

European Red List of Amphibians

Compiled by Helen J. Temple and Neil A. Cox



environment

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Foreword



Europe is a continent rich in natural and cultural heritage, with a diverse range of habitat conditions from dry Mediterranean maquis in the south to the Arctic tundra of the far north. Possibly more than anywhere else in the world European landscapes have been changed by human activities

so that now the continent is covered with a mosaic of mainly semi-natural habitats surrounding urbanized areas. Although bringing higher diversity, this modification has obviously also placed great pressures on our wildlife and natural areas.

In 2001, EU Member States made the commitment to halt the loss of biodiversity within the EU by 2010. The EU Biodiversity Action Plan adopted in 2006 sets out the main targets and activities needed to achieve this commitment. The Mid Term Review of the implementation of the Biodiversity Action Plan published by the Commission in December 2008 demonstrates that, despite some progress made, it is highly unlikely that the 2010 target will be met. Numerous scientific studies show that biodiversity in Europe has been declining rapidly for some time during periods of expansion and intensification of land use. The recent extensive reporting process under Article 17 of the EU Habitats Directive (HD) underlines this fact as most species and habitats protected under the HD are still not under a favourable conservation status. Red Lists are another important tool to scientifically assess and communicate the status of species. They usefully complement the reporting under the Habitats Directive as they address all species in a specific taxonomic group, not just those protected by the EU nature legislation. They hence give important complementary information about the situation of biodiversity in Europe. This first assessment of the Red List status of Europe's amphibians has followed the Red List methodology developed by the International Union for the Conservation of Nature (IUCN), which is the most common methodology used throughout the world.

This new Red List of European amphibians shows us that nearly a quarter of our species are threatened. This compares to 13% of birds, 15% of mammals and 19% of reptiles (these are the only groups for which a European Red list has been

undertaken so far). Furthermore, the majority of amphibian species (59%) in Europe show declining populations. Two of the three orders of amphibians existing in the world are present in Europe: the anurans (frogs and toads) and the caudates or urodeles (newts and salamanders). A surprisingly large proportion of the amphibian species is endemic for Europe – that is to say, they are not found anywhere else in the world. For Europe as a whole, 64 of the 85 species (75%) are endemic, and for the European Union (EU 27) this figure is 46 of 84 occurring species (55%). Moreover, the endemic species also tend to be more threatened within Europe than the species that we share with other regions. This demonstrates the high responsibility of Europe in ensuring a favourable conservation status of amphibians. Unfortunately, the drivers for this decline are mostly still in place.

Amphibians were the first vertebrate animals to colonise the land, but most of them still rely heavily on water. And wetlands are one of the most threatened habitats in Europe. Water pollution, drainage, the conversion into other land uses such as agriculture and urban areas and infrastructure developments have put and are putting this valuable habitat under strong pressure.

What can we as Europeans do about this? First and foremost, we need to fully implement the existing European legislation. The EU Habitats and Birds Directives and the Water Framework Directive (WFD) are the main pieces of legislation ensuring the protection of Europe's wetlands. The Natura 2000 network of protected sites and the integration of wetlands into future river basin management planning (under the WFD) are helping to guarantee their future conservation and sustainable use. The EU has been a major provider of funds for wetland conservation projects both within (through e.g. the EU's financial instrument for the environment LIFE) and outside the Union.

I hope that this European Red List for amphibians will add another piece of evidence for the fact that efforts aimed at halting the loss of biodiversity and the implementation of related European legislation need a major boost in the coming years.

Ladislav Miko
Director
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All of IUCN's Red Listing processes rely on the willingness of scientists to contribute and pool their collective knowledge to make the most reliable estimates of species status. Without their enthusiastic commitment to species conservation, this kind of regional overview would not be possible. A list of all participating scientists can be found at the end of this section, and the specific contribution of each scientist is fully acknowledged in each of the detailed individual species assessments (available online at <http://www.iucnredlist.org/europe> and <http://ec.europa.eu/environment/nature/conservation/species/redlist>).

Coordination of the herpetological component of the European Red List was carried out by Neil Cox and Helen Temple (IUCN Species Programme). We received expert advice and assistance from Peter Paul van Dijk of the IUCN Species Survival Commission (SSC) Tortoise and Freshwater Turtle Specialist Group.

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Species accounts and maps were adapted from data compiled under the IUCN Global Amphibian Assessment (GAA) (<http://www.iucnredlist.org/amphibians>). European data largely originate from two sources; a regional correspondence coordinated by Neil Cox between 2003-2004 during the initial collation of data for the GAA (project launched October 2004), and the IUCN Mediterranean Red Listing Workshop for Freshwater Fishes, Reptiles and Amphibians, held in Málaga (Spain) 13-17 December 2004 (see Cox *et al.* 2006).

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Expert participants at the Reptiles and Amphibians Red List workshop, September 2008, Antalya, Turkey. Photograph © Ozgur Koc.



Executive summary

Aim

The European Red List is a review of the conservation status of c.6,000 European species (mammals, reptiles, amphibians, freshwater fishes, butterflies, dragonflies, and selected groups of beetles, molluscs, and vascular plants) according to IUCN regional Red Listing guidelines. It identifies those species that are threatened with extinction at the regional level – in order that appropriate conservation action can be taken to improve their status. This Red List publication summarises results for European amphibians.

Scope

All amphibian species native to Europe or naturalised in Europe before AD 1500 are included. Geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east, and from Franz Josef Land in the north to the Canary Islands in the south. The Caucasus region is not included. Red List assessments were made at two regional levels: for geographical Europe, and for the 27 current Member States of the European Union.

Status assessment

The status of all species was assessed using the IUCN Red List Criteria (IUCN 2001), which are the world's most widely accepted system for measuring extinction risk. All assessments followed the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2003). Regional assessments were carried out at an assessment workshop and through correspondence with relevant experts. More than 130 herpetologists from over 40 countries in Europe and elsewhere actively participated in the assessment and review process for European reptiles and amphibians. Assessments are available on the European Red List website and data portal: <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>.

Results

Overall, nearly a quarter of amphibians are considered threatened in Europe, with a similar proportion threatened at the EU level. A further 17% of amphibians are considered Near Threatened. By comparison, 19% of European reptiles, 15% of European mammals and 13% of European birds are threatened (BirdLife International 2004a, Cox & Temple 2009, Temple & Terry 2007). No other groups have yet been comprehensively assessed at the European level. More than half of amphibians (59%) have declining populations. A further 36% are stable, and only 2% are increasing.

The overwhelming majority of threatened and Near Threatened amphibian species are endemic to both Europe and the EU, highlighting the responsibility that European countries have to protect the entire global populations of these species. All species considered threatened (Critically Endangered, Endangered, or Vulnerable) at the European level are endemic to Europe and are found nowhere else in the world.

Amphibian species richness is greatest at intermediate latitudes (France, Germany, Czech Republic) as well as in the south and on islands. Habitat loss, fragmentation and degradation are the most significant threats to amphibians in Europe. Other major threats include pollution (including global climate change caused by greenhouse gas emissions) and invasive alien species.

Conclusions

- **Threatened amphibians in Europe require urgent action to improve their status.** While many species already receive some conservation attention, others do not. Priorities identified in this study include addressing threats such as destruction and degradation of freshwater habitats.
- **Species can be, and some already have been, saved from extinction.** Species like the Mallorcan Midwife Toad *Alytes muletensis* would almost certainly now be extinct were it not for intensive ongoing conservation efforts. However, recovery often remains precarious in the face of emerging threats such as invasive alien species, disease, and climate change.
- **Sustained investment in species-, site- and landscape-level conservation is needed from all European countries** to ensure that European species are secure in the long term. This needs to be combined with the political will to truly integrate biodiversity conservation into all policy sectors.

Common Fire Salamander *Salamandra salamandra* (Least Concern). This species is present across much of central, eastern and southern Europe. It is associated with wet cool deciduous, mixed, or rarely, coniferous forests with well shaded brooks and small rivers. Although a number of large, stable populations of this salamander exist in Central Europe, some severe declines have been reported in western parts of its range (e.g. Spain, the Netherlands). The principal threats to this species are habitat destruction and fragmentation, pollution of breeding sites by agrochemicals, and predation by invasive salmonid fishes and American Crayfish *Procambarus clarkii*. Photograph © Roberto Sindaco.



1. Background

1.1 The European context

Europe is one of the seven traditional continents of the Earth, although physically and geologically it is the westernmost peninsula of Eurasia. Europe is bounded to the north by the Arctic Ocean, to the west by the Atlantic Ocean, to the south by the Mediterranean Sea, and to the southeast by the Black Sea and the Caucasus Mountains. In the east, Europe is separated from Asia by the Ural Mountains and by the Caspian Sea (see Figure 1). Europe is the world's second-smallest continent in terms of area, covering approximately 10,400,000 square kilometres (4,010,000 square miles) or 2% of the Earth's surface. In terms of human population, it is the third-largest continent (after Asia and Africa) with a population of some 731 million – about 11% of the world's population. Europe is the most urbanised and, together with Asia, the most densely populated continent in the world.

The European Union, comprising 27 Member States, is Europe's largest political and economic entity. It is the world's largest economy with an estimated GDP in 2008 of 18.9 trillion US dollars (Central Intelligence Agency 2009). Per-capita GDP in many EU states is among the highest in the world, and rates of resource consumption and waste production are correspondingly high – the EU 27's "ecological footprint" has been estimated to exceed the region's biological capacity (the total area of cropland, pasture, forest, and fishing grounds available to produce food, fibre, and timber and absorb waste) by 2.6 times (WWF 2007).

The EU's Member States stretch from the Arctic Circle in the north to the Mediterranean in the south, and from the Atlantic coast in the west to the Pannonian steppes in the east – an area containing a great diversity of landscapes and habitats and a wealth of flora and fauna. European biodiversity includes 488 species of birds (IUCN 2008), 260 species of mammals (Temple & Terry 2007, 2009), 151 species of reptiles, 85 species of amphibians, 546 species of freshwater fishes (Kottelat & Freyhof 2007), 20-25,000 species of vascular plants¹ and well over 100,000 species of invertebrates (Fauna Europaea 2004). Mediterranean Europe is particularly rich in plant and animal species and has been recognised as a global "biodiversity hotspot" (Mittermeier *et al.* 2004, Cuttelod *et al.* 2008).

Europe has arguably the most highly fragmented landscape of all continents, and only a tiny fraction of its land surface can be considered as wilderness. For centuries most of Europe's land has been used by humans to produce food, timber and fuel and provide living space, and currently in western Europe more than 80% of land is under some form of direct management

(European Environment Agency 2007). Consequently European species are to a large extent dependent upon semi-natural habitats created and maintained by human activity, particularly traditional, non-intensive forms of land management. These habitats are under pressure from agricultural intensification, urban sprawl, infrastructure development, land abandonment, acidification, eutrophication and desertification. Many species are directly affected by overexploitation, persecution, and impacts of alien invasive species, and climate change is set to become an increasingly serious threat in the future. Europe is a huge, diverse region and the relative importance of different threats varies widely across its biogeographic regions and countries. Although considerable efforts have been made to protect and conserve European habitats and species (e.g. see Sections 4.3, 4.4, 4.5), biodiversity decline and the associated loss of vital ecosystem services (such as water purification, crop pollination, and carbon sequestration) continues to be a major concern in the region.

1.2 European amphibians: diversity and endemism

Amphibians are a class of vertebrates that includes frogs, toads, salamanders, newts and caecilians. All amphibians are cold-blooded, and most lay eggs. The majority of species undergo metamorphosis, moving from a larval stage (usually aquatic) through the development of limbs and lungs to become terrestrial adults. However, a significant minority of the species develop directly from eggs, usually laid on land, without a larval stage. There are also a few viviparous species that give birth to young, without laying eggs. Almost all species are dependent on moist conditions, and many require freshwater habitats in which to breed. Some species are restricted to freshwater habitats for their whole life cycle, both as larvae and adults. The greatest diversity occurs in tropical forests, with species richness generally lower in temperate and arid regions. Amphibians are entirely absent from marine environments. Amphibians are excellent indicators of the quality of the overall environment, as they are very sensitive to perturbations in ecosystems.

Among the European amphibians there are two distinctive orders, Anura (frogs and toads; 50 European species) and Caudata (newts and salamanders; 35 species). The largest families in Europe are the Salamandridae (newts and relatives) with 26 species, and the Ranidae (true frogs) with 21 species. Two thirds of the 85 amphibian species recorded are endemic to Europe. Table 1 provides more detail. Within the order of frogs and toads, nine of the world's 12 species of the family Alytidae (painted frogs and midwife toads) are found in

¹ Source: Euro+Med PlantBase, <http://www.emplantbase.org/home.html>

Europe, with eight of these species endemic to the region. Two of the world's three species of Pelodytidae (parsley frogs) are found in Europe, both of which are endemic. Three of the four members of the Pelobatidae (Eurasian spadefoots) occur in the region, with one of these being endemic. The monotypic genus *Epidalea* (until recently included within the genus *Bufo*) is relatively widespread, but endemic to Europe. Among the newts and salamanders, 26 species of the family Salamandridae are present within Europe, representing over a third (35%) of the world's species. Importantly, five European genera of Salamandridae (*Calotriton*; *Chioglossa*; *Euproctus*; *Mesotriton*; *Salamandrina*) are wholly endemic to the region. The region is also noteworthy for its eight endemic cave salamander species in the lungless salamander family Plethodontidae (including the endemic monotypic genus *Atylodes*). Until the recent

discovery of *Karsenia koreana* in Korea (Min *et al.*, 2005), these were thought to be the only Old World members of a family that has around 363 species in the Americas. The single Old World member of the Proteidae, *Proteus anguinus*, is endemic to the region; the other five members of the family occur in eastern North America.

