Chapter 14
Conservation Concerns About the Southernmost Lizards of the World

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Abstract Lizard populations are globally in decline due to several human-related threats, and the Patagonia region is not an exception to this problem. With more than 160 species, Patagonian lizards encompass a high percentage of the lizard diversity from South America. Among them, at least one-third are currently listed with some IUCN Red List threat category. These species are affected by several threats, among which some of the most harmful ones are related to energy production, mining, and agriculture. Among threatened species, the six most endangered are *Liolaemus confusus*, *Liolaemus curis*, *Liolaemus cuyumhue*, *Liolaemus hermannunezi*, *Liolaemus rabinoi*, and *Phymaturus vociferator*. These species deserve special attention, thus the areas where these lizards occur should be protected. However, in order to protect a higher number of species in the wild, alternative approaches should be undertaken to prioritize conservation areas, considering other sources of information including local politics, opportunities, social context, land availability, degree of habitat disturbance, and lizard biodiversity, among others. In this challenging scenario, the conservation of Patagonian lizards will require not only committed people, but also further research, adaptive management, sustainable development, and even citizen activism to promote a change in governmental decisions.

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14.1 Lizards on the Edge: Global Situation of Endangered Reptiles

One of the most severe environmental problems caused by humans is global loss of biodiversity (Barnosky et al. 2011). Approximately 200 vertebrate species have disappeared in the past 100 years. This represents an increase of at least two orders of magnitude in the extinction rate when compared to what was recorded during the prevailing two millions years (Ceballos et al. 2017). This current biological annihilation is considered to be the sixth massive disappearance of biota since the emergence of life on Earth, and evidence shows it is mainly caused by human-related threats (Dirzo et al. 2014; Brook et al. 2008).

At present time, a great number of land vertebrate populations are in decline (Pimm et al. 2001). Some extinctions occur so fast (an average of two vertebrates per year) that it is not possible to study the consequences of these events (Ceballos et al. 2017). However, when considering the key role these animals play in ecosystems and the complex networks they integrate, a direct effect on other organisms including humans is highly expected (Steffen et al. 2011). Researchers and practitioners, concerned on this problem, have been working on preventing the extinction of vertebrates worldwide with a historical higher focus on large mammals and some charismatic birds. On the other hand, this situation left amphibians and reptiles underrepresented in conservation planning even when they show a bigger extinction risk than other groups (Pawar et al. 2007). Fortunately, reptiles have received more attention during the last decade than in the past.

Nowadays, reptiles are recognized as environmental heralds (Gibbons and Stangel 1999). It is well known that they play a key role in ecosystems as predators, preys, or seed dispersers; they are useful bioindicators of environmental health and are also model organisms in ecological and evolutionary researches (Pianka 1973; Read 1998; Raxworthy et al. 2008). However, a combination of narrow distributional ranges and higher degree of specialization to live in specific habitats makes reptiles more susceptible to environmental changes and disturbances when compared to other vertebrates, being endemic species generally the most affected (Huey et al. 1983; Jensen 2008). Reptiles are facing several human-related threats, including habitat loss and degradation, invasive species, environmental pollution, emerging diseases, unsustainable habitat use, and climate change (Gibbons et al. 2000; Sinervo et al. 2010; Böhm et al. 2013). These threats, alone or in combination, are increasing extinction risks in reptiles worldwide, and the Patagonia region is not an exception to this problem.

Patagonia is considered an area of high endemism of vertebrates (Lamoreux et al. 2006), and reptiles represent an important component of the Patagonian fauna.

Among reptiles, the Patagonian lizards show not only an incredible diversity of species but also a high number of endemisms (Chebez et al. 2005). This region is considered a "hot" center of origin and diversification source for some lizard genera, such as *Pristidactylus* Fitzinger (Lamborot and Diaz 1987; Scolaro et al. 2003), *Leiosaurus* Duméril and Bibron, *Diplolaemus* Bell (Cei et al. 2003), and *Phymaturus* Gravenhorst (Díaz Gómez 2009). Although several conservation projects are currently being carried out in Patagonia, lizards' hazards and problems are still not being fully addressed.

