Common Spadefoot Toad (*Pelobates fuscus*) – Estonia

**Summary:** This species declined across Europe primarily as a result of the loss of breeding ponds and its terrestrial habitat. In Estonia the restoration and creation of breeding ponds and improvement of surrounding habitat has greatly increased the number of breeding sites. This conservation status improvement was achieved through two LIFE projects and is continuing through actions established in an After-LIFE Conservation Plan and the Estonian Species Action Plan. Key drivers to the success of these conservation measures were the detailed scientific analysis of the species and its habitat requirements, the landscape-scale habitat improvements and the supervision of pond creation by experts. The removal of invasive alien species and the level of publicity and dialogue with local people and landowners were also vital to success. In the areas targeted, the number of breeding ponds increased from 25 prior to conservation action to 145 in 2012 and reached 202 at the latest count.

**Background**

**Status and EU occurrence**

In many countries, the size of the Common Spadefoot Toad (*Pelobates fuscus*)1 population is unknown, so no reliable estimate can be given of the global or EU total. Among those countries which have estimated the population for Habitats Directive reporting purposes, there are considered to be 170,546–1,966,810 individuals. These countries report the biogeographical range in which these individuals occur as 153,000 km², while the reported biogeographical range in which only the number of occupied localities or grid-squares is reported is approximately 540,600 km² (ETC/BD, 2014). It is possible that different Member States took different approaches to the assessment of the population at different stages of the life cycle (egg, tadpole, adult).

The population size in Estonia is 1,000–5,000 adults. The area of available habitat is estimated at 2,000 km², and its quality is rated moderate but improving. Other countries of the Boreal Bioregion in which Common Spadefoot Toad occurs are Lithuania, where there are 50–60 known localities within an overall range of 5,500 km², and Latvia, where the population is estimated at 2,300–5,300 individuals at 23–53 localities with 3,082 km² of habitat of unknown quality (ETC/BD, 2014).

Although the Common Spadefoot Toad is classified as Least Concern, the IUCN note that declines are such that it may soon qualify as Near Threatened (NT) in Europe and the EU 27 (Agasyan et al, 2009).

Work on this species’ taxonomy is ongoing. Although it is possible that it represents a species complex (Agasyan et al, 2009), and some authors only suggested classification errors at the subspecific level (Veith et al, 2006), recent work recommends a split into two species. This would not alter the species status in the EU as the EU population falls entirely within one of the proposed species’ range (Litvinchuk et al, 2013).

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1 Natura 2000 species code: 1197
Ecological requirements

The adult Common Spadefoot Toad is essentially terrestrial, requiring water only for breeding. It is nocturnal, digging itself into the ground using the spade-shaped tubercles on its hind feet, from which it gets its name, for the daylight hours. They also burrow into the ground to hibernate (MotE, 2015).

The species favours places with light, grainy and well-drained soils, which in Estonia and Denmark are typically sandy areas, garden plots and small fields (cultivated without artificial fertilizers or toxic substances) and natural or semi-natural grasslands. The habitat is open, and includes forest edge and clearings, groves, steppes, fields, meadows, sand dunes, heathland, gravel pits, parks and gardens (Agasyan et al, 2009; MotE, 2015; Rannap, Lõhmus and Briggs, 2009).

Courtship, during which males call underwater, and spawning take place in spring, usually in still waterbodies including ditches (though not in Estonia), ponds, puddles, beaver floods, turloughs and lakes. During the larval stage, tadpoles grow to twice the size of the adults, taking up to 100 days from the point when larvae emerge from the egg to metamorphosis (Agasyan et al, 2009; MotE, 2013; MotE, 2015; Rannap pers comm, 2018a).

Water bodies for spawning have to be fish free, with naturally clear and clean water and an extensive zone of shallow water. Clay sediments are preferred, and ponds are generally open to the sun, particularly in Estonia and have to have sandy and loose soil within a 100 m distance. Ponds with deciduous forest and intensive agriculture in the close vicinity are avoided (Environmental Board, 2016; Rannap, Lõhmus and Briggs, 2009).