While the amphibians of Europe are relatively well known, much is left to learn about this group. Within the past few years alone several new species have been described, or identified as truly distinct species, including *Speleomantes sarrabusensis* (Carranza *et al.*, 2008), *Calotriton arnoldi* (Carranza and Amat, 2005), *Pseudepidalea balearica* (Stöck *et al.*, 2006; Stöck *et al.*, 2008), *Pseudepidalea sicula* (Stöck *et al.*, 2008) and *Pelodytes ibericus* (Sánchez-Herráiz *et al.*, 2000).

Table 1. Diversity and endemism in amphibian orders and families in Europe²

Class	Order	Family	Europe		EU 27	
			Number of species	Number of endemic species (% endemic)	Number of species	Number of endemic species (% endemic)
Amphibia	Anura	Alytidae	9	8 (88.8%)	9	7 (77.7%)
		Bombinatoridae	3	2 (66.7%)	3	1 (33.3%)
		Bufo	7	3 (42.9%)	8	2 (25.0%)
		Hylidae	5	2 (20.0%)	5	2 (20.0%)
		Pelobatidae	3	1 (33.3%)	3	1 (33.3%)
		Pelodytidae	2	2 (100%)	2	2 (100%)
		Ranidae	21	16 (76.2%)	20	9 (45.0%)
		Plethodontidae	8	8 (100%)	8	8 (100%)
	Caudata	Proteidae	1	1 (100%)	1	0 (0%)
		Salamandridae	26	21 (80.8%)	25	14 (56%)
Total			85	64 (75.3%)	84	46 (54.8%)

² This table includes species that are native or naturalised since before AD 1500; species introduced after this date are not included. Species of marginal occurrence in Europe and/or the EU are included.

Tyrrhenian Painted Frog *Discoglossus sardus* (Least Concern). Photograph © Roberto Sindaco.



1.3 Threatened status of species

The threatened status of plants and animals is one of the most widely used indicators for assessing the condition of ecosystems and their biodiversity. It also provides an important tool underpinning priority-setting exercises for species conservation. At the global scale the best source of information on the conservation status of plants and animals is the *IUCN Red List of Threatened Species* (see www.iucnredlist.org; IUCN 2008). The Red List provides taxonomic, conservation status, and distribution information on taxa that have been evaluated using the *IUCN Red List Categories and Criteria: Version 3.1* (IUCN 2001). This system is designed to determine the relative risk of extinction, with the main purpose of cataloguing and highlighting those taxa that are facing a higher risk of extinction (i.e., those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List is intended to be policy-relevant, and it can be used to inform conservation planning and priority setting processes, but it is not intended to be policy-prescriptive, and it is not in and of itself a biodiversity conservation priority-setting system.

1.4 Objectives of the assessment

The European regional assessment has four main objectives:

- To contribute to regional conservation planning through provision of a baseline dataset reporting the status of European amphibians.

- To identify those geographic areas and habitats needing to be conserved to prevent extinctions and to ensure that European amphibians reach and maintain a favourable conservation status.
- To identify the major threats and to propose mitigating measures and conservation actions to address them.
- To strengthen the network of experts focused on amphibian conservation in Europe, so that the assessment information can be kept current, and expertise can be targeted to address the highest conservation priorities.

The assessment provides three main outputs:

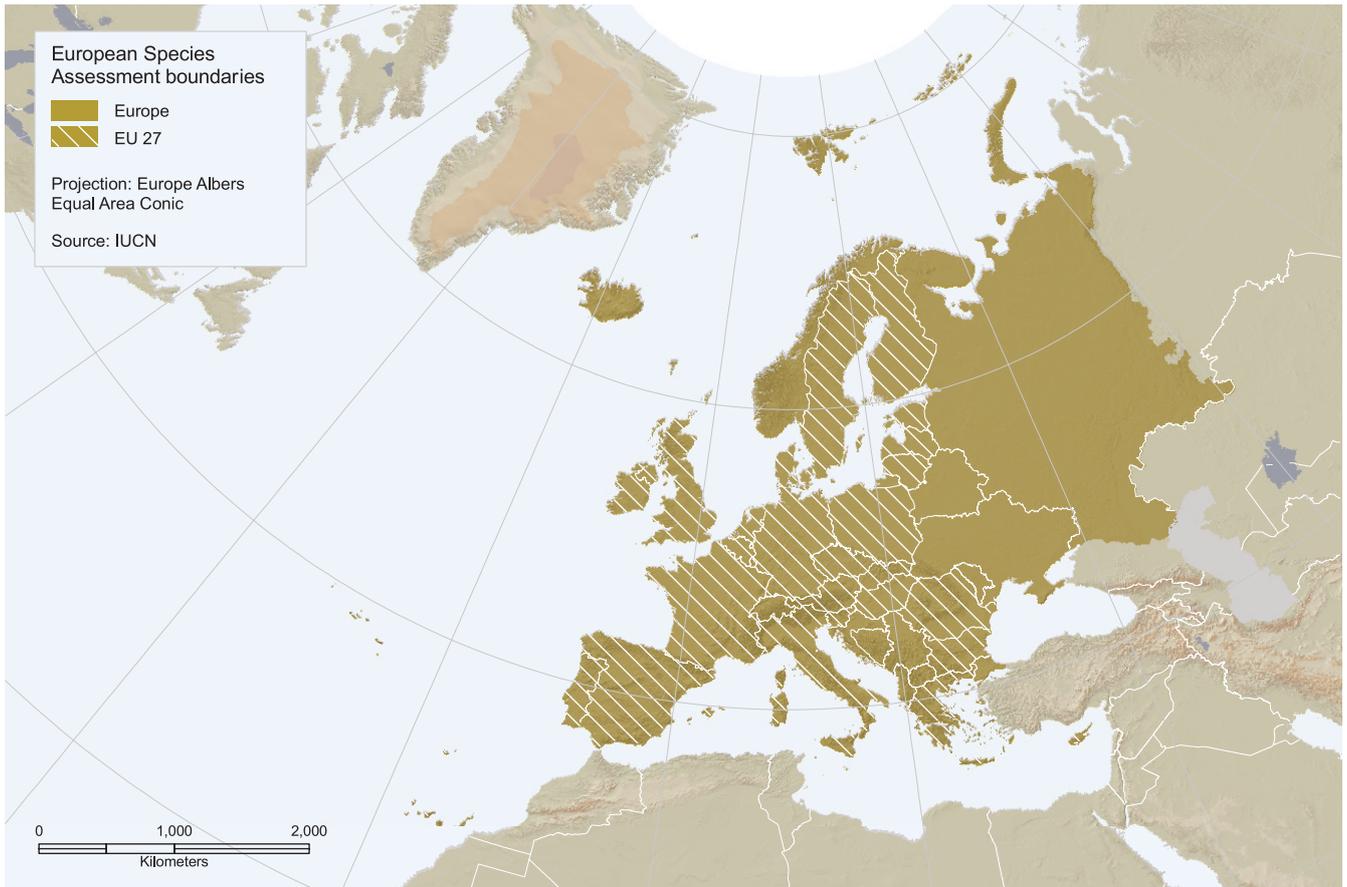
- This summary report on the status of European amphibians.
- A freely available database holding the baseline data for monitoring the status and distribution of European amphibians.
- A website and data portal (<http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>) showcasing this data in the form of species factsheets for all European amphibians, along with background and other interpretative material.

The data presented in this report provides a snapshot based on available knowledge at the time of writing. The database will continue to be updated and made freely and widely available. IUCN will ensure wide dissemination of this data to relevant decision makers, NGOs, and scientists to inform the implementation of conservation actions on the ground.

Northern Spectacled Salamander *Salamandrina perspicillata* (Least Concern). This species is endemic to peninsular Italy, mainly in the Apennine Mountains. It is protected by law in several provinces in Italy, and is listed in Appendix II of the Bern Convention. It occurs in several protected areas, including the Abruzzo National Park. Photograph © Antonio Romano.



Figure 1. Regional assessments were made for two areas – continental Europe and the EU 27



Many amphibian species are increasingly reliant upon artificial aquatic habitats, such as this drinking trough, to provide breeding habitat. Photograph © Antonio Romano.



2. Assessment Methodology

2.1 Global and regional assessment

The present study was an assessment of the global and regional conservation status of all amphibian species occurring in geographical Europe and the EU 27.

2.2 Geographic scope

The geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east (including European parts of the Russian Federation), and from Franz Josef Land in the north to the Mediterranean in the south (see Figure 1). The Canary Islands, Madeira and the Azores were also included. In the southeast, where definitions of Europe are most contentious, the Caucasus region was not included.

Red List assessments were made globally and at two regional levels: 1) for geographical Europe (limits described above); and 2) for the area of the 27 Member States of the European Union.

2.3 Taxonomic scope

All amphibian species native to Europe or naturalised in Europe before AD 1500 were included in the assessment. Species introduced to Europe by man after AD 1500 were considered by the assessment, but were classed as Not Applicable. Similarly, species that are of marginal occurrence in Europe were classed as Not Applicable. The European Red List uses Amphibian Species of the World (Frost 2008) as its default taxonomy for amphibians. Distinct subpopulations and subspecies of amphibians within Europe were not individually assessed as part of this project.

2.4 Preliminary assessments

For every amphibian species native to Europe or naturalised before AD 1500, the following data were compiled.

- Species' taxonomic classification
- Geographic range (including a distribution map)
- Red List Category and Criteria
- Population information
- Habitat preferences
- Major threats
- Conservation measures (in place, and needed)
- Species utilisation
- Other general information
- Key literature references

These data were based on initial information gathered as part of the IUCN Global Amphibian Assessment (IUCN, CI and NatureServe). Much of this previous material originated during an earlier review of the conservation status of reptiles and amphibians in the Mediterranean basin (Cox *et al.* 2006). All species had their global status assessed according to the 2001 IUCN Red List Categories and Criteria: Version 3.1 (http://www.iucnredlist.org/info/categories_criteria2001).

Preliminary species summary reports, distribution maps and global assessments were distributed to all the participants before the workshop to allow them to review the data presented and prepare any changes to the data.

2.5 Review workshop and evaluation of assessments

Expert herpetologists for Europe were invited to attend a five-day regional review workshop, held in conjunction with an IUCN review of reptile and amphibian species of the Wider Caucasus, at the Grida City Hotel in Antalya, Turkey in September 2008.

Focused working groups were organised to efficiently review identified geographical sets of species. New information was added to the species summaries and maps, and corrections to existing data were made. Preliminary Red List Assessments for each species were then made at the global, European and EU 27 levels.

Facilitating staff from the IUCN Red List Unit and the IUCN/SSC-CI/CABS Biodiversity Assessment Unit evaluated the assessments to check they complied with the guidelines for application of the IUCN Red List Categories and Criteria and included the most up-to-date, comprehensive information.

Reviewing species assessments at the European Reptiles and Amphibians workshop. Photograph © Ana Nieto.



Following the review workshop, the data were edited, and outstanding questions were resolved through communications with the workshop participants. The post-workshop draft assessments were also made available on an FTP site to allow the participating scientists to make any final edits and corrections.

The resulting finalised IUCN Red List assessments are a product of scientific consensus concerning species status and are backed by relevant literature and data sources.

The Mallorcan midwife toad *Alytes muletensis* (Vulnerable) is part of an ancient lineage of amphibians, diverging from all others 155 million years ago. First identified from fossils that formed up to 5 million years ago in mainland Europe, this species was believed to have been extinct for over 2,000 years. In 1977 it was discovered in the inaccessible limestone canyons of northern Mallorca – a true “living fossil”. Males care for strings of eggs produced by the female by wrapping them around their hind legs. The wild population of this species has now stabilised as a result of captive breeding initiatives initiated in 1988, although the chytrid fungal disease has recently been discovered in the population. Photograph © Richard Griffiths.



3. Results

3.1 Threatened status of amphibians

The status of amphibians was assessed at two regional levels: geographical Europe, and the EU 27. At the European level 22.9% were considered threatened, of which 2.4% Critically Endangered, 7.2% Endangered and 13.3% Vulnerable (Table 2 and Figure 2). A similar pattern was seen in the EU 27 (22.0% threatened, of which 2.4% CR, 6.1% EN and 13.4% VU)(Table 2 and Figure 3).

Overall, nearly a quarter of amphibians are considered threatened in Europe. A further 16.9% of amphibians are considered

Near Threatened. By comparison, 19.4% of European reptiles, 15.2% of European mammals and 13% of European birds are threatened (BirdLife International 2004a, Cox & Temple 2009, Temple & Terry 2007). No other groups have yet been comprehensively assessed at the European level according to IUCN regional Red List guidelines. Species classed as threatened (Critically Endangered, Endangered and Vulnerable) at the European and EU 27 level are listed in Table 3.

A further six amphibian species were classed as Not Applicable, either because they were introduced after AD 1500 or are of marginal occurrence in the European region.

