

Rana pyrenaica

A RELICT OF THE PYRENEES



Editor:



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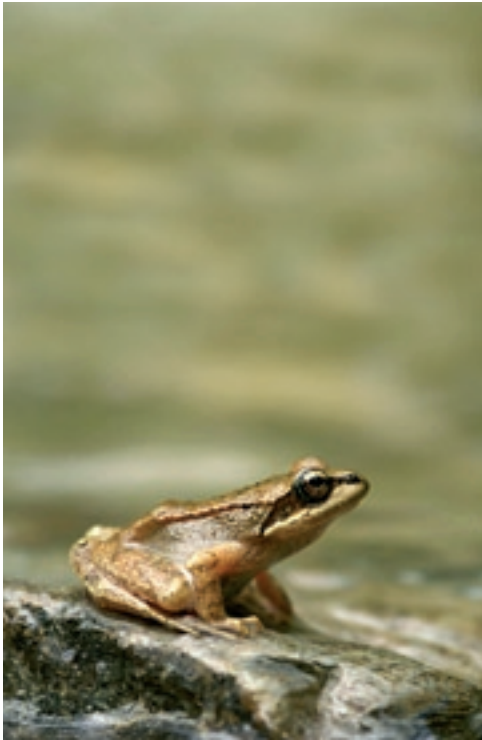
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AN IMPORTANT CREATURE LIVING

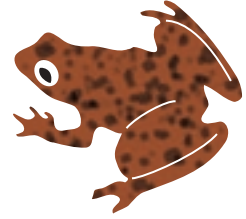


Rocks and water. Some barriers difficult to overcome, as well as broth culture. The two elements meet as sources of life in the mountains, where the fauna can become special. The smallest and most special vertebrates of the Pyrenees are hiding at high altitudes, in a few isolated peaks and in the form of lizards, unknown here or there; or they are diving in the cold waters of brooks, with an appearance of a frog, incapable of inhabiting waters outside these mountains. Here on both sides of the Pyrenean border lives a unique and endemic frog, which we are going to tell you more about in the following pages.

The history of getting to know this frog has been intense and includes mistakes and false assumptions. It has taken decades to form an approximately clear idea of the different forms of frogs that can be found in the Pyrenees. Nevertheless, there is no doubt that even the most hidden details of these inhabitants will be revealed in the course of time.

In a continent as well-developed as Europe, where everything already seems to be known and where to find a new species of animal, the ones we like to consider “superior,” is thought to be difficult, a discovery of such creates astonishment, at least among scientists. Therefore, there is an urge to find out everything about

This book will help us all learn to appreciate the richness of the natural heritage, represented by the existence of an organism like the Pyrenean Frog, as small as it might be, in a gigantic, natural environment as famous and as visited as the Pyrenees.



BETWEEN ROCKS AND WATER

the new species in order to know its place in the natural context as majestic as, in our case, the Pyrenees Mountains.

At this moment, it is obligatory, necessary, and even comforting to gather and organize the existing information and to analyze and synthesize it in order to understand the big picture, which is considered absolutely indispensable. We are experiencing one of the biggest moments and pleasures of a scientist: the resolution of the unknown. This is how we came to approach the project from which this report we are now presenting has emerged, whose purpose is merely to let the public know what is known about the Pyrenean Frog so far. In order to be up to date, we included the latest scientific research of the study in question, which is no other than the variation found between the populations distributed along the mountain chain in places it has been able to colonize during its evolutionary history. We are talking about the genetics, the most efficient tool available to determine the relationship between different populations.

This book will help us all learn to appreciate the richness of the natural heritage, represented by the existence of an organism like the Pyrenean Frog, as small as it might be, in a gigantic, natural environment as famous and as visited as the Pyrenees, which is no longer free from the wide and growing range of threats.



Iberolacerta bonnali



Iberolacerta aurelioi



Iberolacerta aranica

LET'S TALK ABOUT SOME HISTORY

For a long time, the herpetologists (specialists of amphibians and reptiles) have been working in the Pyrenees, trying to name the different forms of frogs they found. Specifically, they wanted to name the forms belonging to the group which has the generic label of brown frogs. These species are characterized by brownish tones, and they can be found in forest environments and mountain grasslands. These frogs are not so tied to bodies of water, unlike another group of frogs, called the green frogs.



*Before discovering the Pyrenean Frog (*Rana pyrenaica*), three species of brown frogs were known to exist in the Iberian Peninsula: the Common Frog (*Rana temporaria*), the Iberian Frog (*Rana iberica*) and the Agile Frog (*Rana dalmatina*).*

Before discovering the Pyrenean Frog (*Rana pyrenaica*), three species of brown frogs were known to exist in the Iberian Peninsula: the Common Frog (*Rana temporaria*), the Iberian Frog (*Rana iberica*) and the Agile Frog (*Rana dalmatina*). It has been thought that at some point all these species have been present in the Pyrenees. Maybe these species were too many to share their habitat without having at least some conflict. But meanwhile, up to the end of the 20th century, there was a lot of discussion about the presence of the Agile Frog in the Catalan Pyrenees, as well as the presence of the Iberian Frog in many areas of the Pyrenees. The latter was recorded in areas situated on both slopes, in Huesca, Hautes Pyrénées, Andorra, and Barcelona. The discussion, at a time when the studies of genetics were still budding or did not even exist, was focused on the morphological aspects, the emphasis being on the size of the individual frogs and on some of their features, especially the length of the hind limbs. It was (and is) quite common to find populations of frogs with hind limbs relatively long compared to its size, a characteristic typical to the Iberian Frog but less common to the Pyrenean Frog and especially to the Common Frog. Given the high morphological variability found in the specimens of all the species of brown frogs, even among local populations of the same species, the confusion was almost inevitable. This is particularly the case with the Iberian Frog, whose presence in the Pyrenees has been, as we have seen, widely supported.

The confusion about the Common Frog, which is indeed a common species in all of the Pyrenees mountain range, from the Basque Country and Navarre all the way to Girona, was caused by the large morphological variability found in the species and by the existence of populations that had long limbs (the so





*In the late summer of 1990, during the course of a study in the Odesa and Monte Perdido National Park, a new type of brown frog was discovered in the area of Bujaruelo. After more than two years of morphological and ecological studies, in 1993, a species new to science was described under the name of *Rana pyrenaica*.*

called Gasser Frogs). It is known that this type of frog is a subgroup of the Common Frog, and it has to be studied thoroughly, not forgetting the studies on the genetic variability. The validity of the several subspecies described for the Pyrenees has to be confirmed. The subspecies with the widest distribution in the mountain range, and widely distributed in the European continent in general, come from a lineage originating from Italy. In the western Cantabrian region a lineage exists, whose origin is from the Iberian Peninsula and whose distribution does not reach the Pyrenees. It is precisely the great similarity of some populations of the Common Frog with the Iberian Frog which led some authors to record the presence of the latter species in the Pyrenees in the middle of the 20th century.

In the late summer of 1990, during the course of a study in the Odesa and Monte Perdido National Park, a new type of brown frog was discovered in the area of Bujaruelo. After more than two years of morphological and ecological studies, in 1993, a species new to science was described under the name of *Rana pyrenaica* (Serra-Cobo, 1993). Following this study the possible presence of the Iberian Frog in the Pyrenees seems to have been rejected for good, considering that just like this species, the Pyrenean Frog is a species that typically inhabits mountain streams with clear and cold water. Without a doubt, some of the historical observations, and even some of the recent ones, published explaining the Iberian Frog may have lead to confusion about the Pyrenean Frog, a species that now can be distinguished from the other brown frogs without difficulties, based on its morphological characteristics, even if some of these might fall into the range of variation that is slightly shared with every species of the group.

Immediately after discovering the existence of the new species, initiatives to determine its distribution in the mountain range and in the peripheral systems were set up. In Catalonia and Andorra the species has still not been found, but in Navarre it was located only one year after its discovery in Huesca. A couple of years later, the species was found in the headwaters of the Irati River, in the French territory of the Pyrénées Atlantiques, but always on the southern slope of the Pyrenees (the Ebro river basin).