The current scenario of Patagonia with an increase in frequency and magnitude of threats coupled with the absence of sustainable policies makes the lizards' situation very worrying. In this chapter, we will summarize the current information related to conservation of Patagonian lizards. We will assess lizard biodiversity and conservation status, threats, priority species, and areas while evaluating management needs in order to promote conservation actions in a preliminary way. We hope this work serves as a baseline to promote the protection of lizards in this remote and pristine region from South America.

14.2 Diversity and Conservation Status of Patagonian Lizards

Geographic aspects of reptile diversification in arid environments (Pianka 1986; Melville et al. 2006) are represented in Patagonia with the second most diverse lizard genus, *Liolaemus* (Pincheira-Donoso and Scolaro 2007; Uetz 2018). This region is considered by several specialists a vulnerable, outstanding area at the regional level and with the highest regional priority for conservation (Dinerstein et al. 1995). Moreover, the Patagonian steppe has been included in the "Global 200" priority ecoregions for conserving the most outstanding and representative habitats for biodiversity on the planet (Olson and Dinerstein 2002). The contribution of Patagonian lizards to the Neotropical diversity, and therefore, to the importance of this area in the international context, is not negligible at all.

With a total of 169 described species (this number can show small differences depending on different taxonomic approaches), grouped within 12 genera, the richness of Patagonian lizards encompasses approximately 8% of the whole diversity of lizards described for the Neotropics (2086 described species, Uetz 2018). More than one-third of these Patagonian species are currently listed within some threat category at national and/or international Red Lists (Table 14.1). From the rest, at least 10% was not yet assessed, another 5% is categorized as data-deficient, and one species is listed as near threatened. Considering that several of these species have small distributional ranges and live in threatened habitats, we assume a great number of them will fall within a threat category after a deep assessment. These results mean that the current number of threatened lizard species living in Patagonia could reach

Table 14.1 Number of Patagonian lizards' species listed at each category in national and international Red Lists

	National Red List	IUCN Red List
Not assessed	24	22
Data-deficient	13	12
Least concern	78	120
Near threatened	1	1
Vulnerable	42	5
Endangered	6	6
Critically endangered	5	3

approximately 50%; a number that will probably increase in the short term if the current trends of human-related threats continue.

A high number of lizard species from Patagonia are endemic to the region. Among them, the higher number of endemics belongs to the diverse family Liolaemidae, with almost all of its species included within the genera *Liolaemus* and *Phymaturus*. *Liolaemus* is the second most diverse genus of Iguania, and the Patagonia region harbors approximately 40% (112 species) of the total species richness within this clade (Pincheira-Donoso and Scolaro 2007; Abdala and Quinteros 2014). Among these species, approximately 30 are endemic to Patagonia (Corbalán et al. 2011), and 10 of them are listed in some threat category at the IUCN Red List, meaning that 26% of threatened *Liolaemus* live in this remote region.

The genus *Phymaturus* is mainly endemic from Patagonia with part of it living in neighboring regions. *Phymaturus* has a total of 48 species, 40% of which are listed in some threat category at the IUCN Red List, but a review of their status in national Red Lists showed an increase in threat category of up to 60%. However, both Red Lists (National vs IUCN) are based on different methodologies with some differences in the applied categorization criteria (see Box 14.1).

Independent of the implemented method, most of the imperiled species among Patagonian lizards were listed within a threat category based on three common factors: (1) small populations, expressed in a small number of individuals and/or a small distributional range; (2) declining populations, expressed in a decline of the number of individuals and/or a decline in the distributional range, and (3) populations severely fragmented and/or species occurring in a small number of localities (criteria A, B, C, and/or D of the IUCN and variable National Distribution of the SUMIN index, see Box 14.1).

Most of Patagonian lizard species are endemic and/or specialists, with restricted ranges, and it is well known that these kinds of species are commonly the most affected by human-related threats (Işik 2011). This is in coincidence with the paradigms of the small populations and the declining populations from the Conservation Biology discipline. In this regard, any management aimed at ensuring the long-lasting viability of these species should mainly be focused on stopping population declines by alleviating main threats and then to recover populations until reaching a stable population size. For this reason, it is very important to firstly know which threats are affecting Patagonian lizards as a way to start planning how to mitigate them.