Table 2. Summary of numbers of amphibian species within each category of threat

IUCN Red List categories	No. species Europe (no. endemic species)	No. species EU 27 (no. endemic species)
Extinct (EX)	0	0
Extinct in the Wild (EW)	0	0
Regionally Extinct (RE)	0	0
Threatened categories		
Critically Endangered (CR)	2 (2)	2 (2)
Endangered (EN)	6 (6)	5 (5)
Vulnerable (VU)	11 (11)	11 (8)
Near Threatened (NT)	14 (13)	15 (12)
Least Concern (LC)	49 (32)	48 (19)
Data Deficient (DD)	1 (0)	1 (0)
Total number of species assessed*	83 (64)	82 (46)

*Excluding species that are considered Not Applicable.

Figure 2. Red List status of amphibians in Europe

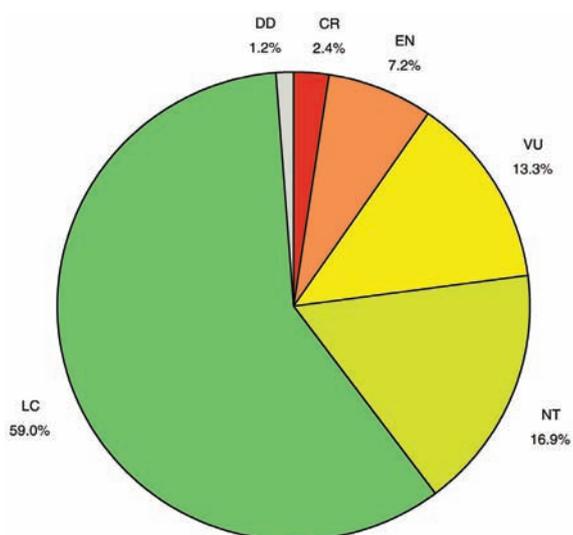


Figure 3. Red List status of amphibians in the EU 27

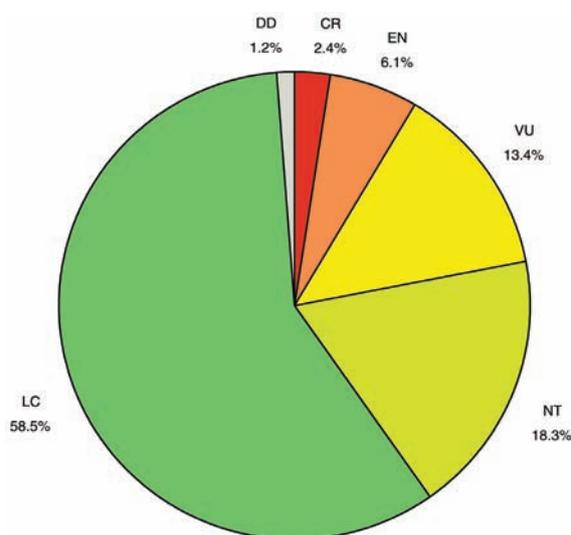


Table 3. Threatened amphibian species at the European and EU 27 level¹. All species listed below are endemic to Europe

Family	Genus	Species	Common Name	Red List status	
				Europe	EU 27
RANIDAE	<i>Pelophylax</i>	<i>cerigensis</i>	Karpathos Frog	CR	CR
SALAMANDRIDAE	<i>Calotriton</i>	<i>arnoldi</i>	Montseny Brook Newt	CR	CR
BOMBINATORIDAE	<i>Bombina</i>	<i>pachypus</i>	Appenine Yellow-bellied Toad	EN	EN
PLETHODONTIDAE	<i>Speleomantes</i>	<i>supramontis</i>	Supramonte Cave Salamander	EN	EN
RANIDAE	<i>Pelophylax</i>	<i>cretensis</i>	Cretan Frog	EN	EN
RANIDAE	<i>Pelophylax</i>	<i>shqipericus</i>	Albanian Water Frog	EN	NE
RANIDAE	<i>Rana</i>	<i>pyrenaica</i>	Pyrenean Frog	EN	EN
SALAMANDRIDAE	<i>Euproctus</i>	<i>platycephalus</i>	Sardinian Brook Salamander	EN	EN
ALYTIDAE	<i>Alytes</i>	<i>dickhilleni</i>	Betic Midwife Toad	VU	VU
ALYTIDAE	<i>Alytes</i>	<i>muletensis</i>	Mallorcan Midwife Toad	VU	VU
PLETHODONTIDAE	<i>Atylodes</i>	<i>genei</i>	Sardinian Cave Salamander	VU	VU
PLETHODONTIDAE	<i>Speleomantes</i>	<i>flavus</i>	Monte Albo Cave Salamander	VU	VU
PLETHODONTIDAE	<i>Speleomantes</i>	<i>sarrabusensis</i>	Sette Fratelli Cave Salamander	VU	VU
PROTEIDAE	<i>Proteus</i>	<i>anguinus</i>	Olm	VU	VU
RANIDAE	<i>Pelophylax</i>	<i>epeiroticus</i>	Epirus Water Frog	VU	VU
RANIDAE	<i>Rana</i>	<i>latastei</i>	Italian Agile Frog	VU	VU
SALAMANDRIDAE	<i>Chioglossa</i>	<i>lusitanica</i>	Golden-striped Salamander	VU	VU
SALAMANDRIDAE	<i>Lyciasalamandra</i>	<i>helterseni</i>	Lycian Salamander	VU	VU
SALAMANDRIDAE	<i>Salamandra atra</i>	<i>lanzai</i>	Lanza's Alpine Salamander	VU	VU

¹ Species listed as NE (Not Evaluated) in the EU 27 do not occur in the region.

Appenine Yellow-bellied Toad *Bombina pachypus* (Endangered). This species is endemic to Italy, where it occurs south of the Po Valley, through the Appenine region, south to the southern tip of the Italian mainland. It is listed as Endangered on the basis of rapid recent population declines, suspected to have been caused by the introduced fungal disease chytridiomycosis. Photograph © Roberto Sindaco.



Table 4. Red List Status (European Regional level) of amphibians by taxonomic family

Order	Family	Total*	CR	EN	VU	NT	LC	DD	% Threatened
Anura	Alytidae	9	0	0	2	3	4	0	22.2
	Bombinatoridae	3	0	1	0	0	2	0	33.3
	Bufonidae	6	0	0	0	0	5	1	0
	Hylidae	5	0	0	0	0	5	0	0
	Pelobatidae	3	0	0	0	1	2	0	0
	Pelobatidae	2	0	0	0	0	2	0	0
	Ranidae	21	1	3	2	2	13	0	28.6
Caudata	Plethodontidae	8	0	1	3	4	0	0	50
	Proteidae	1	0	0	1	0	0	0	100
	Salamandridae	25	1	1	3	4	16	0	20
Total		83	2	6	11	14	49	1	22.9

* Does not include species classed as Not Applicable (NA).

3.2 Status by taxonomic group

European amphibians belong to a number of different families (see Section 1.2), among which considerable differences exist both in species numbers as well as in threatened status (Table 4). The Anuran families Alytidae (midwife toads), Bombinatoridae (fire-bellied toads), and Ranidae (true frogs) contain a high proportion of threatened species, as do all three families of newts and salamanders (Plethodontidae, Proteidae and Salamandridae). Of the eight Plethodontidae (lungless salamanders) occurring in Europe, 50% are threatened and the remaining 50% are Near Threatened. The family Proteidae (mudpuppies or waterdogs) contains six extant species worldwide, of which only one (the Olm *Proteus anguinus*) occurs in Europe – this species is considered Vulnerable, so 100% of species in the family Proteidae are threatened at the European level.

3.3 Spatial distribution of species

3.3.1 Species richness

Information on the species richness of amphibians within orders and families has already been given in Section 1.2 and Table 1. The geographic distribution of species richness in Europe is presented in Figure 4.

For European mammals and reptiles, there is a clear gradient of increasing species richness from north to south, with the greatest richness being found in the Balkan peninsula (Temple & Terry 2007, Cox & Temple 2009). A rather different pattern is seen for amphibians, with high diversity at intermediate latitudes (France, Germany, Czech Republic) as well as in the south.

Looking at amphibian species richness from a national perspective, the top five EU countries are Italy, France, Spain, Germany and Greece (Table 5).

Table 5. Number of amphibian species in the 27 current EU member states (excluding species classed as Not Applicable)

Country	Total number of species
Austria	20
Belgium	17
Bulgaria	17
Cyprus	3
Czech Republic	21
Denmark	15
Estonia	10
Finland	4
France	38
Germany	23
Greece	22
Hungary	18
Ireland	3
Italy	42
Latvia	12
Lithuania	11
Luxembourg	14
Malta	2
Netherlands	17
Poland	17
Portugal	20
Romania	19
Slovakia	19
Slovenia	21
Spain	34
Sweden	13
United Kingdom	17

Figure 4. Species richness of European amphibians

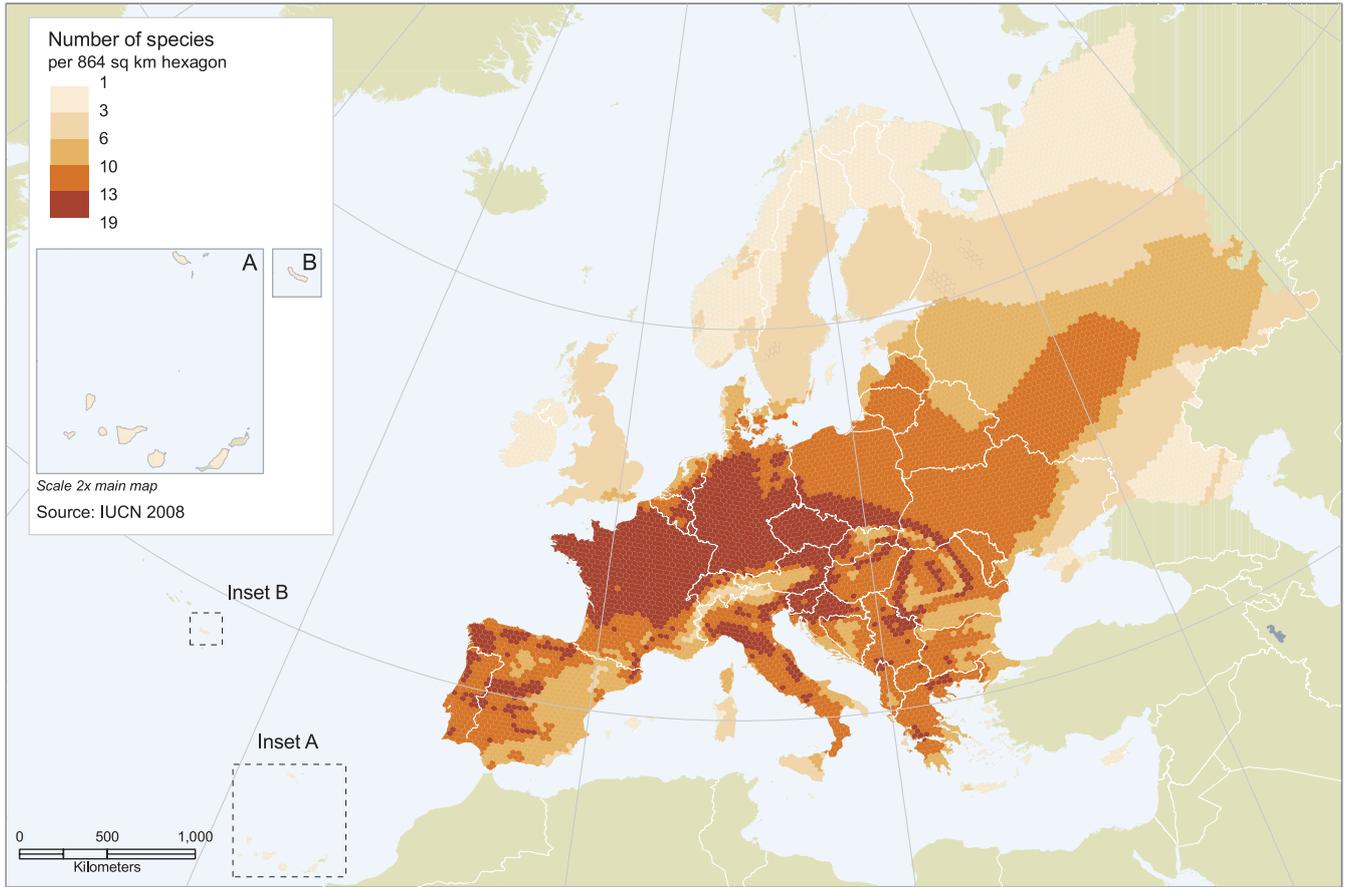
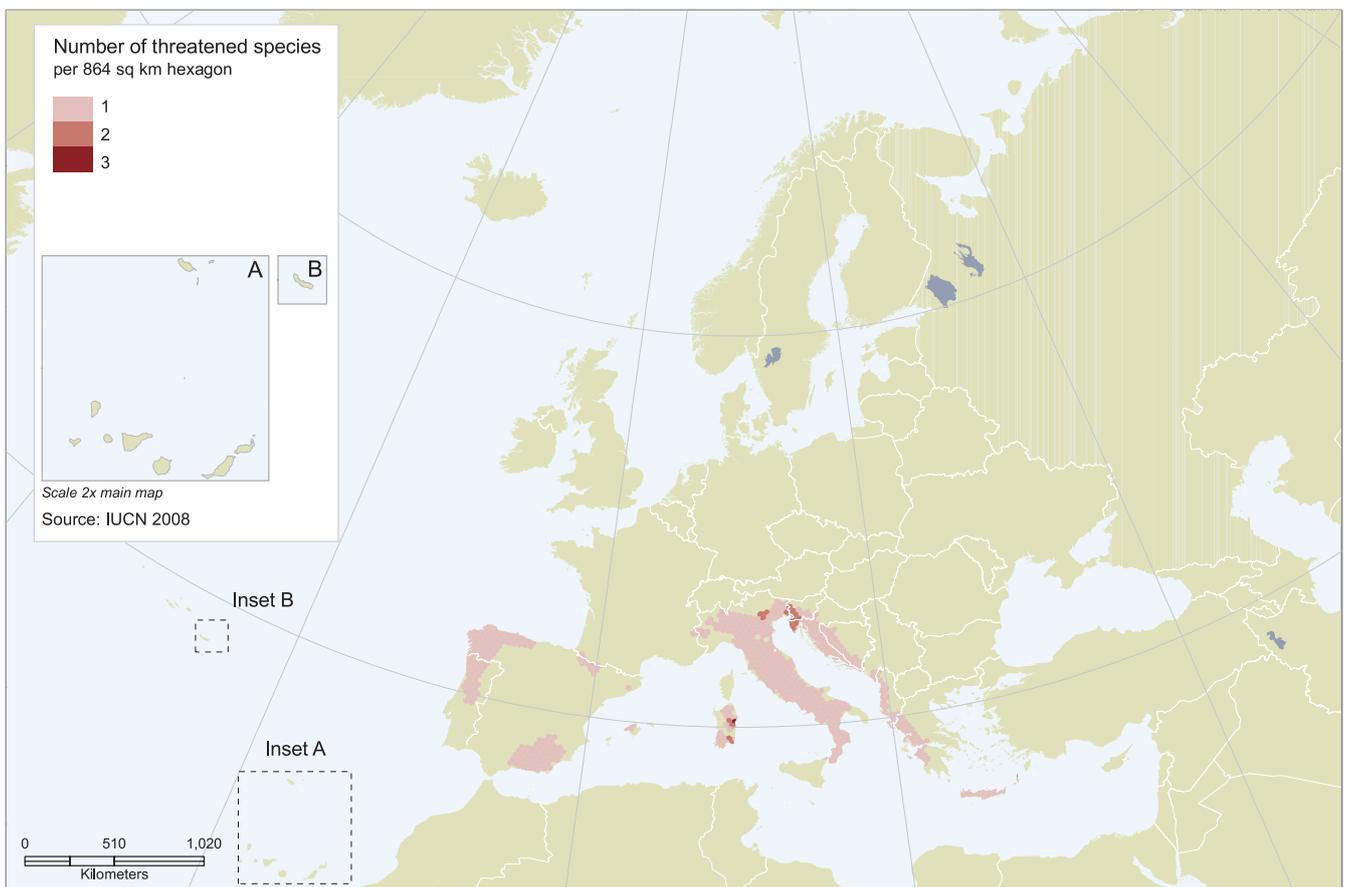