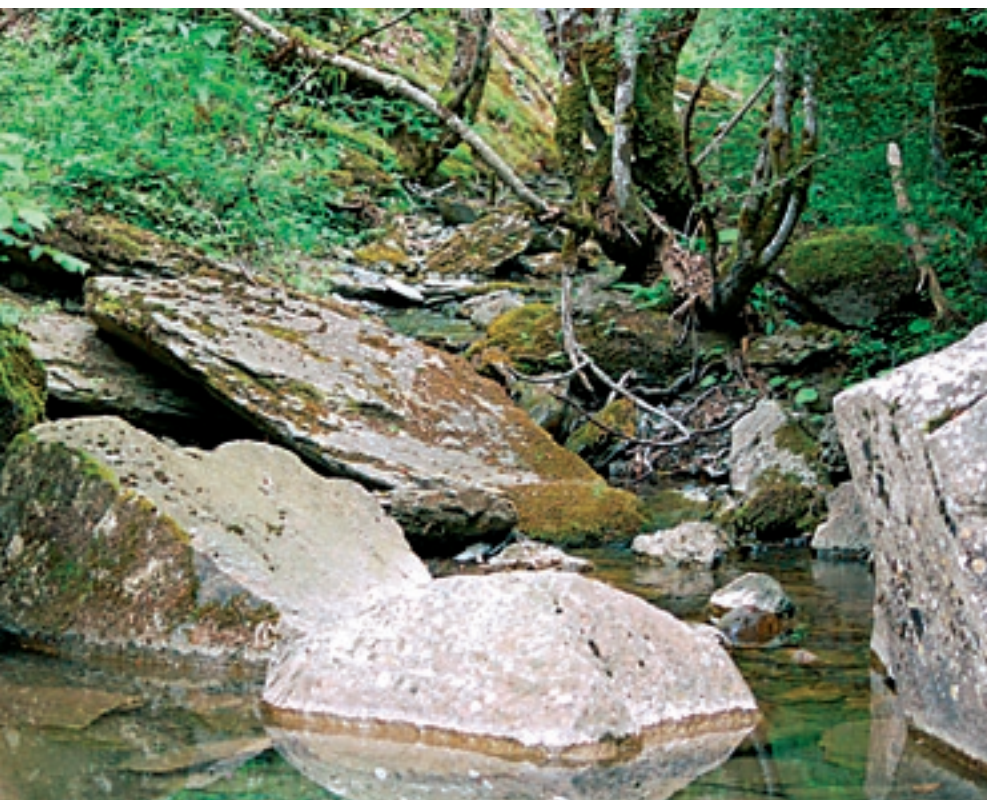
WHERE AND HOW THE FROG LIVES



It is necessary to persevere in doing studies that, eventually, will allow us to determine in detail the relationship between the frog, its habitat, and the other components of the aquatic ecosystems the frog colonizes.

Since the discovery of the Pyrenean Frog, a group led by the founder of the species, Dr. Jordi Serra-Cobo, has carried out an extensive monitoring of the species in the Aragonese Pyrenees, with the goal to get to know the situation of these groups of frogs. The Regional Government of Aragón is the entity responsible for the management of the species, which soon after being discovered was included in the regional threatened species list. The field studies have contributed valuable information about characteristics and biological and ecological necessities of the species, aspects that were previously completely unknown. Nevertheless, this process is far from being completed, so it is necessary to persevere in doing studies that, eventually, will allow us to determine in detail the relationship between the frog, its habitat, and the other components of the aquatic ecosystems the frog colonizes. All this will contribute to adopting a progressively better species management practice. According to the surveys and studies done in Aragón year after year during the last decade, it now seems that the threats are becoming real for the species. On the other hand, in Navarre there is a lot less information available, and the existing information is limited to the distribution and to some preliminary data on activity cycle, reproduction and habitats occupied by the frog. The French population, directly connected with the Navarrian one, is symbolic and remains quite unknown.





DISTRIBUTION

The Pyrenean Frog is an endemic species to the Pyrenean System, i.e., exclusive to these mountains. Its entire population is concentrated in one part of the Pyrenees, so it is not even dispersed over the whole mountain range. Its distribution range hardly reaches 2000 km². The species inhabits moderately high altitudes of the mountain chain and some mountains of the Pre-Pyrenees. It can be found exclusively on the southern slopes of the Pyrenees, in the river basins of the Ebro River. The characteristics of the northern slopes, in France, do not seem to be favourable to this stream-inhabiting amphibian. The steep slopes generate strong instability in the streams that are fast flowing, leading to marked changes depending on the season. The upper parts of the valleys on the southern slopes present a softer landscape and the frog has learned to adapt to watercourses that flow in areas that have less slope. Nevertheless, this environment is far from being free of instability, and catastrophic events occur, whether caused by summer droughts, thawing avalanches, or moving rocks and soil, that considerably change the morphology of the stream beds and stream banks. However, the highly active dynamics of the populations have made it possible for the frog to adapt to all these changing conditions. The animals continuously colonize new sites for reproduction at the same time they leave others, in a continuous process that leads them to regain the abandoned sites in a few years time. This is a pattern of dispersion that has been defined under the term of “metapopulation dynamics”, and which many populations of amphibians seem to follow. The Pyrenean Frog extends from east to west, between the Ordesa and Monte Perdido National Park (Huesca) and the Irati Valley (Navarre). The headwaters of this river maintain a population of the frog in a group of small brooks, in the French territory of the Pyrénées Atlantiques, in contact with the nuclei situated in the downstream courses of the same river, already belonging to Navarre.

A large majority of the species is found in the Alto Aragón, having a sporadic distribution between the Escuaín Gorge, in the east, and the Ansó Valley, the border of Navarre in the west. If some observations made in the surroundings

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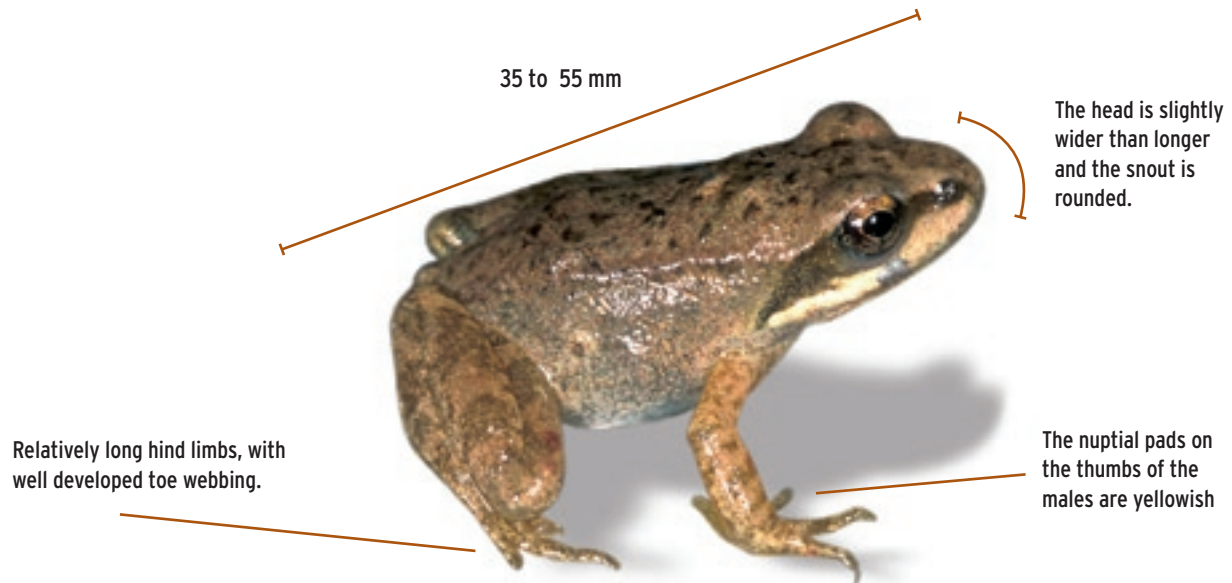
of the Cotiella massif were confirmed, the distribution would slightly extend eastwards. The southern limit of the species' distribution falls in the Canciás Mountains. After having carried out various surveys without finding the species, there exists a big gap between the Canfranc Valley and the Ansó Valley, where the frog appears to be absent (valleys of Hecho, Aisa, Borau). In Aragón the frog has been observed at least once in 130 locations. The most populated nuclei are situated in the valleys of Escuaín and Bujaruelo, the southern slopes of the Tendeñera Mountains, in the upper parts of the Acumuer Valley, and the southern slope of the Collarada.

In Navarre, 28 locations occupied by the Pyrenean Frog are known, situated between the forest of Irati (the western distribution limit of the species) and the Roncal Valley. The species is found in streams at the upper parts of the Aezkoa (mount Aezkoa-Irati), Salazar Valley (ravine of Anduña and high Irati) and the Roncal Valley (ravines of Belabarce, Maze, Mintxate, Uztárroz and Vidángoz). The area occupied by the species does not exceed 700 km².

In the Pyrénées Atlantiques, the frog has been seen at least once in no more than seven locations, scattered along a strip of about 10 km in length, in the upstream of the Irati River (less than 20 km²). Very occasionally the frog appears in stretches of the streams, some of which determine the border of the Spanish territory, like the streams of Contrasario (or Murgatzagiko erreka) and Gazterroko erreka.

