critical	4000 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Tissue samples for a total of 91 specimens (13 individual in each zone)	Problems accessing the field areas where the sampling will take place	Fieldwork  Collection of wild specimens.
Genomic extraction and amplification of nuclear DNA	Colombia	Critical	1500 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Samples of amplified DNA for a total of 91 specimens	Problems with the quality of the tissue samples and the amplification protocol	Laboratory processing
Generate a genomic library using restriction site associated DNA sequencing (RAD-SEQ) and perform bioinformatic analyses	USA	Critical	6300 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Identify single nucleotide polymorphisms (SNP) from a total of 91 specimens. Datasets, calculated parameter for genetic structure and diversity and plots for the SNP genetic structure	DNA failing quality checks due to poor quality tissue, and low quality reads. Failure to detect genetic structure	Laboratory processing and genomic analyses to determine population structure and genetic diversity





<b>Objective 2: To identify the historical processes that determined the distribution of <i>L. miyatai</i> from a phylogenetic and phylogeographic approach.</b>								
Collection of tissue samples from <i>L. miyatai</i> and other congeners present in the area <i>Lepidoblepharis</i> spp. And species from the genus <i>Gonatodes</i> and <i>Pseudogonatodes</i> as an external group in the phylogenetic analysis	Colombia/C aribbean region	Critical	1000 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG, ANLA	Tissue samples for a total of 110 specimens (including at least one individual of <i>L. miyatai</i> per each location reported, and other sphaerodactylids)	Problems accessing the field areas where the sampling will take place	Fieldwork  Collection of wild specimens.
Genomic DNA extraction and amplification of mitochondrial genes 16 s and COI	Colombia	Critical	1500 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Samples of amplified DNA for a total of 110 specimens (included target species and outgroups)	Problems with the quality of the tissue samples and the amplification protocol	Laboratory processing
DNA sequencing	USA	Critical	2000 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Sequence of the 110 specimens	Problems related with human error involved in DNA sequencing. Export permits; low DNA product quality and concentration; suitable primers	Laboratory processing



Preparation of phylogenetic and phylogeographic topologies	Colombia	Critical	1000 GBP	1 year	Tayrona NNP, Autonomous Regional Corporation-CORPAMAG	Phylogenetic trees and haplotype networks	Requirements of the software for analysis may exceed the capacity of the available computers	Computational analysis
<b>Objective 3: Evaluate the potential effects of land-use on the extent of suitable habitat of <i>L. miyatai</i></b>								
Data cleaning and compilation (occurrence data of <i>L. miyatai</i> )	Colombia	Critical	100 GBP	1 year	Natural Museums inside and outside Colombia	Records from <i>L. miyatai</i> in Herpetological collections and new records obtained during the EDGE fellow work	Problems with the information of each locality (e.g. specimens without geographic information)	Computational analysis
Generation of species distribution models	Colombia	Critical	500 GBP	1 year		We will model the potential distribution of the species using Maxent following the proposed procedure of Agudelo-Hz, Urbina-Cardona, & Armenteras-Pascual, 2019	Generates over-adjusted models leading to inadequate results	Computational analysis
Calculation of the extent of suitable habitat for <i>L. miyatai</i> ,	Colombia	Critical	1000 GBP	1year	Tayrona NNP	Area of suitable habitat mapped	Inadequate results because of failure in the model design	Computational analysis



and land-use change scenarios								
<b>Objective 4: Generate a strengthening of environmental education in the community</b>								
Social Cartography using PGIS (Participatory Geographic Information Systems) workshop approach with the community of Las Tinajas and Calabazo	Colombia	Critical	5000 GBP	2 years	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Generation of maps that showing the local people's perception about their territory	Not enough key actors who give information on land use and change	Conduct workshops where the villagers can draw polygons on georeferenced landscape maps to indicate areas, and economical activities of local importance.
Structured Interviews with Key informants of the community of Las Tinajas and Calabazo to obtain information for the PGIS	Colombia	Critical	1000 GBP	1 year	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Number of interviews, informed consent	People do not want to be part of the interviews	Field work
Processing and validation of the information generated in interviews and PGIS workshops	Colombia	Critical	1000 GBP	2 years	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Digitalised information, shapes files, Plotted map	Not enough key actors to review the digitalised information	Generate detailed maps to identify activities in the area, priority conservation areas for the species and areas with the greatest intervention need
Strengthening the knowledge of children at schools from Las Tinajas and Calabazo	Colombia	Critical	20000 GBP	10 years	Community of Las Tinajas and Community of Calabazo	Number of workshops and attendance lists, informed consent	Not enough children for workshops	Musical workshops will be held in the schools of the communities with