Figure 5. Distribution of threatened amphibians in Europe



3.3.2 Distribution of threatened species

The map showing the distribution of threatened amphibians in Europe (Figures 5) reveals somewhat different patterns from depictions of overall species diversity. The greatest concentration of threatened amphibian species is found in the Iberian peninsula, the Italian peninsula, the Balkan coast, and several Mediterranean islands.

3.3.3 Endemic species richness

Figure 6 shows the distribution of endemic amphibian species (e.g., those that are unique to Europe and are found nowhere else in the world). Amphibians show particularly high endemic species richness in the Iberian and Italian peninsulas and France. The Mediterranean islands have many range-restricted endemic amphibians, although these regions do not necessarily show up on the endemic species richness maps because typically each particular island will only have one or a few endemic species.

3.4 Major threats to amphibians in Europe

The major threats to each species were coded using the IUCN Major Threats Authority File. A summary of the relative importance of the different threatening processes is shown in Figure 7.

For amphibians, habitat loss is the most significant threat, affecting 17 out of 19 threatened species and 76 species in total. Pollution (which here also includes global climate change caused by greenhouse gas emissions) is the second most important threat, impacting on 62 species. In third place, invasive alien species threaten nearly half of Europe's amphibian species. These invasive species include predators such as introduced salmonid fishes and pathogens such as the fungal disease chytridiomycosis, which has been implicated in amphibian population collapses and extinctions in many parts of the world. Non-native species of amphibians have been introduced in some areas, which may compete or hybridise with native populations and act as vectors of disease.

Information has not been collected during the assessment process on the relative importance of one threat compared to another for a particular species. Development of such information in the future is a priority for the assessment and will enable a more complete analysis of significant threats to species.

Common Toad *Bufo bufo* (Least Concern). This species is widespread in Europe; it is an adaptable species present in coniferous, mixed and deciduous forests, groves, bushlands, meadows, arid areas, parks and gardens. Photograph © John Wilkinson.



Figure 6. Distribution of endemic amphibians in Europe

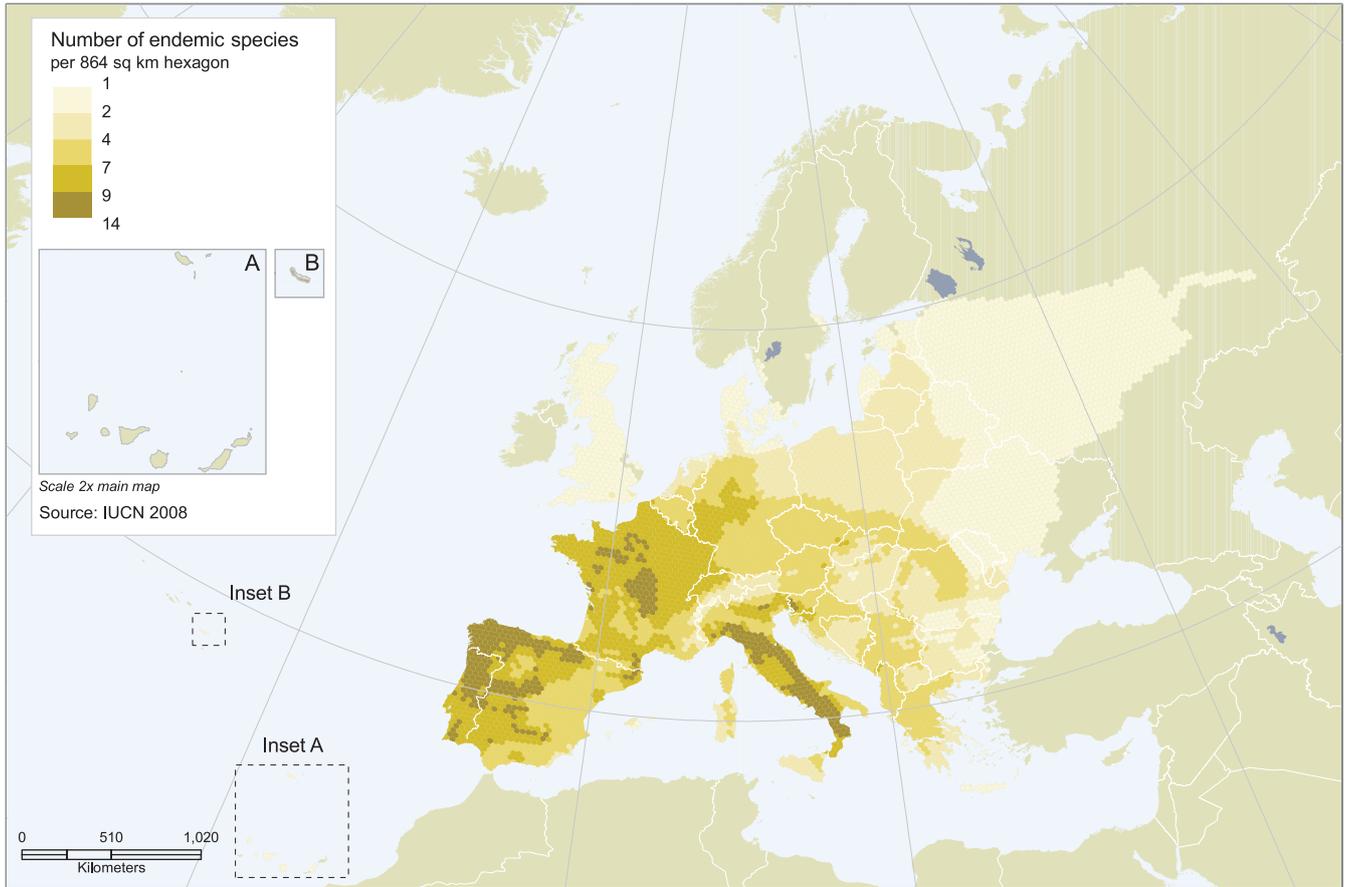
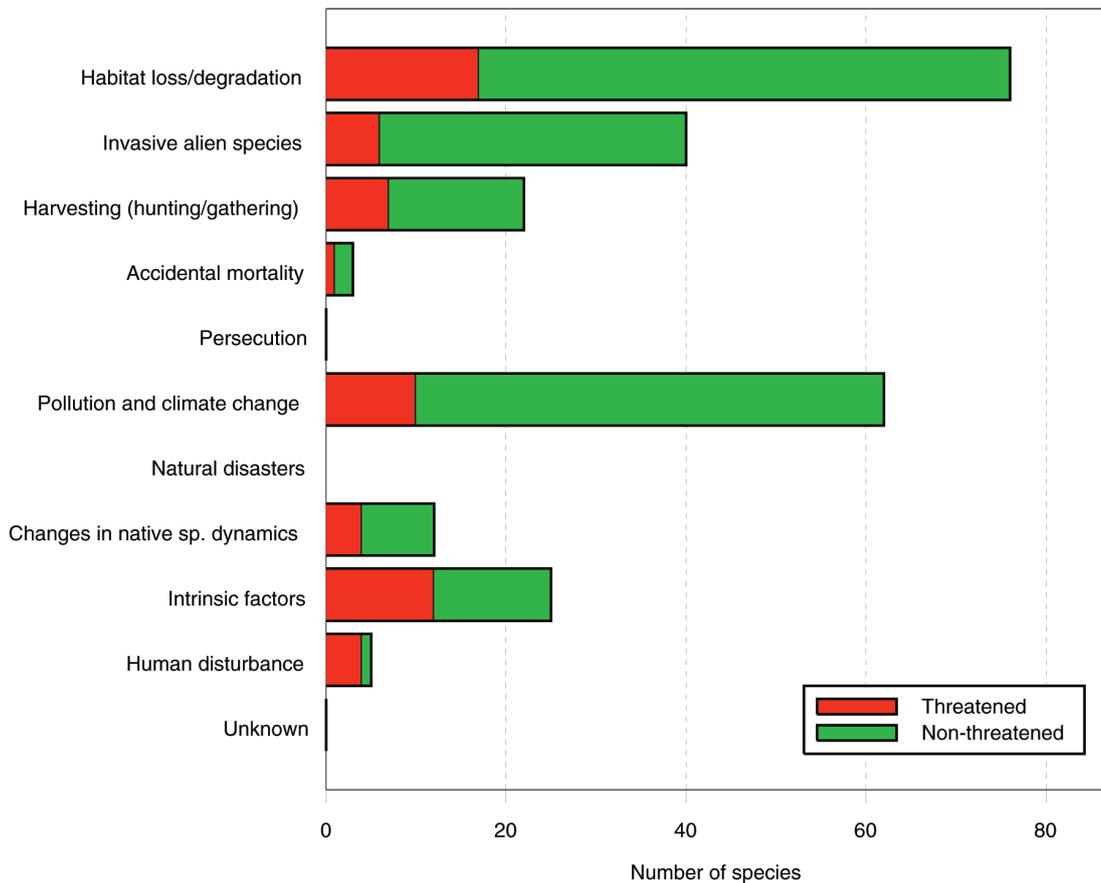


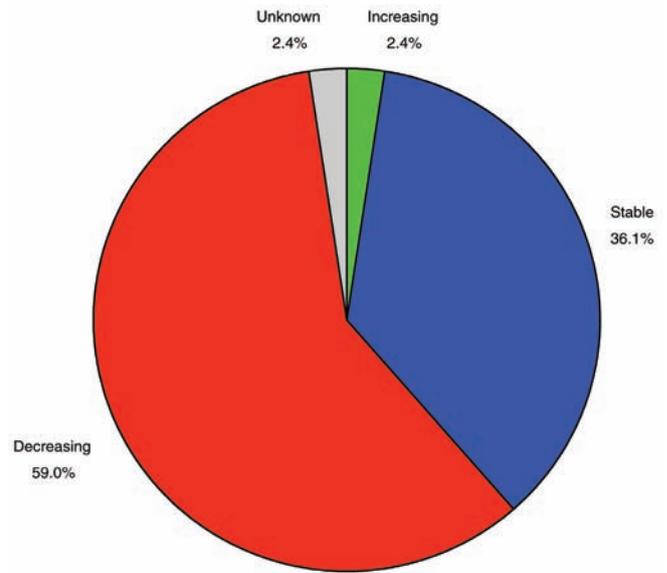
Figure 7. Major threats to amphibians in Europe



3.5 Demographic trends

Documenting population trends is one key to assessing species status, and a special effort was made to determine which species are believed to be declining, stable, or increasing. More than half (59%) of European amphibians are declining in population. A further 36% are stable, and only 2% are increasing (see Figure 8). The two species with increasing population trend are *Alytes muletensis* and *Pelophylax ridibundus*. The former is a threatened species that has increased in number as a result of intensive conservation efforts, while the latter is a European native that is highly invasive in some areas.