MORPHOLOGICAL DESCRIPTION

Given the large amount of variability that exists among the populations of the different species of the brown frogs, as well as among the populations belonging to the same species, it is useful to make comparisons between the morphological characteristics. The Pyrenean Frog is small-sized in comparison with the Common Frog and the Agile Frog, but equal-sized with the Iberian Frog: from 35 to 55 mm. The snout is less pointed than in the Iberian Frog, and the dark stripe crossing the temporal area of the head is less conspicuous than in the other brown frogs. The upper lip is whitish coloured. The head is slightly wider than longer; the tympanum is small and in some particular frogs practically non-existent. The hind limbs are relatively long in relation to the body, and they are longer than those of the Common Frog and shorter than those of the rest of the brown frogs. The toe webbing is well developed, an adaptation to an aquatic life. The colour of the dorsum varies from creamy cinnamon to greyish olive green with some greenish spots, and the females tend to have reddish tones. The venter is clear coloured, and the throat is speckled a slight grey-pinkish colour. As in the other brown frogs, the call of the males is low and barely perceptible. One of the principal secondary sexual characteristics of the males is the colour of nuptial pads on the thumbs of the forelimbs, which is yellowish in the Pyrenean frog in contrast to the grey, brownish or blackish colours in the other brown frog species.

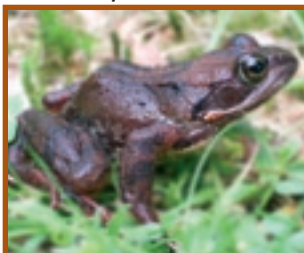


HOW TO IDENTIFY THE BROWN FROGS?

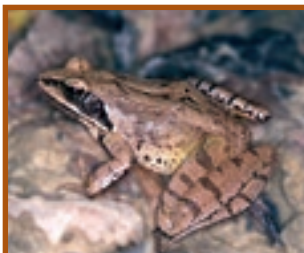
Rana pyrenaica



Rana temporaria







Rana dalmatina



Rana iberica



HEAD	Slightly wider than longer, rounded snout	Wider than longer, rounded snout	Similar length and width, pointed snout	Wide with rounded snout
LIPS	White stripe between the eye (or snout) and the armpit	Whitish stripe between tympanum and eye	White stripe between armpit and eye	White stripe between the corner of the lip and the eye or the snout
TYMPANUM	Very small and not very prominent	Medium-big, positioned far from the eye	Very big and close to the eye	Small and positioned far from the eye
BODY	Relatively slender, small sized	Robust, big sized	Slender, medium-big sized	Slender, small sized
THROAT	Grey-pinkish speckled, without clear central line	With spots or patches of different brown and reddish tones	Clear, sometimes with small brownish spots	With lots of brownish spots and a clear central line
VENTER	 Yellowish white	 Creamy speckled with big spots of diverse tones	 Whitish without spots, groins with lemon yellow patch	 Whitish covered with dark spots
LIMBS	Relatively long, with developed toe webbing	Generally short, with not much toe webbing	Very long, with slightly developed toe webbing	Very long, with well developed toe webbing

LIFE CYCLE



Following the norm of amphibians, the life cycle of the Pyrenean Frog is divided between the aquatic environment, where the larval development takes place, and the terrestrial environment, which includes the adult life. However, even during its adult life, this frog is strongly tied to aquatic environments of flowing water, spending most part of its aerial life inside or on the banks of waterways.



(1)

After mating (1), when the male “embraces” the female under its armpits, the fertilization of the eggs takes place in the water. Eggs are laid under clusters of rocks (2) in streams or in narrow openings between the stream bed and riverbanks, in places where the water current is slow. The majority of the eggs gets stuck to the bottom of the rocks. Each female can lay more than 140 eggs in the Aragón population; the average observed in Navarre is about 70 eggs (with maximum of 170). The eggs are big in size (diameter about 3 mm) and brownish in colour and each of them is surrounded by a small gelatinous capsule. The eggs are very dense and do not float, which is considered to be an adaptation to fast flowing waters, just like the selection of the most sheltered sites for egg laying. It takes between one month and one and a half months for the embryos to hatch and transform into swimming larvae.



(2)



(3)

The development of the larvae is slow and depends on weather conditions of the area. The larvae (3) or tadpoles (called “cucharetas” in the area of Broto, Huesca) are very peculiar, and they are easily distinguished from larvae of the rest of the brown frogs. They are robust, but at the same time slender and really dark (like the ones of the Common toad, that occupies the same habitats as the Pyrenean Frog). The muscular part of the tail is well developed, which helps them to get by in water currents. The larvae have a silver glow on the sides of their bodies.



(4)



(5)

After three to four months of larval growth, or even more in populations that are situated at higher altitudes or under harsher climate conditions caused by snowing and cold temperatures late in the spring time, the metamorphosis takes place (4), following the pattern known for frogs in general. The baby frogs emerge (5) relatively big-sized in comparison to the size of the adults (11 mm in one sample studied in Navarre), having benefited from the big size of the eggs.

HABITAT



The species needs permanent, clean and fresh waterways that do not have algae, but do have a high oxygen level and a constant flow of water with at least some renewal.

The areas inhabited by the Pyrenean Frog are characterised by beech forests, formed exclusively by beech or mixed with firs and Scots Pines. Many areas have been deforested, so currently the lands are covered with mountain pastures. The bedrock is usually limestone, which has favoured the formation of karst landscape. Limestone bedrock holds poorly the water in aboveground watercourses, especially in the highest stretches of the headwater basins. The substrate is flysch, composed of calcareous sandstone in the inhabited areas of the western Pyrenees, and composed primarily of limestone in the central parts of the mountain range. In the upper parts of the Pyrenees, the streams run through mountain pasturelands.

In Alto Aragón, in the middle of the Pyrenean landmasses, the variety of habitats occupied by the frog reaches its maximum, exceeding the variability found in the western periphery of its distribution range. In this zone, the Scots Pine forests cover large areas of land. The most favourable altitudes for the frog range from 1000 to 1800 m, but the species can live at altitudes between 800 and 2100 m. The highest altitude where the frog has been found is in the ravine of Cardal (Bujaruelo Valley). The species is highly dependent on water currents and hardly leaves them during its entire life cycle. The adults spend the whole time dedicated to reproduction in water, under the rocks and in the banks or hiding under small cascades. The streams have rocky or stony bottoms and stony margins, sometimes with herb vegetation. The morphology of the streams is most variable in Alto Aragón where the maximum widths are 1.7-5.3 m and depth varies between 0.15-2 m.

When summer arrives, the frogs shelter in crevices of stream margins, which means that they practically do not leave the aquatic environment. The juveniles show a somewhat more terrestrial behaviour, and they are probably the ones responsible for dispersing and searching for new streams. The species needs permanent, clean and fresh waterways that do not have algae, but do have a high oxygen level and a constant flow of water with at least some renewal. The velocity of the water in the streams of the Central Pyrenees, where the topography is rougher, reaches maximums of 1.57 m/s. The medium water temperatures in July are around 13-21° C, but at the end of winter, the frogs can be active in temperatures of 0.5° C. The pH of the water is alkaline, being slightly



above 8. The frog is never found in still and eutrophic waters, but in this part of the Pyrenees, it can inhabit draining ditches in ravines, drainpipes of roads, fountains, troughs, wells and ponds as long as the water is renewed and stays clear.

In Navarre and the Pyrénées Atlantiques, the frog lives submerged in brooks that circulate in the beech forests and forests mixed with beech and Silver Fir or Scots Pine, mostly dominated by the former ones. In the high Irati and the Navarrian Pyrenees, regions with high pluviosity, the Cantabrian influence is obvious because of the presence of certain characteristic scrublands. There the rainfall exceeds 1400 mm, with the maximum level superior to 2100 mm (Irati, Mintxate Valley).

In Navarre, the Pyrenean Frog is found at 790 m, the lowest altitude known for the species. The highest altitude where the species is present in this region is 1250 m. In the Pyrénées Atlantiques, the frog is found at altitudes between 830 and 1500 m, in the headwaters of the Irati, where the deforestation of beech forests and the consequent cattle farming coincide with the habitat of the most fragile populations of the species. The stream beds are of pebble stones with fine particles, and the medium slope varies between 1 and 16 %. In the Western Pyrenees, the medium width of the streams is around 2 m and the depth is 30 cm.

NATURAL HISTORY



It seems that the hard weather conditions and the small size of the frog join in a manner so that the species can overcome the inherent difficulties in producing new generations using a strategy made up of chained elements.

Based on what we know so far, the Pyrenean Frog may have differentiated from a common ancestor shared with the other brown frogs in the Pre-Pyrenean zone, and after the last glaciations, it would have expanded to the areas where the frog populations are currently distributed. Another explanation could be that the species survived in the interior of some valleys in the Pyrenees, and later on it dispersed in the massif. The process seems to have been fast, which is why the level of genetic variation is very low between the populations; that is, the species shows great homogeneity in genetic composition.