Box 14.1: Methods Used to Categorize Patagonian Lizards at National and International Red Lists

The National Red List of Patagonian lizards was based on the methodology proposed by Reca et al. (1994) with some modifications (see Lavilla et al. 2000; Giraudo et al. 2012), at least for the Argentinean species, which represents approximately 85% of all lizards' species inhabiting this region. This method depends upon the estimation of the SUMIN index for each species, which is based on assigning standardized values in a qualitative way to six variables (Avila et al. 2013). These variables are (1) national distribution and degree of endemism, (2) ecological rarity, (3) human effects, (4) reproductive potential, (5) size, and (6) abundance. Each variable can have a value from 0 to 5 (5 being the worst value in terms of conservation), and the sum of these variables for each species represents the SUMIN index. The distribution of SUMIN values for all the assessed species is then used to establish a limit value after which a species is considered as threatened. For this reason, this method is sensitive to the number of species assessed. On the other hand, the method applied by the IUCN can determine a threat category on the basis of few variables, as long as a predefined threshold was reached. In this last case, each assessment is species-specific, thus this method is not affected by the number of species assessed. Since both methods have strengths and weaknesses, they can be applied in a complementary way, in order to achieve a deeper understanding about the conservation status of a group of species.

14.3 What Is Threatening Patagonian Lizards?

Nonnative people were the first to inhabit the vast land of Patagonia (most of them immigrants from the United Kingdom) approximately a century ago. The historical use of the Patagonia region by immigrants was as livestock ranches with a number of domestic animals that overpassed the carrying capacity of the ecosystem. This bad management led to a desertification process that even today is considered one of the most harmful process affecting the steppe habitat, 60% of the Patagonia region (Mazzoni and Vázquez 2009). Later, the increasing and not planned urbanization, the unregulated tourism, and the industrial development originated several new sources of threats for native lizards. However not all these threats are affecting Patagonian lizard species in the same way. Detailed knowledge of which threats are specifically affecting each species is key to start developing action plans aimed at protecting these species and its habitats.

Within the species files recorded at both the national and the international Red Lists, detailed information related to specific threats exists for most of the 56 lizards

listed in some threat category. However, 22 species still are listed within a threat category but without a reference to any recognized threat. Within these 22 lizard species, 17 of them are included in the genus *Phymaturus*. These species were listed in a threat category only at national level, mainly because they are herbivorous and viviparous lizards (which is not common among neotropical lizards) with restricted distribution ranges, thus they are assumed to be most sensible to potential disturbances (Chap. 13). As seen in Box 14.1, these features are enough to include species in a threat category following the SUMIN methodology but not by following the one used by the IUCN. For this reason, more research is needed in these species in order to start figuring out what threats are affecting them and in which degree of impact. Regarding the 34 species with recognized threats, we can observe that they are affected by a total of 21 types of threats, grouped in 11 of the 12 categories recognized by the IUCN (unified list for classification of threats affecting biodiversity, IUCN 2018). The most frequent threats recognized as affecting Patagonian lizards are related to energy production and mining with 20% of the species affected; agriculture and aquaculture, reaching 20% of the species affected; and residential and commercial development with 13% of the species affected (Table 14.2).

It is important to highlight two threats that may potentially affect Patagonian lizards, related to two governmental projects still not implemented. The first one is the construction of a nuclear plant, projected for northeastern Patagonia (near to the Atlantic coast), and the second one is a hydroelectric dam projected for central western Patagonia, near the Andean mountain range. In the case of dams, a negative effect was already recorded for some threatened Patagonian lizards (Mella and Nunez 2017). For this reason, in case these projects are effectively implemented, the development of a monitoring program for target species is highly recommended, as a way to promote rapid conservation responses when necessary.