Figure 8. Population trends of European amphibians



The Supramonte Cave Salamander *Speleomantes supramontis* (Endangered) is only found in a small area in central-eastern Sardinia (Italy), where it is threatened by habitat loss and illegal collection. It is listed on Appendix II of the Bern Convention, and it is also listed on Annexes II and IV of the Habitats Directive. Further research into the threats leading to the recent apparent declines in this species is needed. Photograph © Roberto Sindaco.



4. Discussion

4.1 Status and population trends of European amphibians

The status of amphibians was assessed at two regional levels: geographical Europe, and the EU 27. At the European regional level 22.9% of species were threatened in total, with 2.4% Critically Endangered, 7.2% Endangered and 13.3% Vulnerable (see Figure 2). A similar pattern was seen in the EU 27 (22.0% threatened, of which 2.4% CR, 6.1% EN and 13.4% VU).

Birds, mammals and reptiles are the only other taxonomic groups to have been assessed at both the European and the EU³ level. In the case of birds, conservation status (*sensu* the Habitats Directive; see Section 4.6 for a definition) was assessed for all European and EU 25 species, with species divided into “Favourable” and “Unfavourable” categories (BirdLife International 2004b). A higher proportion of bird species have Unfavourable conservation status at the EU level than at the pan-European level: almost half (48%) of the EU’s 448 species were assessed as having Unfavourable conservation status, whereas only 43% of 524 European species had Unfavourable conservation status. In the case of mammals and reptiles, assessments were carried out according to IUCN Red List methodology, and species showed more similar patterns of threat at the European and EU scale. For mammals, 14% of species were threatened at both the European and EU level (Temple & Terry 2007). A slightly higher proportion of reptiles were threatened at the EU scale versus the European scale: 21% versus 19%, respectively (Cox & Temple 2009).

Overall, nearly a quarter of amphibians are considered threatened in Europe – the highest level of threat of any European species group comprehensively assessed to date. By comparison, 19% of European reptiles, 15% of European mammals and 13% of European birds are threatened (BirdLife International 2004a; Cox & Temple 2009; Temple & Terry 2007, 2009). No other groups have yet been comprehensively assessed at the European level according to IUCN regional Red List guidelines.

The overwhelming majority of threatened and Near Threatened amphibian species are endemic to both Europe and the EU, highlighting the responsibility that European countries have to protect the entire global populations of these species. All species considered threatened (Critically Endangered, Endangered, or Vulnerable) at the European level are endemic to Europe and are found nowhere else in the world.

The assessment showed that more than half (59%) of European

amphibians are declining in population. A further 36% are stable, and only 2% are increasing. This means that a higher proportion of amphibians are declining than is known to be the case for reptiles, mammals or birds. By contrast, 42% of reptile species have declining populations (Cox & Temple 2009) and 27% of European mammals have declining populations, although the latter may be an underestimate as a further 33% of European mammals have an unknown population trend (Temple & Terry 2007, 2009). Just under a quarter (23%) of European birds are decreasing in number, based on population trends between 1990 and 2000 (BirdLife International 2004a).

BirdLife International’s analysis of population trends in European birds was based on quantitative data from a well established monitoring network covering the majority of species and countries in Europe. By contrast, comprehensive and reliable population trend data are available for only a tiny minority of amphibian species. The population trend analysis in this report is based in many cases on survey data from a small and potentially non-representative part of the species’ range, or on a subjective assessment of population trend based on known threats. Better monitoring of amphibian populations in Europe is urgently needed, especially for threatened, Near Threatened and Data Deficient species.

4.2 Major threats to European amphibians

The most significant set of threats to European amphibians identified during the course of the assessment were habitat loss, fragmentation, and degradation. European amphibians are dependent on freshwater habitats for their life cycle, and freshwater habitats are among the most threatened habitat types in Europe. Looking into the data in more detail, agricultural intensification and infrastructure development emerge as the most frequently cited causes of habitat decline and deterioration. Water abstraction is also a significant threat and is having a particularly detrimental effect on amphibian populations in Europe’s drier southern regions.

A particular problem is posed by the loss of temporary freshwater habitats (seasonal ponds and other wetlands). These are often particularly favoured as breeding habitats since temporary freshwater habitats typically have fewer predators (e.g. fish are absent, as they cannot survive in habitats that are seasonally dry) and competitors. Water is a resource under increasing pressure from *inter alia* intensification of agriculture and growing resident and tourist human populations. Seasonal

³ The European bird and mammal assessments were carried out prior to the accession of Romania and Bulgaria in 2007, so both of these assessments covered the EU 25 only.

wetlands are under threat not only in arid Mediterranean regions but all over Europe, and there is an increasing trend for temporary pools to dry up earlier in the year. This acts like a trap – adults gather to breed, but then the spawn dries out before tadpoles can emerge and mature, which can result in rapid population declines. Climate change is likely to exacerbate this threat, especially in drier parts of southern Europe.

In the Mediterranean, traditional artificial habitats are very important as amphibian breeding sites – for example stone troughs and old stone wells. In some parts of Italy for example, the majority of amphibian breeding sites are artificial (Corsetti & Romano 2007, Romano *et al.* 2007). With the decline of traditional agriculture these are filled in or abandoned. Traditionally every house or farm had its own well – whereas now water is piped to these buildings.

Terrestrial habitats upon which amphibians depend are also under threat. Eutrophication (caused by agrochemical fertilisers for example) is a threat to terrestrial habitats in some areas. Many terrestrial amphibians rely on open steppe-type vegetation, but eutrophication causes succession to dense grassland and scrub. Other threats to terrestrial habitats include wide-scale urbanisation, road construction, development of transport and tourist infrastructure, and agricultural intensification on the one hand and abandonment of traditional agricultural practices on the other. The transition from mosaic cultural landscape of non-intensive, traditional farms to intensive monoculture has adversely affected European amphibians as it has many other European species.

Invasive alien species were also identified as a major threat to many amphibian species. Numerous alien species have become successfully established over large areas of Europe (Hulme 2007), and future global biodiversity scenarios suggest that the rate of biological invasions in Europe is likely to increase (Sala *et al.* 2000). The number of invasive alien species in Europe continues to grow, and although there is greater awareness of this problem than there was ten years ago there are still insufficient control measures in place and better monitoring and early warning systems are needed (European Environment Agency 2007). In terms of negative impacts on native European amphibians, some of the most pernicious invasive species include predators such as the American Crayfish *Procambarus clarkii*, the American Bullfrog *Lithobates catesbeianus* and a variety of introduced fishes (for example centrarchids and salmonids) as well as pathogens such as the fungal disease chytridiomycosis (Garner *et al.* 2005). Threats often act synergistically – for example the loss of temporary ponds means that amphibians concentrate in permanent waters where they are vulnerable to predation by introduced predators.

4.3 Protection of habitats and species in Europe

European countries and EU member states are signatories to a number of important conventions aimed at conserving biodiversity that are particularly relevant to amphibians, including the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats, the 1991 Convention on the Protection of the Alps and, most importantly, the 1992 Convention on Biological Diversity. All European countries and many lower administrative units (states, provinces, etc.) have some form of protective species legislation.

The Bern Convention is a binding international legal instrument that aims to conserve wild flora and fauna and their natural habitats and to promote European co-operation towards that objective. It covers all European countries and some African states. Considerable work has been undertaken within the Convention for the protection of amphibian species. In addition to numerous workshops and seminars, the Convention has adopted recommendations and developed Action Plans for certain species (e.g., *Rana latastei*, *Triturus cristatus complex*; see Edgar & Bird 2007a,b).

European countries and the EU have made the commitment to halt the loss of biodiversity within Europe by 2010. This means that not only should extinctions be prevented, but population declines should be stemmed and ideally reversed. The present study has shown that a large number of species show long term declines, and that the proportion of species declining and under threat exceeds levels identified for European birds, mammals and reptiles (BirdLife International 2004a, Cox & Temple 2009, Temple & Terry 2007). Given this result it seems unlikely that the 2010 target of halting biodiversity loss will be met.

4.4 Protection of habitats and species in the EU

EU nature conservation policy is based on two main pieces of legislation - the Birds Directive⁴ and the Habitats Directive⁵. The main aim of this nature conservation policy is to ensure the favourable conservation status (see Box 1) of the habitats and species found in the EU. One of the main tools to enhance and maintain this status is the Natura 2000 network of protected areas. EU nature conservation policy also foresees the integration of its protection requirements into other EU sectoral policies such as agriculture, regional development and transport. The Habitats Directive, which aims to protect other wildlife species and habitats, applies to both terrestrial and marine regions. Each Member State is required to identify sites of European importance and is encouraged to put in place

⁴ Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds.

⁵ Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna.

a special management plan to protect them, combining long-term conservation with economic and social activities as part of a sustainable development strategy. These sites, together with those of the Birds Directive, make up the Natura 2000 network - the cornerstone of EU nature conservation policy. The Natura 2000 network has grown over the last 25 years and now includes more than 26,000 protected areas in all Member States combined, with a total area of around 850,000 km² – more than 20% of total EU territory⁶.

The Habitats Directive contains a series of Annexes that mostly identify habitats and species of European Community concern. Member States are required to designate Natura 2000 sites for the species listed on Annex II; Annex IV species are subject to a strict protection system. Table 6 shows those species identified as threatened by the assessment and their inclusion in the protected species Annexes of the Habitats Directive and Appendix II of

the Bern Convention (all amphibian species that are not listed on Appendix II of the Bern Convention are automatically listed on Appendix III). The majority of threatened species are listed on the Habitats Directive Annexes II and/or IV, but there are a few exceptions: *Pelophylax cerigensis*, *P. cretensis*, *P. epeiroticus* and *Rana pyrenaica*. Three of these species (*P. cerigensis*, *P. cretensis* and *R. pyrenaica*) had not yet been described when the Habitats Directive came into force. *P. cerigensis* is known only from Karpathos Island, Greece, where it is currently only known with certainty from a single river, near Olimbos in the mountains on the north side of the island. *P. cretensis* is endemic to the island of Crete, and *P. epeiroticus* is restricted to western Greece (including the island of Kerkyra), and southern Albania. *Rana pyrenaica* is largely restricted to the southern slopes of the western central Pyrenees Mountains. In Spain, it occurs from the Roncal Valley (Navarra) eastwards to Parque Nacional de Ordesa (Huesca). It also occurs in the Iraty Forest in the western French Pyrenees.

Table 6. The threatened amphibian taxa identified by the assessment and their presence on either Annexes II and IV of the Habitats Directive or Appendices II or III of the Bern Convention. All amphibians not listed on Appendix II of the Bern Convention are automatically listed on Appendix III. An asterisk (*) indicates that the species is a priority species for the Habitats Directive

Genus	Species	Red List status		Habitats Directive Annexes	Bern Convention Appendices
		Europe	EU 27		
<i>Pelophylax</i>	<i>cerigensis</i>	CR	CR		
<i>Calotriton</i>	<i>arnoldi</i>	CR	CR	IV ¹	II ¹
<i>Bombina</i>	<i>pachypus</i>	EN	EN	II/IV ²	II ²
<i>Speleomantes</i>	<i>supramontis</i>	EN	EN	II/IV	II
<i>Pelophylax</i>	<i>cretensis</i>	EN	EN		
<i>Pelophylax</i>	<i>shqipericus</i>	EN	NE	n/a	
<i>Rana</i>	<i>pyrenaica</i>	EN	EN		
<i>Euproctus</i>	<i>platycephalus</i>	EN	EN	IV	II
<i>Alytes</i>	<i>dickhilleni</i>	VU	VU	IV ³	II ³
<i>Alytes</i>	<i>muletensis</i>	VU	VU	II*/IV	II
<i>Atylodes</i>	<i>genei</i>	VU	VU	II/IV ⁴	II ⁴
<i>Speleomantes</i>	<i>flavus</i>	VU	VU	II/IV	II
<i>Speleomantes</i>	<i>sarrabusensis</i>	VU	VU	II/IV ⁵	II ⁵
<i>Proteus</i>	<i>anguinus</i>	VU	VU	II*/IV	II
<i>Pelophylax</i>	<i>epeiroticus</i>	VU	VU		
<i>Rana</i>	<i>latastei</i>	VU	VU	II/IV	II
<i>Chioglossa</i>	<i>lusitanica</i>	VU	VU	II/IV	II
<i>Lyciasalamandra</i>	<i>helverseni</i>	VU	VU	II/IV ⁶	
<i>Salamandra</i>	<i>lanzai</i>	VU	VU	IV ⁷	II ⁷

¹ As part of *Euproctus asper*.

² As part of *Bombina variegata*.

³ As part of *Alytes obstetricans*.

⁴ As *Hydromantes (Speleomantes) genei*.

⁵ As part of *Hydromantes (Speleomantes) imperialis*.

⁶ As part of *Mertensiella luschani (Salamandra luschani)*.

⁷ As part of *Salamandra atra*.

⁶ Source: http://ec.europa.eu/environment/nature/index_en.htm, downloaded February 2009.

4.5 Conservation management of amphibians in the EU

LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU as well as in some candidate, acceding and neighbouring countries. Since 1992, LIFE has co-financed over 2,700 projects with a total budget of approximately €1.35 billion. LIFE supports the implementation of the Birds and Habitats Directives and the establishment of the Natura 2000 network. Projects involve a variety of actions including habitat restoration, site purchases, communication and awareness-raising, protected area infrastructure and conservation planning.