The Pyrenean Frogs are active from the end of February or March until October to November, depending on the prevailing climate of each area and year. The rest of the time, the hardest part of the winter, they spend sheltered in the narrow openings of the stream beds and banks. The reproduction period is between February and April (or even May). The activity may get interrupted by weather conditions, re-initiating after a period of snowing or bad weather conditions. The males occupy the stream pools before the females, staying submerged in areas with a certain depth and calm water. Their call, consisting of seven or eight notes, is relatively weak and, on top of that, muffled by the water mass. The egg laying happens in these places when the females arrive. The reproduction takes place at nights, but the Pyrenean Frog stays active during the daytime as well. Often, the egg masses appear congregated in one single stream pool, attached to different rocks. When the development of the tadpoles is completed, which takes various months, the froglets abandon the water between July and September. It appears that they are more terrestrials than the adults. When the frogs turn three, they reach sexual maturity and reproduce, some of them having colonized gorges close to the ones where they spend their larval phase.

It seems that the hard weather conditions and the small size of the frog join in a manner so that the species can overcome the inherent difficulties in producing new generations using a strategy made up of chained elements: the eggs are big in size, the number of eggs is small compared with other similar species, the larva is robust, and the number of baby frogs that reach the metamorphosis (which we call reproduction success) is probably higher than in other brown frogs. Apparently, the Pyrenean Frogs live only a few years, maybe four or five, because of the instability of their habitats





caused by summer droughts and strong alterations of the stream beds, due to floods and avalanches of rocks that block the pools where the frog reproduces.

The populations with the highest densities of the Pyrenean Frog are found in the Central Pyrenees, but in its whole distribution range, the species appears in small nuclei, many of which seem to be disconnected from the others. The frog does not occupy entire streams, instead only small stretches, and from one year to another the colonized areas may change. The frog ceases to reproduce in a place because of the circumstances mentioned earlier that cause high mortality in the populations or force them to change the place. However, in a few years, the frogs can recolonize the abandoned places. The environmental circumstances and the details of the frog's behaviour still remain quite unknown. Many years of monitoring the frog's movements are needed in order to understand thoroughly the biological characteristics that make the Pyrenean Frog unique among the anuran amphibians (amphibians without a tail in the adult stage, frogs and toads) of the Pyrenees.

The densest populations of the Alto Aragón are the ones found in the Escuaín Valley and the High Ara Valley (Bujaruelo). It has been confirmed that individual frogs from populations which live close by have moved to some of these populations. On the contrary, the populations of the Ordesa Valley have fewer and fewer individuals, and they are very unstable. In Navarre, the densities of the populations get higher from west to east. The populations of the Irati (western extreme) are the least abundant, including the population inhabiting the streams of the upper parts of the Pyrénées Atlantiques, where the fragile populations fluctuate between years, appearing and disappearing from one year to another.

Many features of the ecology of the Pyrenean Frog, of its life and habits, are still unknown. There is no data available on the frog's demography, alimentation or home range (the extent and characteristics of the area where they spend their adult life). In regards to possible enemies, in the streams of the Roncal Valley (Navarre), there are observations of some individual frogs that apparently have parasites in their bodies or extremities. One potential predator of the Pyrenean Frog's larvae might be the Pyrenean Newt, even though in laboratory experiments the number of tadpoles consumed by it has been very low. To the contrary, trout has a strong control over the populations of the Pyrenean Frog, and the two species rarely coincide in the same stretches of brooks.

HOW DOES THE PYRENEAN FROG RELATE TO ITS NEIGHBOURS?



The Pyrenean Frog has managed to choose an exact environment where it can persist as a different species in an environment like the Pyrenees, surrounded by some particular accompanying species. However, it also has found an ally who has similar ecological necessities and with which it intimately shares the same biotope, the Pyrenean Newt.

The Pyrenean Frog lives together with six other species of amphibians in its whole distribution area. The frog's particular biology, which makes it so greatly dependent on water during its entire life, has enabled it to reduce to a minimum possible competition with other species which are most similar. These are species with which the frog shares common ancestry, form and dimensions or similar ecological features, which leads to the species having some vital necessities in common. This kind of overlap always makes the coexistence of the living beings difficult.

Following this, we should conclude that the Fire Salamander, the Pyrenean Newt and the Palmate Newt do not cause big problems. Great: And what about the Common Midwife Toad, the Common Toad and the Common Frog? This is where problems could start. However, the Common Midwife Toad is very terrestrial, and in the Pyrenees it reproduces mainly in still bodies of water. As far as the Common Toad is concerned, a species also tied to watercourses, just like the Pyrenean Frog, it chooses the largest streams with copious flow. So this means that the only obstacle the Pyrenean Frog has to overcome is the Common Frog, the species most genetically similar. But the Common Frog, a big and heavy amphibian compared with the Pyrenean Frog, is very terrestrial and reproduces mainly in ponds and water bodies without currents.

In conclusion, the Pyrenean Frog has managed to choose an exact environment where it can persist as a different species in an environment like the Pyrenees, surrounded by some particular accompanying species. However, it also has found an ally who has similar ecological necessities and with which it intimately shares the same biotope, the Pyrenean Newt. This newt preys on the tadpoles of the Common Frog and this way reduces its attention to the tadpoles of the Pyrenean Frog. However, later we will see that another species, genetically very different from the Pyrenean Frog, is causing serious problems to the survival of the frog.

There is not enough information on all accompanying species of the Pyrenean Frog to establish the relationships that would help us understand the causes of coexistence of the amphibians in the Pyrenees. But an important part of them is being investigated so that the people responsible for the conservation could have the best information that enables them to do their work in the prevailing conditions. We can summarize this information in the following table:





Common Midwife Toad



Fire Salamander



Common Frog



Pyrenean Newt



Palmate Newt



Common Toad



SPECIES RELATIONSHIP



Pyrenean Frog >< Pyrenean Newt

Closely associated, sharing the same biotopes

The presence of the newt prevents competition between the pyrenean frog and the common frog



Pyrenean Frog >< Palmate Newt

No competition between the species



Pyrenean Frog >< Common Midwife Toad

No competition between the species



Pyrenean Frog >< Common Frog

Strong potential competitors who avoid each others by choosing very different sites for egg laying



COINCIDENCES

- Endemics of the Pyrenees
- Together in the same streams
- Width of the stream > 1 m
- Slope of the stream moderate or strong
- Stream banks stony or rocky
- Stream bed of stones or rocks
- Water pH > 7.5
- Dissolved oxygen in the water > 8 ppm
- High water renewal rate
- Preyed upon by the trout

DIFFERENCES

- Newt: more extended and abundant
- Frog: Clay-like stream banks

In the Pyrenees, the geographical distribution areas of the newt and the frog overlap.

- Reproduce in different places
- Newt: in artificial water containers
- Width of the stream < 1 m
- Wetlands in the flat areas
- Wetland margins with vegetation, clay or sand
- Newt: water pH < 7.5
- Newt: dissolved oxygen in the water < 6 ppm
- Clay, sand or peat substrate

In the Pyrenees, the geographical distribution areas of the toad and the frog overlap.