14.4 Priority Species for Conservation

It is clear that the biodiversity of the Patagonian lizards is under risk, and if we do not focus on conservation efforts, many populations could decline and even go extinct in a short period of time. However, given that conservation funds are limited, managers must decide where and how to invest (Pimm et al. 2001). In this frame, biologists and managers have developed methods to prioritize conservation efforts (Margules and Usher 1981; Usher 1986; Mindreau et al. 2013) mostly based on priority species and/or areas. In this section we will focus on six priority Patagonian lizard species that must be urgently considered as target in conservation programs. These species are listed as critically endangered at the national and/or the international Red Lists. This category means that a species will probably go extinct if the causes associated to its decline do not cease or diminish under a significant threshold, thus we also will deepen on which are these specific threats and how we can stop them.

Table 14.2 Number of species of each genus affected by different types of threats (the same species can be affected by more than one threat)

	Number of species	Urban development	Agriculture and aquaculture	Energy production and mining	Transportation and service corridors	Biological resource use	Human intrusions and disturbance	Natural system modifications	Invasive and problematic species	Pollution	Geological events	Climate change and severe weather
Pristidactylus	4	1	3	2	1	3	1	1	1	1	0	0
Phymaturus	27	1	3	5	2	0	0	1	0	3	3	1
Liolaemus	22	7	5	7	3	1	4	1	2	2	4	0
Diplolaemus	3	0	0	0	0	1	0	0	0	0	0	0

The item urban development includes residential and commercial development

Liolaemus confusus This species was recently described by Núñez and Pincheira-Donoso (2006). It is known from three closely located sites in Chile. The species is locally common, but it populations are apparently declining due to habitat loss related to the expansion of pine plantations, an exotic habitat that the species reject. It is also threatened by goats overgrazing and firewood extraction (Nuñez 2017). The species was formerly listed as critically endangered at the National Red List (Ministerio del Medio Ambiente 2014), previous to the discovery of a new subpopulation. Later the species was listed as data-deficient at the IUCN Red List (Nuñez 2017), making its real status unclear until more information is gathered. Remarkably, a "preventive rescue" of 20 specimens was carried out when the 2017 Chilean forest fires approached to the type locality, the only time that such protection protocol has been carried out in Liolaemidae (Ramírez-Álvarez et al. 2017).

Conservation Actions Needed or in Course Since the species does not occur in any protected area, it is recommended to conduct actions oriented to protect its habitat and to mitigate main threats.

Liolaemus curis This species is endemic to rocky areas of Andean shrublands in Chile (Termas de Flaco and Damas River) with a very small extent of occurrence of 10 km^2 (see IUCN Nature Serve 2017 for a detailed description of this term). The species was listed as critically endangered at the IUCN Red List (Mella and Nunez 2017) and the Chilean Environmental Ministry (Ministerio del Medio Ambiente 2014), mainly because most of its habitat was completely destroyed by hydroelectric dams, reducing the current population to just a few individuals (Mella and Nunez 2017).

Conservation Actions Needed or in Course Although a group of individuals were successfully translocated to a suitable habitat previous to the development of a hydroelectric plant, this habitat was also lost because of another hydroelectric project (Ministerio del Medio Ambiente 2014). A reintroduction program based on ex situ management would help this species recovery as long as new habitats are found.

Liolaemus cuyumhue This species is only known from its type locality, a small sand dune ecosystem located in Bajo de Añelo (Patagonia Argentina). Its habitat is currently being degraded by intensive oil and gas exploration and exploitation. A recent oil and gas project within the range of this species, which is based on fracking, is planned to be conducted at this species' habitat. Not only this big project but also its consequent activities (new rigs, tracks, and roads) could bring this species to the edge of extinction. For this reason, *L. cuyumhue* is listed as critically endangered at the IUCN Red List (Avila 2016) and as vulnerable at the national Red List (Abdala et al. 2012). *Liolaemus calliston*, a syntopic species recently described (Avila et al. 2017) from the same locality, could be in the same category.