using printing material and musical workshops								the accompaniment of foundations such as “Jacana jacana” who carry out environmental education through music. Likewise, didactic material will be generated to be distributed to children during the workshops in order to improve their knowledge of the species and reptiles in general
<b>Objective 5. Implement a monitoring system through participatory action research approach (PAR)</b>								
Create a participatory monitoring program	Colombia	Critical	10000 GBP	5 years	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Number of workshops and attendance lists, informed consent; workshop report	Not enough people for workshops	Workshops with the community to: 1) identify reptile species in the area, with emphasis on small lizards; 2) identify important areas of suitable habitat for this species; and 3) recognise the important aspect of the biology of small lizards and reptiles



Workshops with communities about reptile monitoring	Colombia	Critical	10000 GBP	5 years	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Number of workshops and attendance lists, informed consent; workshop report	Not enough people for workshops	Workshop to: 1) establish better survey techniques within the community; 2) determine periods and duration of each monitoring survey; and 3) determine which institutions the information should be shared with and why
Surveys and monitoring with the community	Colombia	Critical	10000 GBP	5 years	Community of Las Tinajas and Community of Calabazo Tayrona NNP	Numbers of surveys and monitoring realize each trimester, attendance lists, field formats	Not enough people for workshops	After training, survey sites will be established to search for reptiles. Community members will report the reptiles registered per each field work in field report formats
<b>Objective 6. Create an environmental education program about tropical dry forest lizard of the Tayrona NNP with the staff of the protected area and tourist enterprises that works in the area</b>								
Interviews with staff of the Tayrona NNP that work on tours and	Colombia	High	1000 GBP	1 year	Tayrona NNP staff	Number of interviews, informed consent	People do not want to be part of the interviews	Field work



wildlife monitoring within the park								
Interview with the staff of the touristic enterprise that work inside the Tayrona park	Colombia	High	1000 GBP	1 year	Tourist operators	Number of interviews, informed consent	People do not want to be part of the interviews	Field work
Workshops with Tayrona NNP staff and Touristic operators to develop monitoring strategies for <i>L. miyatai</i>	Colombia	High	5000 GBP	5 years	Tayrona NNP staff, Tourist operators	Assistance lists, informed consent	Not enough people for workshops	Field work
Creation of information boards within the park on <i>L. miyatai</i>	Colombia	Medium	10000 GBP	10 years	Tayrona NNP	Number of fences distributed in bays where the species has presence.	Problems with the desing and distribution of the fences	Administrative work
Design and creation of information brochures showing the diversity of the park's reptiles and how to identify them	Colombia	Medium	8000 GBP	7 years	Tayrona NNP Tourist operators	Numbers of brochures with the information of Tayrona NNP's reptiles	Problems with the design and distribution of the brochures	Generate illustrative brochures with the list of species, photographs and basic information of the reptiles. This booklet will be distributed to tour operators so that they can distribute it to tourists and to Tayrona NNP so that it can be placed by them at the



								entrances authorized for ecotourism
<b>Objective 7: To create a network of institutions working on Tropical Dry Forests in Colombia</b>								
Create a network on tropical dry forest studies	Colombia	High	1000 GBP	7 years	NGOs, private and public Academic Institutions, public environmental Institutions (regional and national)	Number of workshops and attendance lists	Establishing communication between researchers and institutions can be very challenging	Office work, fieldwork
<b>Objective 8: To Consolidate a working team composed of different experts for the creation of a National Program for Reptile Conservation in Colombia</b>								
Invite experts to participate	Colombia	High	1000 GBP	5 years	NGOs, Academic Institutions	Number of workshops and attendance lists	Experts are not interested in being part of the initiative	Office work
Establish workspaces to discuss the necessity for public policy for reptile conservation	Colombia	High	1000 GBP	5 years	NGOs, Academic Institutions	Number of workshops and attendance lists	Establishing communication between researchers and institutions can be very challenging	Office work
Establish workspaces to invite institutions to participate in discussions tables	Colombia	High	1000 GBP	5 years	NGOs, Academics Institutions Others Publics	Number of workshops and attendance list	Establishing communication between researchers and	Office work.