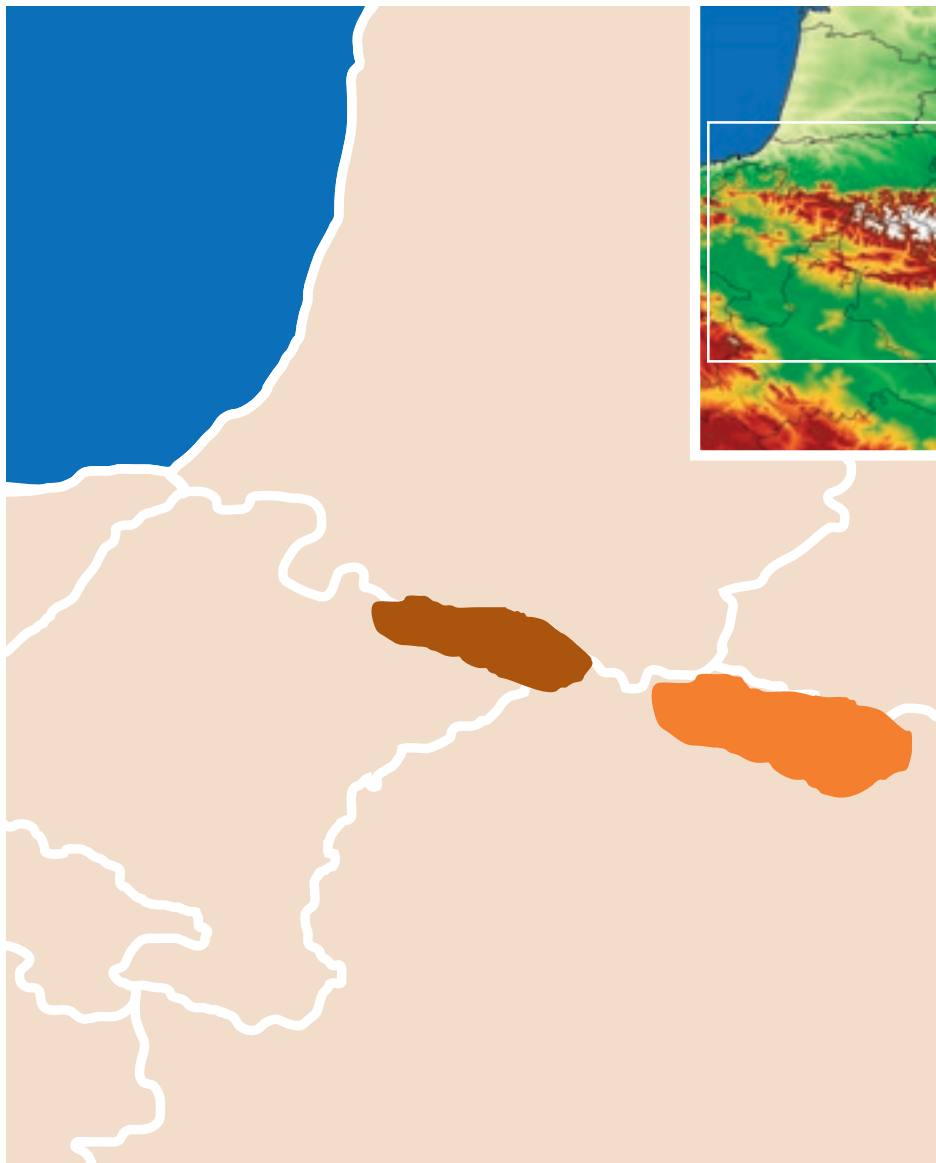
- Reproduce in different places
- Toad: still waters or waters with slow renewal rate
- Width of the stream < 1 m
- Wetlands in the flat areas
- Wetland margins with vegetation, clay or sand
- Toad: dissolved oxygen in the water < 8 ppm
- Clay, sand or peat substrate

In the Pyrenees, the geographical distribution areas of the Common Frog and the Pyrenean Frog overlap.

- Rarely reproduce in the same places
- Common Frog: still waters or waters with slow renewal rate
- Width of the stream < 1 m
- Wetlands in the flat areas
- Wetland margins with vegetation, clay or sand
- Common Frog: water pH < 7.5
- Common Frog: dissolved oxygen in the water < 6 ppm
- Clay, sand or peat substrate



LOCATION OF THE PYRENEAN FROG



MAP OF THE SPECIES' GLOBAL DISTRIBUTION

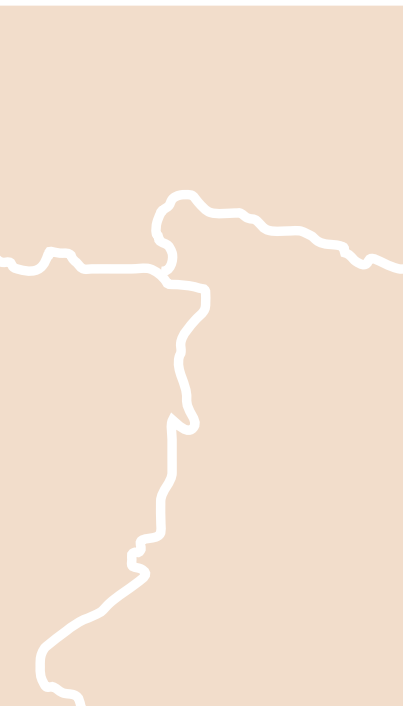
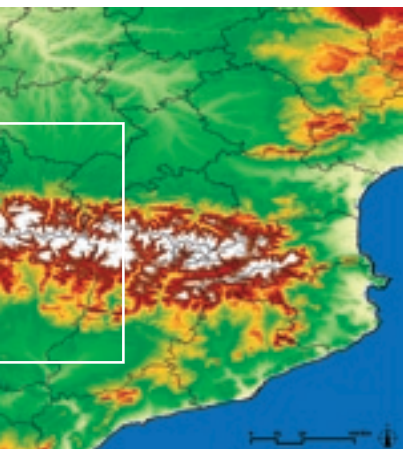
The two existing population groups, which are proven to have genetic differences, are colour-coded.



Includes the populations of Navarre, French Basque Country, and the most western populations of Aragón.



The majority of the population is concentrated in the Central Aragonese Pyrenees.



AN ENDANGERED SPECIES? ATTACKS FROM VARIOUS FRONTS

The species with a reduced distribution area and characteristics of a specialist species are the first ones to face the risk of extinction.



The catastrophe, from the point of view of the Pyrenean Frog could be caused by a combination of factors that can have various origins. That is a phenomenon called “synergetic effects”.

The species with a reduced distribution area and characteristics of a specialist species, which reduce their presence in some very specific environments, are the first ones to face the risk of extinction. If the habitat is linear and practically immutable, like the streams, the possibilities of perseverance get narrower. If this habitat is composed of water, an element so vulnerable to any external influence or modification, the ecosystem as a whole is considered fragile.

Nevertheless, the Pyrenean Frog has acclimatized to the hard conditions of the mountains in a process that has lasted for millions of years. However, the current climatic and environmental circumstances, whose variation humans are proven to be all the time more responsible for, are changing the idyllic prospects of the species adapting to its environment. Now these events occur at a dizzying pace, and, without noticing, we are getting used to talking about catastrophes. The catastrophe, from the point of view of the Pyrenean Frog (and its accompanying species in the streams, the Pyrenean Newt), could be caused by a combination of factors that can have various origins. That is a phenomenon called “synergetic effects.”

Next, we will pinpoint the factors that may have something to do with the alarming situation, according to the observations of the monitoring studies being carried out on the Aragonese populations of the species. These factors do not appear to differ much from those acting in other populations, based on the impressions obtained from the populations of Navarre and the French Alto Irati.





GLOBAL THREATS

The amphibian populations all over the world are currently found under serious threats. It is a phenomenon known as “the global decline of amphibians.” They are the group of vertebrates considered as being most affected by the external factors of various origins, some of which act equally in all continents. This is caused either because the factors are due to a more or less global phenomenon having to do with the climate, or in the case of biological factors, because they are characterized as a cosmopolitan pathogen organism, distributed throughout the world.

Traditionally, it has been thought that the mountains would be out of reach for the environmental changes caused by man, because there appeared to be fewer changes or they appeared to be driven by slowly acting natural processes. One example is the process of deforestation, initiated thousands of years ago, that has shaped an important part of the landscape that we now contemplate and consider being natural in all continents. Furthermore, in many countries, a significant part of the protected natural areas has been established in mountain ecosystems. The state of conservation in mountain areas is, generally, a lot better than in any area situated at lower altitudes because of the simple fact that the majority of the human population lives in the latter ones. However, at the moment, it is starting to be recognized that the populations of amphibians in mountains are facing threats that are different from those previously mentioned.

There are two agents that are responsible for causing the principal global effects on amphibians in the mountains: the ultraviolet B rays and a microscopic fungus called “chytrid”, which has a scientific name difficult to pronounce: *Batrachochytrium dendrobatidis*.

ULTRAVIOLET RADIATION

The depletion of the ozone layer leads to high incidences of ultraviolet radiation, especially at high altitudes. The mountain areas receive doses that can reach lethal levels for the fauna that is strictly dependent on the land and lacks protective shells that would block the rays from entering the body. As it occurs on land, it also occurs in water, and it is here where amphibians spend most of their unprotected life stages, first the egg and embryonic stages and then the larval or tadpole stage, separated from their environment only by a fine membrane, that does not seem to be enough to block the radiation.

But as it turns out, all larvae are not equally affected, so that the mortality caused by the UV-rays is higher in some species than in others. Physiology, metabolism, the time of year when the larval period takes place, and the habitat chosen by the larva, whether living in transparent or muddy waters, in deep or shallow waters, sheltered among vegetation or in free waters, are factors that determine the lethal power that the ultraviolet rays can have on the species.

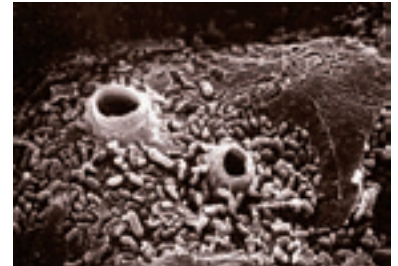
The embryos of the eggs laid are kept sheltered under the rocks. But what about the currents of the Pyrenean streams, the shelter offered by the abundant rocks in the stream beds and the fissures in the stream banks, do they give sufficient protection against the radiation for the larvae of the Pyrenean Frog?