Conservation Actions Needed or in Course A recent news article published in one of the most important newspapers in Argentina discussed a potential revision of the Vaca Muerta project due to the potential extinction of this species (Kacoliris, personal observation). However, considering the expected income of this oil and gas extraction, it does not look like this report is going to change the course of the project. In this context, the search for new habitats for translocating individuals is highly recommended.

Liolaemus hermannunezi This species is known only from the type locality, near Los Barros, Biobío Region, Chile (Pincheira-Donoso and Scolaro 2007; Abdala et al. 2012), its presence in Argentina being uncertain. An international highway planned between Chile and Argentina will cross through its range causing habitat fragmentation and potential roadkills. The species is also thought to be strongly affected by volcanic activity and fires in the region. For these reasons, this lizard was listed as critically endangered at the National Red List (Ministerio del Medio Ambiente 2014). However, given the lack of enough evidence, the species was later listed as data-deficient at the IUCN Red List (Garin et al. 2016).

Conservation Actions Needed or in Course There are no ongoing specific management actions in place aimed to protecting this lizard. The construction of pathways for wildlife could help in reducing the adverse effects of the planned highway.

Liolaemus rabinoi The current area of occupancy of this species is smaller than 4 km^2 (see Nature Serve IUCN 2016 for a detailed description of this term). A hydroelectric dam destroyed the previously known habitat of this species, and it was assumed extinct. A new population was found in sand dunes that are heavily disturbed by the unregulated circulation of off-road vehicles, including rally competitions (Abdala et al. 2017). For these reasons and the fact that this lizard does not occur in any protected area, the species was listed as critically endangered in the IUCN and in the national Red Lists (Abdala 2016; Abdala et al. 2012).

Conservation Actions Needed or in Course Some attempts were conducted to avoid circulation of vehicles in the area, including a change in the route of the Dakar Rally. However, local people still drive on the habitat. Effective prohibition of vehicles on these sandy habitats and the creation of a protected area are highly needed. Translocation of individuals to safer habitats could also improve current status of this species by promoting the establishment of new populations.

Phymaturus vociferator This species is endemic to Chile, with an extent of occurrence of nearly 74 km^2. Its whole population is restricted to one location. Although the population is located within a National Park, a binational project aimed at connecting Argentina and Chile through a highway would threaten the species (Avilés et al. 2017). The road could lead to a decline in the extent and quality of the habitat

of this lizard and, even worst, to the species' extinction. For this reason *P. vociferator* was listed as critically endangered at the National Red List and as vulnerable at the IUCN Red List (Avilés et al. 2017).

Conservation Actions Needed or in Course This species is found in Parque Nacional Laguna del Laja. Still, no ongoing conservation actions are taking place to prevent the effects of the planned highway. The construction of pathways for wildlife could help reduce the adverse effects of the highway.

In summary, a total of six lizard species are listed as critically endangered at least in one of the Red Lists. However, the status of two of these species, *L. confusus* and *L. hermannunezi*, was recently changed to data-deficient, making its real status unclear until new information is gathered. Among the other four species, two of them are endemic to Argentina (*L. cuyumhue* and *L. rabinoi*), and two of them are endemic to Chile (*L. curis* and *P. vociferator*). Urgent actions are required to avoid the extinction of these four species but without losing sight of the remaining species. In a regional context of increasing threats (e.g., highways, hydroelectric plants, oil and gas extraction, etc.), it is expected that several of the species currently listed as endangered or vulnerable will be moved to a critically endangered category. At the same time, data-deficient and species not yet assessed might fall in any threat category in the short term. Thus, not only specific actions for priority species but also bigger and more ambitious actions are needed to preserve a higher number of Patagonian lizard species in the wild.

14.5 Priority Areas for Conserving Patagonian Lizards

Which areas are better to protect lizards in Patagonia? As seen before, the answer to this question will depend on the conservation target—a species or a group of species, but in any case, priorities among different areas should be established on the basis on predefined criteria. However, even when targets are known and priorities are established, to design a protected area is very difficult, and the real implementation of that area is even harder. A lot of variables must be attended, and many times, the designated areas tend not to be the ones identified as priorities in scientific studies. Even so, researchers continue doing their best trying to develop methodologies that include the most detailed information for a better prioritization process (see Box 14.2). In this section, we provide some basic but important information to help in identifying some priority areas for conservation of Patagonian lizards.