Based on a search of the LIFE project database that lists all past and current LIFE projects, 50 projects link their actions to amphibian conservation and 5 target specific species. Table 7 shows the taxonomic breakdown of these projects. Examples of actions taken within these projects include habitat restoration, habitat conservation and re-introductions.

Table 7. The number of LIFE projects targeted either towards specific species or broader taxonomic groups. This review is based on a search for amphibian species on the LIFE database <http://ec.europa.eu/environment/life/project/Projects/index.cfm> which identified 50 projects. Some projects target more than one species. Species based projects were not included in the count for taxonomic group projects. Most of the 50 projects were focused at the habitat or site level rather than on particular species

Species	Projects
<i>Bombina bombina</i>	1
Mallorcan Midwife Toad (<i>Alytes muletensis</i>)	1
<i>Triturus cristatus</i>	1
<i>Salamandra atra aurorae</i>	1
<i>Pelobates fuscus insubricus</i>	1
Taxonomic Group	
Amphibians	4
Fire-bellied toads	1
Habitat	
Habitats and sites for amphibian species	40

4.6 Extinction risk versus conservation status

The IUCN Red List Criteria classify species solely on the basis of their relative extinction risk (IUCN 2001). However, Unfavourable conservation status according to the EU Habitats Directive has a much broader definition. This is identified clearly in Article 1 of the Directive (see Box 1). No species meeting

the IUCN Red List Criteria for one of the threatened categories at a regional level can be considered to have a Favourable conservation status in the EU. To be classified as Vulnerable (the lowest of the three IUCN threatened categories) a species must undergo a reduction in population size of at least 30% over 10 years or 3 generations (or have a very small or small and declining population or geographic range; see the 2001 IUCN Red List Categories and Criteria version 3.1 http://www.iucnredlist.org/info/categories_criteria2001). It is difficult to claim that a species experiencing a decline of this magnitude is maintaining its population, that its range is stable, and that it remains a viable component of its habitat. Crucially, however, this does not mean that the opposite is true: species that are not threatened as defined by IUCN Red List Criteria do not necessarily have a Favourable conservation status (BirdLife International 2004a). Guidelines issued by the European Commission on the protection of animal species under the Habitats Directive reinforce this message that “the fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not necessarily mean that it has a favourable conservation status” (Anon. 2007).

Many amphibian species remain widely distributed in Europe, although their populations and ranges have suffered significant long-term decline as a result of habitat loss and degradation in conjunction with other threats (see Sections 3.4 and 3.5). The European Red List has highlighted the fact that 59% of amphibians have declining populations (see Figure 8). Many of these species have declined at a rate that does not exceed 30% over the last 10 years or three generations, and thus does not trigger IUCN Red List Criterion A. Nevertheless, although many of these species would be categorised as Least Concern, those showing significant long-term decline could not be regarded as having Favourable conservation status.

Box 1. Selected provisions of the EU Habitats Directive (92/43/EEC)

Article 1(i) defines the conservation status of a species as “the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations in the European territory of the Member States”. It states that a species' conservation status will be taken as Favourable when:

- Population dynamics data on the species concerned suggests that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the considerable future; and
- There is, and probably will continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.



4.7 Red List versus priority for conservation action

Assessment of extinction risk and setting conservation priorities are two related but different processes. Assessment of extinction risk, such as the assignment of IUCN Red List Categories, generally precedes the setting of conservation priorities. The purpose of the Red List categorization is to produce a relative estimate of the likelihood of extinction of a taxon or subpopulation. Setting conservation priorities, on the other hand, which normally includes the assessment of extinction risk, also takes into account other factors such as ecological, phylogenetic, historical,

or cultural preferences for some taxa over others, as well as the probability of success of conservation actions, availability of funds or personnel, cost-effectiveness, and legal frameworks for conservation of threatened taxa. In the context of regional risk assessments, a number of additional pieces of information are valuable for setting conservation priorities. For example, it is important to consider not only conditions within the region but also the status of the taxon from a global perspective and the proportion of the global population that occurs within the region. Decisions on how these three variables, as well as other factors, are used for establishing conservation priorities is a matter for the regional authorities to determine.

5. Conclusions

5.1 Application of project outputs

The amphibians data set, a summary of which is presented here, is part of a wider European assessment that also covers other species groups including reptiles (Cox & Temple 2009), mammals (Temple & Terry 2007), freshwater fishes, butterflies, dragonflies, and selected beetles, molluscs, and plants. In conjunction with data compiled on European birds by BirdLife International (BirdLife International 2004a,b), it provides a key resource for conservationists, policymakers, and environmental planners throughout the region. By making this data widely and freely available, we aim to stimulate and support research, monitoring and conservation action at local, regional, and international levels.

The outputs from this project can be applied at the regional scale to prioritise sites and species to include in regional research and monitoring programmes and for identification of internationally important sites for biodiversity. All the endemic species assessed in this project will be submitted for inclusion in the next update of the IUCN global Red List (www.iucnredlist.org). The large amount of data collected during the assessment process (available online at <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>) can be used for further analyses to give deeper insights into the conservation needs of European species and the impacts on their populations of land-use policies and natural resource use.

5.2 Future work

Through the process of compiling amphibian data for the European Red List a number of knowledge gaps have been identified. Across Europe there are significant geographic, geopolitical and taxonomic biases in the quality of data available on the distribution and status of species. Few European countries have any kind of organised and systematic monitoring for amphibian species, even though monitoring of amphibian species of European interest is now a statutory responsibility under EU legislation. National amphibian population monitoring schemes have been initiated in some EU Member States, for example in the Netherlands (since 1964) and the United Kingdom, but in a number of countries of the EU even basic data on species distribution and population status are limited. It is hoped that by presenting this data set, both regional and international research will be stimulated to provide new data and to improve on the quality of that already given.

A challenge for the future is to improve monitoring and the quality of data, so that the information and analyses presented

here and on the European Red List website can be updated and improved, and conservation action can be given as solid a scientific basis as possible. If the amphibian assessments are periodically updated, they will enable the changing status of these species to be tracked through time via the production of a Red List Index (Butchart *et al.* 2004, 2005, 2006, 2007). To date, this indicator has been produced for birds at the European regional level and has been adopted as one of the headline biodiversity indicators to monitor progress towards halting biodiversity loss in Europe by 2010 (European Environment Agency 2007). By regularly updating the data presented here we will be able to track the changing fate of European amphibians to 2010 and beyond.

Sardinian Tree Frog *Hyla sarda* (Least Concern). Photograph © Roberto Sindaco.



References

- Anon. 2007. *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC*. Available online at: http://ec.europa.eu/environment/nature_conservation/specific_articles/art12/index_en.htm
- BirdLife International. 2004a. *Birds in Europe: population estimates, trends, and conservation status*. BirdLife International, Cambridge, UK.
- BirdLife International. 2004b. *Birds in the European Union: a status assessment*. BirdLife International, Wageningen, The Netherlands.
- Butchart, S.H.M., Stattersfield, A.J., Bennun, L.A., Shutes, S.M., Akcakaya, H.R., et al. 2004. Measuring global trends in the status of biodiversity: Red List Indices for birds. *PLoS Biology* 2: e383.
- Butchart, S.H.M., Stattersfield, A.J., Baillie, J.E.M., Bennun, L.A., Stuart, S.N., et al. 2005. Using Red List Indices to measure progress towards the 2010 target and beyond. *Philosophical Transactions of the Royal Society of London B* 360: 255–268.
- Butchart, S.H.M., Akcakaya, H.R., Kennedy, E., Hilton-Taylor, C. 2006. Biodiversity indicators based on trends in conservation status: strengths of the IUCN Red List Index. *Conservation Biology* 20: 579–581.
- Butchart, S.H.M., Akcakaya, H.R., Chanson, J., Baillie, J.E.M., Collen, B., et al. 2007. Improvements to the Red List Index. *PLoS ONE* 2(1): e140. doi:10.1371/journal.pone.0000140.
- Carranza, S and Amat, F. 2005. Taxonomy, biogeography and evolution of Euproctus (Amphibia: Salamandridae), with the resurrection of the genus Calotriton and the description of a new endemic species from the Iberian Peninsula. *Zoological Journal of the Linnean Society* 145: 555–582.
- Carranza, S., Romano, A., Arnold, E.N. and Sotigu, G. 2008. Biogeography and evolution of European cave salamanders, Hydromantes (Urodela: Plethodontidae), inferred from mtDNA sequences. *Journal of Biogeography* 35: 724–738.
- Central Intelligence Agency. 2009. The World Factbook. <https://www.cia.gov/library/publications/the-world-factbook/>
- Corsetti, L. & Romano, A. 2007. 2Amphibians of the Ausoni Mountains (Latium, Central Italy). *Acta Herpetologica* 2(2): 129–137.
- Cox, N.A. and Temple, H.J. 2009. *European Red List of Reptiles*. Luxembourg: Office for Official Publications of the European Communities.
- Cox, N., Chanson, J. and Stuart, S.(Compilers) 2006. *The Status and Distribution of Reptiles and Amphibians of the Mediterranean Basin*. IUCN, Gland, Switzerland and Cambridge, UK. vii + 51 pp.
- Cuttelod, A., García, N., Abdul Malak, D., Temple, H. & Katariya, V. 2008. The Mediterranean: a biodiversity hotspot under threat. In: J.-C. Vié, C. Hilton-Taylor and S.N. Stuart (eds). *The 2008 Review of the IUCN Red List of Threatened Species*. IUCN Gland, Switzerland.
- Edgar, P. & Bird, D.R. 2007a. *Action Plan for the Conservation of the Crested Newt Triturus cristatus Species Complex in Europe*. The Herpetological Conservation Trust, Bournemouth.
- Edgar, P. & Bird, D.R. 2007b. *Action Plan for the Conservation of the Italian Agile Frog (Rana latastei) in Europe*. The Herpetological Conservation Trust, Bournemouth.
- European Environment Agency. 2007. *Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe*. EEA Technical Report No. 11/2007.
- Fauna Europaea Web Service. 2004. *Fauna Europaea version 1.1*, Available online at <http://www.faunaeur.org>
- Frost, D.R. 2008. *Amphibian Species of the World: an Online Reference*. Version 5.2 (15 July, 2008). Electronic Database accessible at <http://research.amnh.org/herpetology/amphibia/index.php>. American Museum of Natural History, New York, USA.
- Garner, T.W.J., Walker, S., Bosch, J., Hyatt, A.D., Cunningham, A.A. and Fisher, M.C. 2005. *Chytrid fungus* in Europe. *Emerging Infectious Diseases* 11:1639–1641.
- Hulme, P.E., Roy, D.B., Cunha, T. & Larsson, T.-B. 2008. A pan-European inventory of alien species: rationale, implementation and implications for managing biological invasions. In DAISIE (eds.) *The Handbook of European Alien Species*. Springer, Dordrecht.
- IUCN. 1994. *IUCN Red List Categories*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN. 2003. *Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0*. IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN 2008. 2008 *IUCN Red List of Threatened Species*. <www.iucnredlist.org>.
- Kottelat, M. and Freyhof, J. 2007. *Handbook of European freshwater fishes*. Kottelat, Cornol, Switzerland and Freyhof, Berlin, Germany.
- Min, M.S., Yang, S.Y., Bonett, R.M., Vieites, D.R., Brandon, R.A., and Wake, D.B. 2005. Discovery of the first Asian plethodontid salamander. *Nature* 435: 87–90.
- Mittermeier, R.A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. 2004. *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. CEMEX, Conservation International and Agrupación Sierra Madre, Mexico City.
- Romano, A., Montinaro, G., Mattocchia, M. & Sbordoni, V. 2007. Amphibians of the Aurunci Mountains (Latium,

- Central Italy). Checklist and conservation guidelines. *Acta Herpetologica* 2(1): 17-25.
- Sala, O.E., Stuart Chapin III, F., Armesto, J.J. *et al.* 2000: Global biodiversity scenarios for the year 2100. *Science* 287: 1770-1774.
- Sánchez-Herráiz, M.J., Barbadillo, L.J., Machordom A. and Sanchiz B. 2000. A new species of pelodytid frog from the Iberian Peninsula. *Herpetologica*, 56, 105-118.
- Stöck, M., Moritz, C., Hickerson, M., Frynta, D., Dujsebayaeva, T., Eremchenko, V., Macey, J.R., Papenfuss, T.J. and Wake, D.B. 2006. Evolution of mitochondrial relationships and biogeography of Palearctic green toads (*Bufo viridis* subgroup) with insights in their genomic plasticity. *Molecular Phylogenetics and Evolution* 41: 663-689.
- Stöck, M., Sicilia, A., Belfiore, N., Buckley, D., Lo Brutto, S., Lo Valvo, M. and Arculeo, M. 2008. Post-Messinian evolutionary relationships across the Sicilian channel: Mitochondrial and nuclear markers link a new green toad from Sicily to African relatives. *BMC Evolutionary Biology* 8: 56-74.
- Temple H.J. and Terry A. 2007. *The status and distribution of European mammals*. Luxembourg: Office for Official Publications of the European Communities.
- Temple H.J. and Terry A. 2009. European Mammals: Status, trends and conservation priorities. *Folia Zoologica*.
- WWF. 2007. Europe 2007: *Gross Domestic Product and Ecological Footprint*. World Wide Fund for Nature (WWF).