CHYTRIDIOMYCOSIS

The microscopic chytrid fungus causes a disease called chytridiomycosis, which exclusively affects amphibians. It is found in water, also in environments with cool temperatures, like in the mountains. It is very sensitive to the pollution of water, which is why it only appears in well conserved areas. Everything points to humans as being the transmitting vector of the pathogen, given that there is very little genetic variation among the chytrid fungi spread all over the world.

Although being a parasite of the amphibians, the fungus develops in water without the presence of its hosts, acting like a decomposer of organic material (saprophyte). When the amphibians arrive to the water they get infected in the keratin of their skin. The adults die because they have keratin over the whole surface of their skin. In contrast, the larvae have keratin only around the mouth, which enables them to survive until the metamorphosis. That is when the skin of the new amphibian creates keratin, and the fungus provokes the death of the animal. However, the process or the ultimate cause leading to the death of the amphibians is still unknown. Mass deaths occur in populations, right in the moment when the transition from the aquatic to terrestrial life stage takes place.





The intensity of habitat destruction can be evaluated in a gradient between the lethal extreme, meaning the total disappearing, and the progressive weakening of the habitat quality, like the alteration and even the modification of habitat.



The fungus is present in the waters of the Pyrenees, in Aragón, as well as in Navarre, just as in the most parts of the Iberian territory. In Aragón, the fungus has caused mass deaths in toadlets of the Common Midwife Toad, recently emerged from water, in small mountain lakes of Acherito and Piedrafita, at altitudes of 1875 and 1610 m, respectively, in areas where the Pyrenean Frog is present. The rest of the Pyrenean amphibians, including our frog, are known to be carriers of the fungus. But so far there are no records of incidences of the disease in these species. In 2008, numerous frogs from various populations of Ordesa were analyzed, and it was confirmed that they were not infected by the fungus.

HABITAT DESTRUCTION

The primary, universally recognized threat to amphibians (and in fact, to all organisms) is habitat loss or destruction. Like everywhere, the destruction may be a result of a great many factors. Here we will consider it as the main threat to the Pyrenean Frog. The intensity of habitat destruction can be evaluated in a gradient between the lethal extreme, meaning the total disappearing, and the progressive weakening of the habitat quality, like the alteration and even the modification of habitat. They can be provoked not only by human action but also as a product of natural, frequently reoccurring phenomena. In the Pyrenees, the latter ones occur and, as we will see, they affect the frogs, which, on the other hand, should definitely be adapted to them, because that is what has enabled the species to survive these incidences..





The dragging of big stones can affect the banks of the streams and destroy the shelters used by the frog, or accumulate stones and that way fill over the stream pools where the frog reproduces.

AVALANCHES AND FLOODS

The upper parts of the Pyrenean valleys are unstable, especially in the period of thaw that coincides with the reproduction period of the Pyrenean Frog. The snow avalanches and the torrents and floods of water that drag along big blocks of rocks can be mortal to some populations. The distribution of the Pyrenean Frog is scattered in small nuclei, composed of few individuals. It can be said that its habitat is fragmented. This dragging of big stones can affect the banks of the streams and destroy the shelters used by the frog, or accumulate stones and that way fill over the stream pools where the frog reproduces. The sediment and organic material, consisting of branches, dead leaves, pine cones and pine needles, activate the formation of anoxic mud and change the chemical conditions of the water, making it inhospitable for the frog. That leads to the formation of aquatic vegetation that modifies the habitat and attracts other amphibians that are superior competitors to the Pyrenean Frog to the site.

The instability of natural conditions must be one of the most important causes to the uneven and variable presence of the frog in the streams. The investigators have noticed that populations disappear from sites where they have been observed in previous years, and sometimes they confirm that, in the course of a couple of years, these are recolonized by new individuals. A continuous movement appears to exist, in a way that some sites where the frog has disappeared benefit



from the existence of nearby sites which convert to exporters of frogs. Colonizer frogs. But, at what distance should these donating populations be so that there can be movements of individual frogs? How far is the Pyrenean Frog capable of moving?

DROUGHTS

Summer droughts are another natural phenomenon very common in the Pyrenees. The headwaters of the streams dry out in summer. This can produce mortality in the tadpoles developing in the stream pools. The frogs in the terrestrial stage may be forced to search for stretches of streams that maintain water during the droughts, but it can also be possible that the recurrent droughts compel the adults and, apparently, even more so the juveniles that emerge from water, to disperse as explorers far away from their streams. They might find streams that are already occupied or colonize new watercourses. In the Alto Irati (Pyrénées Atlantiques) the presence of juveniles hundreds of meters away from the streams has been documented, occupying puddles, peat lands and soils saturated with water. In Aragón, the quaking bogs, springs and puddles existing in areas between the streams might attract dispersing frogs. In any case, this type of movement constitutes an excellent way to maintain exchange of individuals and, by doing so, a gene flow between the populations. Considering that the phenomenon occurs repeatedly, and that its consequences are being demonstrated as fundamental for the persistence of the frogs' demographic structure, scientists have come up with a name a bit pretentious for the phenomenon: metapopulation.

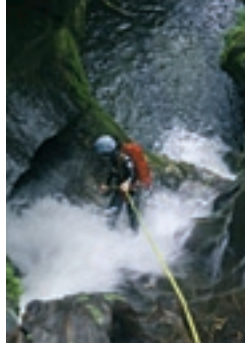
COMPETITION AND PREDATORS

The Common Toad is gaining territory over the Pyrenean Frog. It reproduces not only in the fast flowing streams with volume but also in small tributaries in the upper parts of the valleys where it coincides with the frog. But the toad has very high rates of fecundity, laying thousands of eggs, and the larvae are toxic so they do not have predators. Curiously, the toad is very abundant in the Hecho Valley and its surroundings, where the frog is not found. The Pyrenean Frog may have to compete with the Common Frog in drainage ditches and small water containers.

One of the possible effects of global warming might be that our frog is compelled to move to higher altitudes, where it would find itself in strong competition with the Common Frog, a species that reaches altitudes of practically 3000 m in the Pyrenees. Above the 2100 m, the maximum altitude for the frog, the stream habitats loose quality, becoming less abundant and more unstable than at lower altitudes.

The frog is most incompatible with the Brown Trout. The trout was introduced a long time ago in headstreams in valleys and in narrow brooks, which are inhabited by the Pyrenean Frog and Newt. In the Alto Aragón, the trout was first introduced 50 years ago. It is well confirmed that the trout consumes these Pyrenean amphibians, and during the investigations, it is repeatedly observed that in the stretches where the trout is present the amphibians are absent. The trout acts as a barrier for the communication between the frog's populations, and in fragmented habitats the populations may become disconnected entirely, that way preventing the genetic exchange.





HUMAN ACTIVITIES

Forestry has traditionally been the most impacting human activity in the Pyrenees. Clear cutting promotes soil erosion. The effects on the streams are caused by the opening of new paths and the remodelling of old ones, with the purpose to extract timber. Drainage ditches are being restored, and building works that have effects on small secondary watercourses in the headwaters have been done without previous studies on the environmental impacts, and no repair nor palliative measures have been taken against the disaster. Parts of the stream banks are channelled, trunks are dragged along the streams, destroying or modifying the habitat structure, meanwhile the exploitations have been done without conservation criteria, even attracting traffic of another type of vehicles, those that are used “just for fun”. From time to time, the expanding of forest tracks halts the water circulation in the streams, and during the summer droughts, the scouring of fine sediment can fill up the narrow openings between the rocks and therefore create a habitat not very favourable for the frog. The combustible spills and spills of other toxic substances coming from the forestry machines reach the streams, just like the pesticides used in the treatments of tree masses or the herbicides used in ditches.

In the Navarrian Pyrenees, as well as in some parts of the Aragón zone, these types of conditions are most common. In the French Irati, the deforestation has been the direct cause to the loss of habitat quality for the Pyrenean Frog. In this area the frogs’ presence is now limited to a small territory, and there do not seem to be apparent possibilities to expand along the northern slope of the mountain chain, given the abrupt landscape and the strong inclination of the upstream, which favours instability and droughts in the headwaters of these streams.

In certain enclaves, like in Bujaruelo Valley, other types of building work, for example the construction of a cable car system, can affect the ravines because of the installation of poles and the creation of accesses and other infrastructures, attracting the concentration of human activities. Recreational activities, like gorge walking, contribute to the erosion of the stream beds. During the summer droughts, the organic contamination caused by the extensive livestock farming produces anoxic conditions in the stream pools where the water circulation is at a minimum or the water gets held back. The chemical alteration of the water will lead to frog larvae dying.