Box 14.2: Some Methods Used to Establish Conservation Priorities
Prioritization is commonly related to the fact that conservation resources are limited. Thus, it is necessary to decide where to focus conservation efforts. There are several ways to determine priorities among areas when the aim is to protect species. A simple approach to prioritizing is to assess species richness

(continued)

Box 14.2 (continued)
among potential areas. The higher the number of species present in a specific area, the higher the priority for conservation. In other cases, the objective of a protected area can be to conserve a single highly threatened species. To integrate both approaches, some methods that consider the differential contribution of endangered species to the overall richness were developed (Fattorini 2006). Several other factors are commonly considered in prioritization (e.g., politics, opportunities, social context, land availability, and degree of disturbance, among others), promoting the development of methods aimed at easing the decision-making process to managers (Álvarez-Berastegui et al. 2014; Kacoliris et al. 2012). Moreover, newer approaches have to consider future changes in habitats due to climate change. It is clear that the problem of determining priority areas for conservation has been a prevailing one among specialists and managers, and there is not just one solution. Instead, new methods must be adaptive and flexible enough to not only be useful but also feasible for solving specific problems.

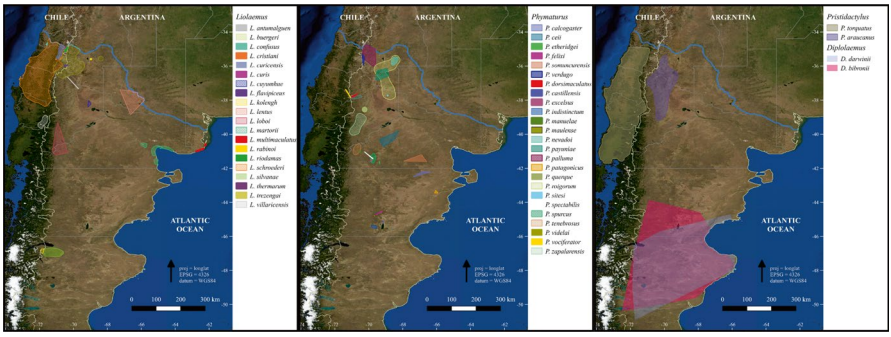

Fig. 14.1 Known ranges for priority lizard species inhabiting Patagonia

A simple but logical approach is to assume that the distributional range of priority species (i.e., the species with the higher extinction risk) should be a priority area. In Fig. 14.1 we represented the known distributional ranges for Patagonian lizards listed as threatened at national and/or IUCN Red Lists (i.e., vulnerable, endangered, or critically endangered). At first glance, this clearly shows that the aim of protecting all these threatened species by setting protected areas that encompass their ranges is very ambitious. However, if we focus just on the most threatened species (i.e., the four listed as critically endangered—*L. cuyumhue*, *L. rabinoi*, *L. curis*, and *P. vociferator*), the total area to protect, based on their extent of occurrence and area of occupancy, would be less than 100 km^2. Unfortunately, as seen in the previous section for some of these species, the economic interests on the lands where they inhabit make very unlikely the creation of protected areas there.

Another approach is provided by Corbalán et al. (2011), who defined priority areas based on the core area of the geographical distribution of the Patagonian lizards (with a high probability of presence). In the method proposed by these authors, key conservation areas for Patagonian lizards are defined based on a systematic planning with decision support tools (e.g., Marxan and Zonation). These algorithms consider both biological and socioeconomic data along spatial discretized planning units (Watts et al. 2009; Lehtomäki and Moilanen 2013). This type of design and planning of protected areas allow decisions through reproducible and perfectible analysis on both temporal and spatial scales (Watts et al. 2009; Delavenne et al. 2012). The authors conclude that the current reserve network fails in protecting at least 10 out of 60 lizard species included in the study and that in order to protect at least 5% of the distributional ranges of these lizards, the reserve network should increase its area by 3.7%.