Appendix 1. Red List status of European amphibians

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 27)	IUCN Red List Criteria (EU 27)	Endemic to Europe?	Endemic to EU 27?
ANURA	ALYTIDAE	<i>Alytes cisternasi</i>	NT		NT		Yes	Yes
ANURA	ALYTIDAE	<i>Alytes dickhilleni</i>	VU	B2ab (iii,iv)	VU	B2ab (iii,iv)	Yes	Yes
ANURA	ALYTIDAE	<i>Alytes muletensis</i>	VU	D2	VU	D2	Yes	Yes
ANURA	ALYTIDAE	<i>Alytes obstetricans</i>	LC		LC		Yes	
ANURA	ALYTIDAE	<i>Discoglossus galganoi</i>	LC		LC		Yes	Yes
ANURA	ALYTIDAE	<i>Discoglossus jeanneae</i>	NT		NT		Yes	Yes
ANURA	ALYTIDAE	<i>Discoglossus montalentii</i>	NT		NT		Yes	Yes
ANURA	ALYTIDAE	<i>Discoglossus pictus</i>	LC		LC			
ANURA	ALYTIDAE	<i>Discoglossus sardus</i>	LC		LC		Yes	Yes
ANURA	BOMBINATORIDAE	<i>Bombina bombina</i>	LC		LC			
ANURA	BOMBINATORIDAE	<i>Bombina pachypus</i>	EN	A2ce	EN	A2ce	Yes	Yes
ANURA	BOMBINATORIDAE	<i>Bombina variegata</i>	LC		LC		Yes	
ANURA	BUFONIDAE	<i>Bufo bufo</i>	LC		LC			
ANURA	BUFONIDAE	<i>Bufo mauritanicus</i>	NA		NA			
ANURA	BUFONIDAE	<i>Epidalea calamita</i>	LC		LC		Yes	
ANURA	BUFONIDAE	<i>Pseudepidalea balearica</i>	LC		LC		Yes	Yes
ANURA	BUFONIDAE	<i>Pseudepidalea boulengeri</i>	NA		NA			
ANURA	BUFONIDAE	<i>Pseudepidalea sicula</i>	LC		LC		Yes	Yes
ANURA	BUFONIDAE	<i>Pseudepidalea variabilis</i>	DD		DD			
ANURA	BUFONIDAE	<i>Pseudepidalea viridis</i>	LC		LC			
ANURA	HYLIDAE	<i>Hyla arborea</i>	LC		LC			
ANURA	HYLIDAE	<i>Hyla intermedia</i>	LC		LC		Yes	Yes
ANURA	HYLIDAE	<i>Hyla meridionalis</i>	LC		LC			
ANURA	HYLIDAE	<i>Hyla sarda</i>	LC		LC		Yes	Yes
ANURA	HYLIDAE	<i>Hyla savignyi</i>	LC		LC			
ANURA	PELOBATIDAE	<i>Pelobates cultripes</i>	NT		NT		Yes	Yes
ANURA	PELOBATIDAE	<i>Pelobates fuscus</i>	LC		LC			
ANURA	PELOBATIDAE	<i>Pelobates syriacus</i>	LC		NT			
ANURA	PELODYTIDAE	<i>Pelodytes ibericus</i>	LC		LC		Yes	Yes
ANURA	PELODYTIDAE	<i>Pelodytes punctatus</i>	LC		LC		Yes	Yes
ANURA	PIPIDAE	<i>Xenopus laevis</i>	NA		NA			
ANURA	RANIDAE	<i>Lithobates catesbeianus</i>	NA		NA			
ANURA	RANIDAE	<i>Pelophylax bedriagae</i>	LC		LC			
ANURA	RANIDAE	<i>Pelophylax bergeri</i>	LC		LC		Yes	Yes
ANURA	RANIDAE	<i>Pelophylax cerigensis</i>	CR	B1ab(iii) +2ab(iii)	CR	B1ab(iii) +2ab(iii)	Yes	Yes
ANURA	RANIDAE	<i>Pelophylax cretensis</i>	EN	B1ab(iii) +2ab(iii)	EN	B1ab(iii) +2ab(iii)	Yes	Yes
ANURA	RANIDAE	<i>Pelophylax epeiroticus</i>	VU	B1ab(iii)	VU	B1ab(iii)	Yes	
ANURA	RANIDAE	<i>Pelophylax esculentus</i>	LC		LC		Yes	
ANURA	RANIDAE	<i>Pelophylax grafi</i>	NT		NT		Yes	Yes
ANURA	RANIDAE	<i>Pelophylax hispanicus</i>	LC		LC		Yes	Yes
ANURA	RANIDAE	<i>Pelophylax kurtmuelleri</i>	LC		LC		Yes	
ANURA	RANIDAE	<i>Pelophylax lessonae</i>	LC		LC		Yes	
ANURA	RANIDAE	<i>Pelophylax perezi</i>	LC		LC		Yes	Yes
ANURA	RANIDAE	<i>Pelophylax ridibundus</i>	LC		LC			
ANURA	RANIDAE	<i>Pelophylax saharicus</i>	NA		NA			
ANURA	RANIDAE	<i>Pelophylax shqipericus</i>	EN	B1ab(iii)	NE	(does not occur in EU)	Yes	
ANURA	RANIDAE	<i>Rana arvalis</i>	LC		LC			
ANURA	RANIDAE	<i>Rana dalmatina</i>	LC		LC			
ANURA	RANIDAE	<i>Rana graeca</i>	LC		LC		Yes	

Order	Family	Species	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU 27)	IUCN Red List Criteria (EU 27)	Endemic to Europe?	Endemic to EU 27?
ANURA	RANIDAE	<i>Rana iberica</i>	NT		NT		Yes	Yes
ANURA	RANIDAE	<i>Rana italica</i>	LC		LC		Yes	Yes
ANURA	RANIDAE	<i>Rana latastei</i>	VU	B2ab(iii)	VU	B2ab(iii)	Yes	
ANURA	RANIDAE	<i>Rana pyrenaica</i>	EN	B1ab(ii,iii,iv)	EN	B1ab(ii,iii,iv)	Yes	Yes
ANURA	RANIDAE	<i>Rana temporaria</i>	LC		LC			
CAUDATA	PLETHODONTIDAE	<i>Atylodes genei</i>	VU	B1ab(iii)	VU	B1ab(iii)	Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes ambrosii</i>	NT		NT		Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes flavus</i>	VU	D2	VU	D2	Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes imperialis</i>	NT		NT		Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes italicus</i>	NT		NT		Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes sarrabusensis</i>	VU	D2	VU	D2	Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes strinatii</i>	NT		NT		Yes	Yes
CAUDATA	PLETHODONTIDAE	<i>Speleomantes supramontis</i>	EN	B1ab(iii,v)	EN	B1ab(iii,v)	Yes	Yes
CAUDATA	PROTEIDAE	<i>Proteus anguinus</i>	VU	B2ab(ii,iii,v)	VU	B2ab(ii,iii,v)	Yes	
CAUDATA	SALAMANDRIDAE	<i>Calotriton arnoldi</i>	CR	B2ab(iii,iv)	CR	B2ab(iii,iv)	Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Calotriton asper</i>	NT		NT		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Chioglossa lusitanica</i>	VU	B2ab(ii,iii,iv)	VU	B2ab(ii,iii,iv)	Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Euproctus montanus</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Euproctus platycephalus</i>	EN	B2ab(iii,iv)	EN	B2ab(iii,iv)	Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Lissotriton boscai</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Lissotriton helveticus</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Lissotriton italicus</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Lissotriton montandoni</i>	LC		LC		Yes	
CAUDATA	SALAMANDRIDAE	<i>Lissotriton vulgaris</i>	LC		LC			
CAUDATA	SALAMANDRIDAE	<i>Lyciasalamandra helverseni</i>	VU	D2	VU	D2	Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Lyciasalamandra luschani</i>	NA		NE	(does not occur in EU)		
CAUDATA	SALAMANDRIDAE	<i>Mesotriton alpestris</i>	LC		LC		Yes	
CAUDATA	SALAMANDRIDAE	<i>Pleurodeles waltl</i>	NT		NT			
CAUDATA	SALAMANDRIDAE	<i>Salamandra atra</i>	LC		LC		Yes	
CAUDATA	SALAMANDRIDAE	<i>Salamandra corsica</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Salamandra lanzai</i>	VU	D2	VU	D2	Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Salamandra salamandra</i>	LC		LC		Yes	
CAUDATA	SALAMANDRIDAE	<i>Salamandrina perspicillata</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Salamandrina verdigitata</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Triturus carnifex</i>	LC		LC		Yes	
CAUDATA	SALAMANDRIDAE	<i>Triturus cristatus</i>	LC		LC			
CAUDATA	SALAMANDRIDAE	<i>Triturus dobrogicus</i>	NT		NT		Yes	
CAUDATA	SALAMANDRIDAE	<i>Triturus karelinii</i>	LC		LC			
CAUDATA	SALAMANDRIDAE	<i>Triturus marmoratus</i>	LC		LC		Yes	Yes
CAUDATA	SALAMANDRIDAE	<i>Triturus pygmaeus</i>	NT		NT		Yes	Yes

*Species were considered to be Not Applicable (NA) if they were introduced after AD 1500 or if they were considered to be of marginal occurrence in the region. Species were considered to be of marginal occurrence if it was estimated that less than 1% of their global population occurs in Europe. In the absence of population data, terrestrial species were considered of marginal occurrence if less than 1% of their range lies within Europe.

Appendix 2. Methodology for spatial analyses

Data were analysed using a geodesic discrete global grid system, defined on an icosahedron and projected to the sphere using the inverse Icosahedral Snyder Equal Area (ISEA) Projection (S39). This corresponds to a hexagonal grid composed of individual units (cells) that retain their shape and area (~22,300 km²) throughout the globe. These are more suitable for a range of ecological applications than the most commonly used rectangular grids (S40).

The range of each species was converted to the hexagonal grid for analysis purposes. Coastal cells were clipped to the

coastline. Patterns of species richness (Figure 4) were mapped by counting the number of species in each cell (or cell section, for species with a coastal distribution). Patterns of threatened species richness (Figure 5) were mapped by counting the number of threatened species (categories CR, EN, VU at the European regional level) in each cell or cell section. Patterns of endemic species richness were mapped by counting the number of species in each cell (or cell section for coastal species) that were flagged as being endemic to geographic Europe as defined in this project (Figure 6).

Appendix 3. Example species summary and distribution map

The species summary gives all the information collated (for each species) during this assessment, including a distribution map. You can search for and download all the summaries and distribution

maps from the European Red List website and data portal available online at <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>.

Alytes dickhilleni



Taxonomic Authority: Arntzen and García-París, 1995

Global Assessment
 Regional Assessment
 Region: Europe
 Endemic to region

No synonyms available

Common names

Betic Midwife Toad	English
Sapo Partero Bético	Spanish; Castilian

Upper Level Taxonomy

Kingdom: ANIMALIA	Phylum: CHORDATA
Class: AMPHIBIA	Order: ANURA
Family: ALYTIDAE	

Lower Level Taxonomy

Rank: Infra- rank name: Plant Hybrid

Subpopulation: Authority:

General Information

Distribution

This species is restricted to the mountains of south-eastern Spain. It occurs at altitudes of 700-2,140m asl (Sierra Nevada, Almería).

Range Size

Elevation

Biogeographic Realm

Area of Occupancy:	Upper limit: 2140	<input type="checkbox"/> Afrotropical
Extent of Occurrence:	Lower limit: 700	<input type="checkbox"/> Antarctic
Map Status: done	<u>Depth</u>	<input type="checkbox"/> Australasian
	Upper limit:	<input type="checkbox"/> Neotropical
	Lower limit:	<input type="checkbox"/> Oceanian
	<u>Depth Zones</u>	<input checked="" type="checkbox"/> Palearctic
	<input type="checkbox"/> Shallow photic	<input type="checkbox"/> Indomalayan
	<input type="checkbox"/> Bathyl	<input type="checkbox"/> Nearctic
	<input type="checkbox"/> Hadal	
	<input type="checkbox"/> Photic	
	<input type="checkbox"/> Abyssal	

Population

Populations of this species are very fragmented, many of them confined to isolated mountains and valleys. It is relatively common in the Alcaraz, Segura, and Cazorla mountains, but it is rare in drier mountains (Filabres, Baza, Gádor), where it is associated with springs. Populations in drier areas can consist of only a few adults.

Total Population Size

Minimum Population Size: Maximum Population Size:

Habitat and Ecology

The species is present in pine and oak forests, most often on calciferous substrate, in open, very rocky landscapes. Adults occur in rock fissures and on stones next to water sources. Reproduction and larval development takes place in permanent mountain streams, man-made reservoirs and cattle troughs, and the larvae may take a long time to mature. Almost all known breeding habitats are human-modified water bodies.

System		Movement pattern			Crop Wild Relative
<input checked="" type="checkbox"/> Terrestrial	<input checked="" type="checkbox"/> Freshwater	<input type="checkbox"/> Nomadic	<input type="checkbox"/> Congregatory/Dispersive	<input type="checkbox"/> Is the species a wild relative of a crop?	
	<input type="checkbox"/> Marine	<input type="checkbox"/> Migratory	<input type="checkbox"/> Altitudinally migrant		

The species is threatened by loss of suitable breeding habitat as a result of excessive water withdrawal, droughts, and modernization of agricultural practices leading to the abandonment of cattle troughs and other man-made water sources. A potential future threat is the fungal disease chytridiomycosis, which has already impacted the related *Alytes obstetricans* in Spain.