LEGAL PROTECTION

Soon after the existence of the Pyrenean Frog became known, as well as its reduced distribution area and its unstable population status, it was recommended to include the frog in all existing national and regional agreements, directives and legislation for the protection of threatened species. In this manner, the species can benefit from conservation and management plans and programmes which administrators are obliged to put into practice because the species is included in these categories. Therefore, it is guaranteed that the administration will take a share in the responsibility for the conservation of the species. In the worldwide species red list, the Pyrenean Frog, based on the criteria developed by the International Union for Conservation of Nature (IUCN), has the status of an endangered species.

The proposed category, based on the same criteria, for the species' whole Spanish population is vulnerable. In France, the frog is categorized, following the same criteria, as an endangered species in its territory. The Spanish Autonomous Communities consider the populations of the species sensitive to alteration of its habitat in Aragón and of special interest in Navarre. Considering all of this, one can come to a conclusion that the national and regional legislation in Spain are out of date in relation to the propositions made by the international technicians of the IUCN.

LEGISLATION	CATEGORY	CRITERIA
IUCN global	Endangered	Extent of occurrence less than 5000 km ² , fragmented distribution and continuing decline
Proposed IUCN Spain	Vulnerable	Limited distribution and severely fragmented population
IUCN France	Endangered	Minimal extent of occurrence
Threatened species list Aragón	Sensitive to habitat alteration	Destruction and deterioration of habitat
Threatened species list of Navarre	Of special interest	Importance of the population, without taking into account its status

THE SCIENTIFIC WORK

The infrequent occurrence of discovering a new frog species in a mountain range of Southern Europe immediately initiated gathering information, in order to get to know all that had been hidden for such a long time. And not only hidden, but also confused, because there had been numerous specialists, from the first decades of the 20th century onwards, exploring and studying amphibians in the Pyrenees without culminating their research.

The group that discovered the species began to explore the peripheral valleys in the headwaters of the Ara River, where the first contact of the frog had taken place. In the course of the first half of the 1990's, new subpopulations were located in many brooks. The numbers rose quickly, but at the same time, the unstable situation of the species was confirmed. The changes in the morphology of the streams from one year to another led to continuous extinctions, which, alternatively, were every year replaced with observations of new nuclei in other streams as the surveys expanded in the Aragonese territory. One year after the appearance of the publication, in which the new species was described, the frog was found in Navarre, extending its distribution in the west to the limits that are known today. Three years later the frog was observed in the French territory.

For one decade, the group behind the discovery of the species has been running a monitoring programme on the population status for the Government of Aragón, the organism responsible for the conservation of the population in its territory, which is the most important one, in the sense of both extent and number of individuals. The objectives of the monitoring programme have been:

- Get to know in detail the distribution of the amphibian, both its geography (valleys and streams occupied) and the stretches of streams where it is present.
- Determine the intrinsic characteristics of the system of colonization and extinctions which permit the species to persist in the Pyrenean environment.
- Calculate the size of the populations and the distance at which they are found from one another.
- Investigate the causes to its presence in some valleys and to its absence in others.
- Confirm in the field the origin and the intensity of the threats that endanger the species.
- Act as an advisor for the Government and propose management measures for the conservation of the species, an action that culminated in 2004 with the redaction of the habitat conservation plan.



The data of the monitoring programme was obtained using two marking techniques which permitted the identification of individuals in case they were recaptured in following years. This way basic information of the species could be obtained, for example, about the communication existing between the populations, and even the longevity and the approximate number of individual frogs in populations, as well as the variation presented between years. The marked frogs were from the High Ara Valley.

The marking consisted of placing a subcutaneous implant with a needle. Adults were marked with microchips and juveniles with synthetic resin fluorescents. The marks under the skin endure, they do not cause harm to the animal, and they were inserted in diverse parts of the body in order to recognize individually the frogs in future recaptures. The study lasted ten years (1998-2008), in which time 420 frogs were marked. It could not be confirmed that the frogs moved between the different sites, but in contrast, the effects caused by the floods on the survival of the frogs were estimated during the next two years after their occurrence. It was found that the survival was lower in the following year, and the males were able to reproduce already at the age of at least three years.

During the last years of the study (2002-2008), a comparison between three model populations representing the situation of the species in Aragón, depending on the density of individuals, was made. The chosen populations were the population of Bujaruelo (High Ara Valley), with relatively high densities; the population from the Aguilero River (Tena Valley), with medium population densities; and the population from the Ordesa Valley, with a low number of individuals. The extinction rates were very high in the population of Ordesa (67%), whose current state is alarming. In the Aguilero River, the



demographic process seems to be very dynamic, and during the study, the river included 67% of the sites occupied by the frog. In Burajuelo, the study revealed a decreasing trend in the occupation of sites and an increasing trend in the population densities of the sites already occupied, with a joint recolonization and colonization rate of 17%.

The failing to demonstrate possible movements between populations by using the system of marking, due to the instability and the high mortality rate of the populations, suggests a change of methodology for the future studies, opening up the way to molecular analyses. As far as Navarre and France are concerned, monitoring programmes have not been carried out. That is why an important part of the information on the species that we can obtain in the near future should come from DNA analyses. It is particularly important to perform studies on genetic diversity among the populations, in order to determine aspects as decisive as the connections and the grade of isolation that might exist between the occupied nuclei in the geographic gradient of the frog's distribution range. Especially, it would be very interesting to be able to respond to the question whether a real isolation exists between the populations of Ansó and Canfranc, which are situated dozens of kilometres from each other, and so far, there are no observations made on individual frogs in the zones between the two valleys.



The Pyrenean Frog, although being isolated in deep valleys in an abrupt mountain area, seems to be a homogeneous species with very low level of genetic variability.

NEW TOOLS: THE SUPPORT OF THE GENETICS

At this point, and with numerous aspects of the Pyrenean Frog's biology still to be explained, several groups of specialists of amphibians from the Pyrenean zone, from both sides of the border, decided to tackle the problem of the diversity among the populations of the species, which has such a restricted distribution area but at the same time showed a high grade of dispersion and isolation between the populations. Or, at least so it appeared. The analyses on this fundamental aspect were started, so that a correct species management practice could be implemented in the future.

The genetic data available until now was of preliminary type. What is known about the genetic variability is obtained from a study on certain mitochondrial genes. These extranuclear genes allow us to reveal the broad genetic characteristics of the organisms, i.e., how this species is related to other similar species. The mitochondrial DNA is maternally inherited, and it acts like a marker that helps to establish lineages and pedigrees. According to these results, the Pyrenean Frog, although being isolated in deep valleys in an abrupt mountain area, seems to be a homogeneous species with very low level of genetic variability. Its current distribution could be a result of a rapid colonization towards the north from some valley in the Pre-Pyrenean zone where the species would have persisted in refuge during the last Würm glaciation.



We now know that the apparent physical separation between the two distribution nuclei of the species is real, and that the populations of the western Pyrenees nucleus (Navarre and France) are genetically well differentiated from the eastern nucleus (Aragón), representing a very marked genetic structure.

The aim of the study recently conducted by the groups in question has been to bring up to date the different molecular techniques that use, on the one hand, mitochondrial DNA and, on the other hand, the so-called microsatellite nuclear markers (genes located in the cell nucleus) in order to evaluate the genetic variability of the populations of the species in its whole geographic distribution range. These techniques do not require sacrifice of specimens because the analyses can be done with small samples of animal tissue, which is important, especially if the species is as extraordinary as the Pyrenean Frog.

Samples from 515 frogs coming from 19 Pyrenean locations were analyzed. Eleven locations are in the western nucleus of the Pyrenees, including nine populations of Navarre and two of the Pyrénées Atlantiques. The remaining eight populations were from Aragón.

By virtue of this study, we now know that the apparent physical separation between the two distribution nuclei of the species is real, and that the populations of the western Pyrenees nucleus (Navarre and France) are genetically well differentiated from the eastern nucleus (Aragón), representing a very marked genetic structure.

The diversity of genes is low in the populations, and it significantly affects those situated on the limits of the distribution. The gene flow between the eastern populations is low or absent, which is why they are genetically more different and show some problems related to the geographic isolation.

The results prove that the species lives in ravines of rocky mountains, with low population densities. Therefore, the genetic changes derived from the historic processes can be seen in the genetic pattern of these populations.



HOW TO DO A GENETIC STUDY?