about tropical dry forest and endemic species of this ecosystem.					Institutions like Alexander Von Humboldt, or The Ministry of Environment and Sustainable Development		institutions can be very challenging	
Create a webpage to monitor ongoing work and foster collaboration in conservation of tropical dry forest and endemic species of this ecosystem.	Colombia	High	1000	7 years	NGOs, Academics Institutions, Other Public Institutions like Alexander Von Humboldt, or The Ministry of Environment and Sustainable Development	Web page created, distributions maps for species, photos	Problems with accessing information on species of Tropical Dry Forest. Problems establishing communication and interchange of data with researches and institutions	Office work
<b>Objective 9: To Promote academic research to study the ecological knowledge gaps of the species</b>								
Generate information about predator-prey interactions involving <i>L. miyatai</i>	Colombia	medium	6000 GBP	7 years	Academic Institutions, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Number of fieldtrips, data sheet with information, data analysis, scientific papers	Difficulty in accessing the study area, public order, climate conditions	Conduct Field work to generate information on
Study on functional traits of <i>L. miyatai</i>	Colombia	medium	6000 GBP	7 years	Academic Institutions, Tayrona NNP,	Number of fieldtrips, data sheet with	Difficulty in accessing the study area,	Conduct fieldwork to collect data on the functional traits and





					Autonomous Regions Corporation-CORPAMAG	information, data analysis, scientific papers	public order, climate conditions	the relationship between response traits and risk of local extirpation
Study of growth and demography of <i>L. miyatai</i>	Colombia	medium	3000 GBP	7 years	Academic Institutions, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Mark-recapture data, Number of fieldtrips, data sheet with information, data analysis, scientific papers	Difficulty in accessing the study area, public order, climate conditions	Conduct Field work to generate matrix on mark-recapture during different seasons and other variables associated like: weight, snout vent length and sex to estimate growth curves
Generate knowledge on reproductive cycles of <i>L. miyatai</i>	Colombia	Medium	6000 GBP	7 years	Academic Institutions, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Number of fieldtrips, data sheet with information, data analysis, scientific papers	Difficulty in accessing the study area, public order, climate conditions. Problems with animals in ex-situ conditions. Problems with permits with CORPAMAG and ANLA for capture and transport of the animals	Field work to collect individual of <i>L. miyatai</i> . Each individual will be measured weighed and euthanized.  Each specimen will be analysed in the laboratory.



Study on diet of <i>L. miyatai</i>	Colombia	Medium	6000 GBP	2 years	Academic Institutions, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Number of fieldtrips, data sheet with information, data analysis, scientific papers	Difficulty in accessing the study area, public order, climate conditions	Field work to collect individuals and analyse in laboratory stomach contents
<b>Objective 10. Generate an ex-situ reproduction program in conjunction with the Botanical and Zoological Foundation of Barranquilla, Colombia</b>								
Design protocols for ex-situ conditions for the species	Colombia	Medium	6000 GBP	10 years	Botanical and Zoological Foundation of Barranquilla, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Document with all the information about reproduction and conditions in captivity for geckos	Difficult to obtain information on reproduction and conditions in captivity for small geckos. Problems with permits with CORPAMAG and ANLA for capture and transport of the animals	Office work
Create spaces and conditions to keep animals in <i>ex-situ</i> (terrariums, records of environmental conditions, feeding)	Colombia	Medium	10000/ GBP	10 years	Botanical and Zoological Foundation of Barranquilla, Tayrona NNP, Autonomous Regions Corporation-CORPAMAG	Numbers of terrariums, number of individuals in captivity, records of environmental conditions	Problems with the acquisition of materials and supplies for the construction of terrariums, lack of equipment to record environmental conditions	Laboratory work – ex-situ



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