Pressures and threats

The primary causes of decline during the 20th century were:

- habitat destruction;
- pollution and eutrophication;
- introduction of predatory fish and crayfish; and
- killing by vehicles (Agasyan et al, 2009; Environmental Board, 2016).

The destruction of both breeding and terrestrial habitats has probably been the most significant of these, with loss of between 50% and 90% of small water bodies in European countries. Habitat destruction has mainly resulted from changes in land use with large monoculture fields replacing small fields and garden plots; increased stocking rates on farmland; loss of ponds through silting and drainage; succession processes on abandoned land; and the effects of eutrophication caused by the inappropriate use of artificial fertilisers and sewage discharge. Declines in water quality and high levels of pesticide use have also been pressures, as has the reduced availability of loosely structured soils (Agasyan et al, 2009; Environmental Board, 2016; Rannap, Lõhmus and Briggs, 2009).

Climate change or other changes in environmental conditions may disrupt fragile host-pathogen equilibria, impacting amphibian populations (Spitzen-van der Sluijs et al, 2017). Finally, small numbers have been collected for the pet trade (Agasyan et al, 2009).

Drivers of improvements: actors, actions and their implementation approaches

Organisers, partners, supporters and other stakeholders

The Estonian Environmental Board is the government body responsible for implementation of environment and nature conservation policies and laws. It is an arms-length/non-departmental public body associated with the Ministry of the Environment (Environment Board, undated).

Two LIFE projects have had a significant effect on Common Spadefoot Toad populations in Estonia. The first targeted Great Crested Newt (Triturus cristatus), with Common Spadefoot Toad as a secondary target. This project, Protection of the Great Crested Newt in the eastern Baltic region (LIFE04NAT/EE/000070), was coordinated by the Estonian Ministry of the Environment (MotE) with the following in-country partners:

- the State Nature Conservation Centre
- Haanja and Rõuge rural municipalities; and
- the environmental departments of Võru and Põlva counties.

The project was a partnership between Estonian, Finnish and Danish authorities, environmental organisations and consultancies and some Latvian and Lithuanian herpetologists (Rannap, Rannap & Vuorio, 2008).
A second Estonian LIFE project, this time targeting Common Spadefoot Toad and Yellow-spotted Whiteface (*Leucorrhinia pectoralis*) was Dragonlife (LIFE08NAT/EE/000257). This project was managed by the Environment Board from 2010 to 2015. The majority of the project actions had been ongoing for at least two years by the end of the 2007–2012 Habitats Directive Article 12 reporting period (Environmental Board, 2016), so it is safe to attribute conservation status improvements to this work. This also means that measure driven improvements (MDI) will be cumulatively greater through the subsequent Article 12 reporting period.

The Dragonlife project gave special attention to working with local inhabitants, landowners and nature conservation experts and to international cooperation between experts and nature managers.

The project was a partnership between Estonian and Danish authorities (Dragonlife, undated; Environment Board, 2016).

The State Forest Management Centre (RMK) includes work to improve water bodies for Common Spadefoot Toad and Great Crested Newt to spawn in within its annual nature protection works (Ratassepp, 2017).

**Contributions / relevance of strategic plans**

In 2008, the State Nature Conservation Centre began implementing the action plan elaborated during the Great Crested Newt LIFE project, actions included creation of additional ponds for both the rare amphibians (Rannap, Lõhmus and Briggs, 2009).

Furthermore, MDI resulted from the Estonian Species Action Plan (SAP) for Great Crested Newt and the Best Practice Guidelines for that species’ protection (Rannap, Lõhmus and Briggs, undated; Rannap, Lõhmus and Briggs, 2009).

A Species Action Plan (SAP) for Common Spadefoot Toad was drafted by the Environment Board and approved by the MotE in 2015 (Environmental Board, 2016). It follows that this was not responsible for the MDI seen during the 2007–12 Article 12 reporting period, however, it is expected to lead to future improvements.