1

OBTAINING DNA FROM THE INDIVIDUAL

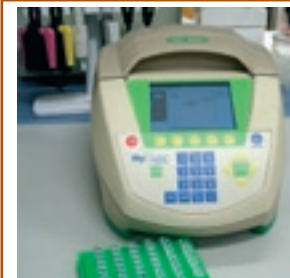


Animal tissue



2

AMPLIFICATION OF DNA BY MEANS OF PCR
TECHNIQUE (POLYMERASE CHAIN REACTION)



Obtaining
millions of
copies of a
specific DNA
fragment

3

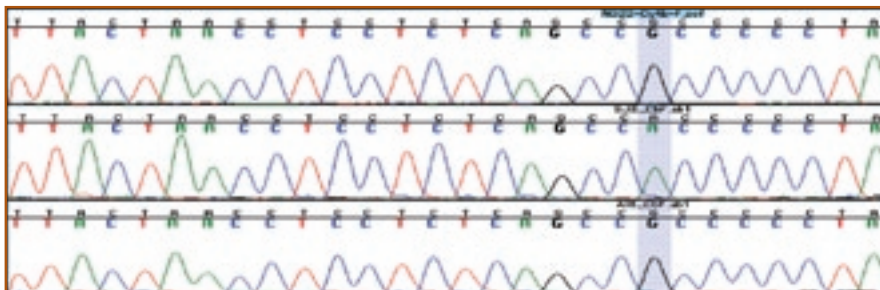
ELECTROPHORESIS



Migration
of DNA in
agarose
gel

4

DNA SEQUENCING



Example of three DNA
sequences lined-up and
belonging to three different
individuals.

A TREASURE TO CONSERVE

The species that form a group inside the family of True Frogs known as the Brown Frogs –for their reddish earth-coloured body– share the dependency on forest environments and are scattered in various continents without being numerous. The Pyrenean Frog is one of these species. It shares its excellence with a few species: it is exclusive and unique to a very small territory in the European setting, but which has a tendency to create rarities, as occurs in mountain systems above certain altitudes or in border situations, which are set to have barriers that all species are not able to overcome. Over the course of time, some of the organisms that were able to pass the barrier in favourable circumstances (generally climatic ones) may end up becoming these rarities.

The ancestors of the Pyrenean Frog come from the continental European zone, north of the Pyrenees mountain chain. We do not know the details but in some moment in its history some population must have become isolated from the rest, which then led to the formation of the little frog that we now call the Pyrenean Frog. Only since very recently, we are starting to understand its relatedness with another frog, a genetically close one, the Common Frog, with which the Pyrenean Frog does not seem to have a good relationship.

Our frog has double merit: on the one hand, it has been able to adapt to some very harsh conditions, but more than anything, it has learnt to explore an environment infrequently inhabited by other species of its group, the flowing waters. In this environment it has coincided with another survivor of the cold and torrential streams, the Pyrenean Newt, with which, for various reasons, it seems to have a good neighbouring relationship. Complicity between weird beings...

But on the other hand, the temptation to give even more merit to another exceptional situation becomes apparent: the frog has succeeded to stay unnoticed for centuries during which time humans have voraciously been exploring and trying to find out the natural mysteries of the mountains. It is nearly always hiding under water, unpleasantly cold for sophisticated thermoregulators, as for human beings, or hiding between rocks, or it spends its life moving between upstream and downstream in order to escape the avalanches, or there are few individuals and they are found widely scattered throughout the mountain. All this has made it possible that the frog has not appeared in books during the last millions of years, until the discovery in 1993 by Jordi Serra-Cobo. The accused land use change and the abandoning of traditional activities in favour of touristic activities have lead to a rapid transformation of the Aragonese Pyrenees during these last decades. This has affected profoundly the Pyrenean Frog, a species with strict ecological requirements. And that is when our responsibility as users and managers enters the scene.



IN THE HANDS OF THE ADMINISTRATIONS

The ball is in the court of the Administration, which has before them the very difficult task of managing the various interests at play in the frog's territory. There are multiple interests: forestry, tourism, construction and road networking. It is not easy to combine and find a balance between them in a way that they would have as little effect as possible on the fragile and scattered populations of the Pyrenean Frog. Any little action concerning a road or a forest path may end up affecting a short stretch of stream where, by coincidence, some frogs are reproducing or are dispersing.

This is not the right moment to delve deeply into the subject, but it is convenient to reflect on some of the management measures already included in the habitat conservation plan for the species. The administration has the responsibility to guarantee the preservation of the Pyrenean Frog in the future, and therefore it has to act in fields as diverse as updating the systems that help understand the trends in the species' status, to the conservation of habitat, to the management of the populations, for which there is a wide variety of methodologies and practices which are being tested every day on threatened amphibian populations all over the world. The most common practices used in the management of the species are the reinforcing of populations through a controlled relocation of individuals under scientific supervision or captive breeding. Another parallel approach includes actions aiming at the recovery, improvement and adjustment of habitat, which in many cases can be sufficient and even the most effective measure. But to state our intentions, even briefly, the administrators responsible for the management of the Pyrenean Frog must get involved and act in various fronts as:

- Habitat loss.
- Recovery of sites abandoned by the frog.
- Widening the understanding of its distribution area.
- Inventory of the potential habitats for its survival.
- Preservation of populations in the long term.
- Monitoring over time of the different population nuclei.
- Recuperation of populations in places where the species has gone extinct.
- Elimination of predators like the trout, whose management is done by the administrators in question, in the stretches where the two species coincide.
- Preventing the repopulation of the trout in the headwaters of the valleys.
- Promoting the investigation programmes directed at the application of correct conservation measures.
- Establishing protocols and guidelines compatible with the conservation of the species for forest management.
- Establishing programmes of coordination between the departments of administration dealing with biodiversity issues and the people working on the nature protection.
- Running information campaigns on the frog's contribution to the richness of the natural patrimony of the Pyrenees.



WHAT YOU CAN DO...

Good citizens with social conscience assume that it is their duty to demand explanations from the administrators about their obligations. But the most responsible citizens go beyond this, to educating themselves, which is a slow and, certainly, complicated process, and to even more conflictive actions, to put into practice what is thought to be necessary.

What can a responsible citizen do to contribute to the conservation of the Pyrenean Frog? Nowadays, “dos and don’ts” of good practices emerge everywhere, which can focus on assuming positive measures and preventing actions with adverse effects on the proposed goals.

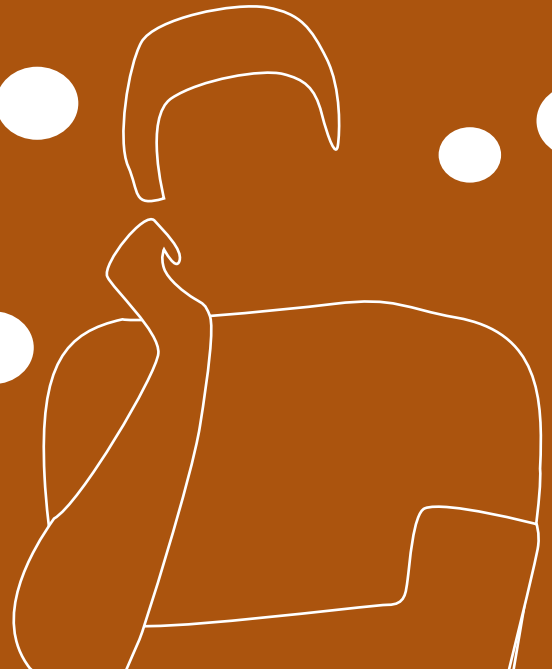
In order to continue contemplating the Pyrenean Frog, which is attractive for many reasons, there is a lot we can do by just paying special attention to diverse aspects during our visits to these mountains; displaying caring attitudes while wandering about the sides of streams and shores of small lakes, and displaying respectful attitudes when deciding to capture this curious frog that dives into the stream pools and that in the case of ending up in our hands, could get contaminated by the pathogenic agents whose transmitting vectors we, the humans, are. Not to mention that the people who love to clean their cars should keep in mind that the streams of the Pyrenees are not exactly the right place to do these activities. But there is one fool proof way to test the citizens’ and business people’s commitment to the cause: will you install your second home or your tourist resort in an area where the construction work can have effects on the streams where the Pyrenean Frog lives?

DOS AND DON'TS FOR A RESPECTFUL CITIZEN TOWARDS THE PYRENEAN FROG



Respect the waterways;
do not spill soaps or oils. Avoid
bathing in the mountain streams,
and of course, never use soap. Do not
wash your belongings in the brooks,
or throw away oils or leftover food
into them.

You are also responsible
for the conservation of the Pyrenean
Frog, and you can be its best keeper. Stay
alert, and if you notice any act that might be
harmful to the species or to its habitat, report
it. Get in contact with the corresponding
administration or call 112 (999).



Do not litter in the mountains, and if you see rubbish nearby the streams, pick it up or inform the authorities. Leave the sites as you found them, respect the riverside vegetation, as well as the rocks of the stream banks.

Avoid disturbing the inhabitants of the mountains, do not capture frogs or tadpoles, let alone take them with you even though you would release them in another site. You would not only commit a possible offence but you could also transmit diseases and harm the species. Avoid driving with motor vehicles on the forest tracks and paths. Do not cross the waterways.

Practice responsible tourism and recreational activities, and keep in mind the possible consequences your activities may have on the environment. Spread the word about the importance of the Pyrenean Frog to people around you and contribute to creating a social conscience.



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ADDITIONAL INFORMATION:

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www.cistude.org

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