An alternative approach to determine priority areas in Patagonia includes several sources of information such as geomorphology, fauna, vegetation, ecology, paleontology, and archaeology of the region (Chehébar et al. 2002). Within the fauna category, the authors considered 82 Patagonian lizard species, among several other vertebrates. Some results of this detailed study were congruent with those obtained by Corbalán et al. (2011), indicating that lizards can act as surrogate species for other taxa (i.e., priority areas for lizards can be similar to priority areas for vertebrates). Even more, some of the priority areas for lizards recognized in Corbalán et al. (2011) are congruent with priority areas selected based on the geomorphology and landscape in Chehébar et al. (2002), thus indicating that in some situations, protecting lizards can lead to the conservation of other values than fauna alone.

Regrettably, as observed before, the gap between the identification of a priority area and effectively protecting that area is usually extremely large, most of the time nearly impossible. Luckily, several types of legally protected areas exist in Patagonia. These areas have different categories including National Parks, National Reserves, Provincial Reserves, Biodiversity Refuges, Private Reserves, and others. National Parks are the most stable because they depend on their own autonomous government and have designated management and control resources. These National Parks play an important role in protecting suitable areas for a high number of Patagonian lizard species (Chebez et al. 2005). In a controversial way, *P. vociferator* is the only critically endangered species that is currently protected within a National Park (Laguna de Laja). Future efforts should promote the creation of new protected areas to ensure a better conservation of some of the most threatened lizards in Patagonia.

14.6 The Challenge of Conserving Lizards: What We Can Do?

The conservation of lizards represents a big challenge and in many cases is even greater than in other groups of vertebrates, because these small animals are not seen as charismatic species (Chap. 2). This situation not only hinders the access to

conservation resources but also makes it difficult for people to engage in lizard conservation. Fortunately, the engagement of people is possible (e.g., sand lizard *L. multimaculatus*, Kacoliris et al. 2012) but requires conservationists to be creative. Even so, people's engagement alone is not enough to stop lizards' decline. The conservation problems affecting Patagonian lizards are too complex, so effective protection of these species can only be addressed by a combination of pragmatic actions.

We already have a combination of tools and guides to use in order to improve the conservation of endangered lizards and their habitats, but none of them can be considered a "silver bullet." Actions that work with one species or area might not with other species and even with the same species but in a different scenario. For this reason, these guidelines should be adapted to particular situations, considering the future (and sometimes unexpected) changes and always considering some degree of uncertainty. Adaptive management has proven to be a good strategy since it allows producing scientific knowledge at the same time that the conservation actions are applied and tested. But also, the monitoring should be a key component of any conservation project in order to help address unexpected alterations in a changing world (i.e., the unexpected should be expected).

We have to find creative ways to increase the awareness about lizards' problems with the aim of promoting a behavioral change in people, creating and reinforcing empathetic feelings. In this sense, it is important to work in creating alternatives for local communities in order to replace unsustainable activities with sustainable ones, without affecting or even by improving their annual incomes. A good example of this goal is ecotourism, an activity that is already taking place in several places of Patagonia. However, regulations must be applied in order to benefit local communities over big enterprises, as a way to promote long-lasting sustainability. Furthermore, we have to get more people to be involved in activism as a means to create and to change governmental decisions. Several current environmental policies are taken without any scientific basis and with a clear negative effect on biodiversity. To cite some examples, at some provinces of Patagonia, native species like the cougar and the guanacos were declared as plague, while at the same time some invasive and highly harmful species like trout are being bred and introduced in native habitats by law. When more people start to demand governments to take care of the environment, some of these nonsense can be reversed.

The future of Patagonian lizards is uncertain. Known and unknown threats, in addition to climate change, will probably cause several species to go extinct in the short- and midterm. However, we are still on time to make a substantial change, by combining research and management and by promoting appropriate government decisions. If we do, we can probably increase the viability of several endangered Patagonian lizards and their habitats. We are on a breakpoint on Earth's history that requires plenty of commitment by our part. For those of us who love lizards, is time to get down to work.

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