	Past	Present	Future
1 Habitat Loss/Degradation (human induced)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.1 Agriculture	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.1.1 Crops	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.1.1.3 Agro-industry farming	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.1.5 Abandonment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3 Extraction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.6 Groundwater extraction	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1.3.8 Unknown	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8 Changes in native species dynamics	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8.5 Pathogens/parasites	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Intrinsic factors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9.7 Slow growth rates	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9.9 Restricted range	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Conservation Measures

This species is listed on Appendix II of the Bern Convention (as part of *obstetricans*). It is listed in regional Red Data Books and is present in the protected areas of Parque Nacional Sierra Morena, Parque Nacional de Sierra Nevada, and the Natural Park of Cazorla, Segura y las Villas. Protection measures in Castilla-La Mancha, Andalusia, such as restoration and construction of new breeding habitats, are under way.

	In Place	Needed
1 Policy-based actions	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2 Legislation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.1 Development	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.1.1 International level	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.1.2 National level	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.2 Implementation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.2.1 International level	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2.2.2 National level	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Communication and Education	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.2 Awareness	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3 Research actions	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.2 Population numbers and range	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.3 Biology and Ecology	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.4 Habitat status	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.5 Threats	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.8 Conservation measures	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.9 Trends/Monitoring	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4 Habitat and site-based actions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.1 Maintenance/Conservation	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.4 Protected areas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.4.1 Identification of new protected areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.4.2 Establishment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.4.3 Management	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Countries of Occurrence

	PRESENCE						ORIGIN					
	Year Round	Breeding Season only	Non-breeding season only	Passage migrant	Possibly extinct	Extinct	Presence uncertain	Native	Introduced	Re-Introduced	Vagrant	Origin uncertain
Spain	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						

General Habitats

	Score	Description	Major Importance
1 Forest	1	Suitable	Unset
1.4 Forest - Temperate	1	Suitable	Unset
5 Wetlands (inland)	2	Marginal	Not applicable
5.7 Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	2	Marginal	Not applicable
5.8 Wetlands (inland) - Seasonal/Intermittent Freshwater Marshes/Pools (under 8ha)	2	Marginal	Not applicable
14 Artificial/Terrestrial	2	Marginal	Not applicable
14.2 Artificial/Terrestrial - Pastureland	2	Marginal	Not applicable
15 Artificial/Aquatic & Marine	1	Suitable	Unset
15.2 Artificial/Aquatic - Ponds (below 8ha)	1	Suitable	Unset
15.3 Artificial/Aquatic - Aquaculture Ponds	1	Suitable	Unset

Species Utilisation

Species is not utilised at all

Trend in the level of wild offtake/harvest in relation to total wild population numbers over the last five years:

Trend in the amount of offtake/harvest produced through domestication/cultivation over the last five years:

CITES status: Not listed

IUCN Red Listing

Red List Assessment: (using 2001 IUCN system) Vulnerable (VU)

Red List Criteria: B2ab(iii,iv)

Date Last Seen (only for EX, EW or Possibly EX species):

Is the species Possibly Extinct? Possibly Extinct Candidate?

Rationale for the Red List Assessment

Listed as Vulnerable, because its Area of Occupancy is less than 2,000 km², its distribution is severely fragmented, and there is a continuing decline in the extent and quality of its habitat and in the number of subpopulations.

Reason(s) for Change in Red List Category from the Previous Assessment:

- | | | |
|---|---|--|
| <input type="checkbox"/> Genuine Change | <input type="checkbox"/> Nongenuine Change | <input checked="" type="checkbox"/> No Change |
| <input type="checkbox"/> Genuine (recent) | <input type="checkbox"/> New information | <input checked="" type="checkbox"/> Same category and criteria |
| <input type="checkbox"/> Genuine (since first assessment) | <input type="checkbox"/> Knowledge of Criteria | <input type="checkbox"/> Same category but change in criteria |
| | <input type="checkbox"/> Incorrect data used previously | |
| | <input type="checkbox"/> Taxonomy | |
| | <input type="checkbox"/> Criteria Revisio | |
| | <input type="checkbox"/> Other | |

Current Population Trend: Decreasing

Date of Assessment: 14/12/2008

Name(s) of the Assessor(s): Jaime Bosch, Miguel Tejado, Miguel Lizana, Iñigo Martínez-Solano, Alfredo Salvador, Mario García

Evaluator(s): Neil Cox and Helen Temple

Notes:

% population decline in the past:

Time period over which the past decline has been measured for applying Criterion A or C1 (in years or generations):

% population decline in the future:

Time period over which the future decline has been measured for applying Criterion A or C1 (in years or generations):

Number of Locations:

Severely Fragmented:

Number of Mature Individuals:

Bibliography

Arnold, E.N. 2003. Reptiles and amphibians of Europe. Princeton University Press, Princeton and Oxford.

Arntzen, J.W. and García-París, M. 1995. Morphological and allozyme studies of midwife toads (Genus *Alytes*), including the description of two new taxa from Spain. *Contributions to Zoology* 65(1): 5-34.

Benavides, J., Viedma, A., Clivilles, J., Ortiz, A. and Gutiérrez, J.M. 2000. Albinismo en *Alytes dickhilleni* y *Salamandra salamandra* en la Sierra de Castril (Granada), *Boletín de la Asociación Herpetológica Española* 11(2): 83.

Fromhage, L., Vences, M. and Veith, M. 2004. Testing alternative vicariance scenarios in Western Mediterranean discoglossid frogs. *Molecular Phylogenetics and Evolution* 31(1): 308-322.

García-Cardenete, L., González de la Vega, J.P., Barnestein, J.A.M. and Pérez-Contreras, J. 2003. Consideraciones sobre los límites de distribución en altitud de anfibios y reptiles en la Cordillera Bética (España), y registros máximos para cada especie. *Acta Granatense* 2: 3-4.

Gasc, J.-P. et al. 1997. Atlas of Amphibians and Reptiles in Europe. Societas Europea Herpetologica & Museum National d'Histoire Naturelle, Paris.

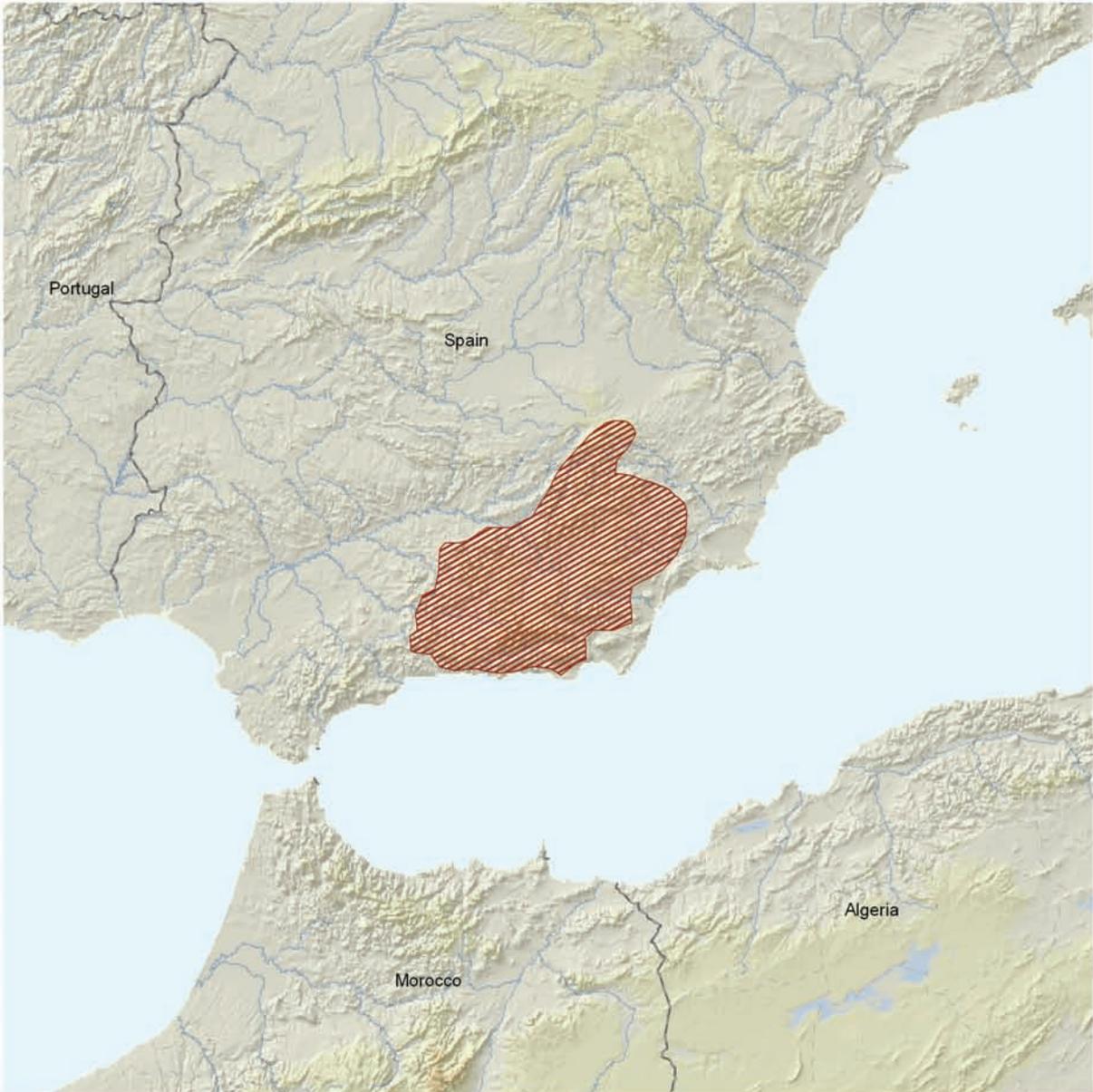
Márquez, R. and Bosch, J. 1996. Advertisement call of the midwife toad from the Sierras Béticas *Alytes dickhilleni*/ Arntzen & García-París, 1995 (*Amphibia*, *Anura*, *Discoglossidae*). *Herpetological Journal* 6(1): 9-14.

Martínez-Solano, I., Gonçalves, H.A., Arntzen, J.W. and García-París, M. 2004. Phylogenetic relationships and biogeography of midwife toads (*Discoglossidae*: *Alytes*), *Journal of Biogeography* 31(4): 603-618.

Martínez-Solano, I., París, M., Izquierdo, E. and García-París, M. 2003. Larval growth plasticity in wild populations of the betic midwife toad, *Alytes dickhilleni* (*Anura*: *Discoglossidae*), *Herpetological Journal* 13(2): 89-94.

Pleguezuelos, J.M. 1997. Distribucion y Biogeografía de los Anfibios y Reptiles en España y Portugal. *Asociacion Herpetologica Española*, Las Palmas de Gran Canarias.

Pleguezuelos, J.M., Márquez, R. and Lizana, M. 2002. Atlas y Libro Rojo de los Anfibios y Reptiles de España. Dirección General de la Conservación de la naturaleza-Asociación Herpetológica Española, Madrid.



Alytes dickhilleni

range type

- native (resident)
- native (breeding)
- native (non breeding)
- reintroduced
- introduced
- origin uncertain
- possibly extinct
- extinct

- national boundaries
- subnational boundaries
- lakes, rivers, canals
- salt pans, intermittent rivers

data source:
IUCN (International Union for Conservation of Nature)

NE DD LC NT **< VU >** EN CR EW EX
VULNERABLE

azimuthal equal area central point: 0° E, 0°

map created 02/11/2009



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IUCN Red List of Threatened Species™ – Regional Assessments

The Status and Distribution of Freshwater Biodiversity in Eastern Africa. Compiled by William R.T. Darwall, Kevin G. Smith, Thomas Lowe, Jean-Christophe Vié, 2005

The Status and Distribution of Freshwater Fish Endemic to the Mediterranean Basin. Compiled by Kevin G. Smith and William R.T. Darwall, 2006

The Status and Distribution of Reptiles and Amphibians of the Mediterranean Basin. Compiled by Neil Cox, Janice Chanson and Simon Stuart, 2006

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European Red List of Reptiles. Compiled by Neil Cox and Helen J. Temple, 2009

IUCN – The Species Survival Commission

The Species Survival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of 8,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation. www.iucn.org/ssc

IUCN – Species Programme

The IUCN Species Programme supports the activities of the IUCN Species Survival Commission and individual Specialist Groups, as well as implementing global species conservation initiatives. It is an integral part of the IUCN Secretariat and is managed from IUCN's international headquarters in Gland, Switzerland. The species Programme includes a number of technical units covering Species Trade and Use, The IUCN Red List, Freshwater Biodiversity Assessment Initiative (all located in Cambridge, UK), and the Global Biodiversity Assessment Initiative (located in Washington DC, USA). www.iucn.org/species

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The European Red List is a review of the conservation status of c.6,000 European species (mammals, reptiles, amphibians, freshwater fishes, butterflies, dragonflies, and selected groups of beetles, molluscs, and vascular plants) according to IUCN regional Red Listing guidelines. It identifies those species that are threatened with extinction at the regional level – in order that appropriate conservation action can be taken to improve their status.

This publication summarises results for Europe's 85 native species of amphibians. Nearly a quarter of these species are threatened with extinction at the European level as a result of threats including habitat loss, fragmentation and degradation, pollution, climate change, and invasive alien species.

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