**Measures taken and their effectiveness**

From 2005 to 2007, the Great Crested Newt project restored 22 degraded ponds and created 208 new ponds clustered in 31 areas in south-eastern Estonia. A key element of the project was its large scale, following previous experience that landscape scale programmes are necessary for effective conservation of threatened amphibians. The Estonian sites alone covered 40,262 ha, the largest areas being Haanja and Otepää Nature Parks which form part of the Natura 2000 network. Over the three years, the number of ponds holding Common Spadefoot Toad rose from 8 (2%) before the intervention to 29 (15%) afterwards (Rannap, Rannap and Vuorio, 2008; Rannap, Lõhmus and Briggs, undated; Rannap, Lõhmus and Briggs, 2009).

Importantly, characteristics of the ponds to be constructed were carefully researched in advance and used to identify intervention sites. Following the project experience, the following were seen as the most important for Great Crested Newt and Common Spadefoot Toad recovery:

- Some new ponds should be located close to water bodies known to hold the target species. Such ponds were re-colonised significantly faster.
- Ponds should be constructed in clusters, each including ponds with diverse characteristics (unless only one target species is present in the locality). As well as facilitating colonisation, this allows for uncertainty over exact requirements for the species and the fact that annual variation in weather conditions affects pond suitability.
- Ponds should be separated from running water to avoid fish introduction, sedimentation or pollution.
- Suitable terrestrial habitat for the target species should be available nearby.
- On-site expert input to the restoration process is advisable.

Management schemes developed during the project established 2- to 3-year monitoring cycles. These emphasise habitat management for the pond and surrounding land, and, fish elimination. At some sites, land owners are contractually prohibited from releasing fish (Rannap, Lõhmus and Briggs, undated; Rannap, Lõhmus and Briggs, 2009).

In 2009–10, the Dragonlife project built on the earlier success and was managed by a team including many people with experience from the Great Crested Newt project. Dragonlife again began with international cooperation and research to inform the physical actions to be carried out. This included developing an inventory of existing water bodies and establishing the habitat requirements of Common Spadefoot Toad and the dragonfly Yellow-spotted Whiteface (*Leucorrhinia pectoralis*). Added to the findings of the previous project was
the importance of beaver floods and consequently supporting the Eurasian Beaver (*Castor fiber*) population in Estonia.

Dragonlife again involved landscape-scale habitat (re)creation, this time with the majority of sites in northern Estonia. Over the course of the project, 65 new water bodies were created and 52 were restored, although in practice the two types of action were not always distinct. The suitability of the surrounding 50 ha of habitat was also improved, for example, through brush-cutting and creating suitable hibernation sites for the toads.

A focus of this project was developing best practice and guidance for the removal and control of invasive alien species (IAS). However, elimination of IAS primarily took place in 2013–14, so is covered under ‘Future Actions’.

Great efforts were made to communicate with stakeholders, particularly landowners, and a wide variety of media were used to raise public awareness of the project. Project staff communicated directly with local people and landowners on a frequent basis during the preparation and implementation of project actions, for example addressing landowners concerns about restrictions being placed on the use of their land. The project worked closely with the education sector as ponds make an excellent location for children and young people to learn about wildlife and conservation. Most innovative was a collaboration with the University of Tartu to develop a mobile application for the identification of wild amphibians, which also incorporated amphibian sound recordings (Dragonlife, undated; Environment Board, 2016; Rannap et al, 2011).

No conservation measures for this species were recorded by Estonia in its Article 17 report for 2007–12, so no table is shown.

**Funding sources (current and long-term) and costs (one-off and ongoing)**

The main funding sources for Common Spadefoot Toad conservation have been the EU LIFE programme and national funds from the Estonian Environmental Investment Centre.

The Protection of Great Crested Newt LIFE Project budget was €736,190, of which, €423,804 was spent in Estonia. Taking a proportion of project management costs into account (€46,000 across the three countries and two species) approximately half the Estonian budget was spent on actions relating to Common Spadefoot Toad:

- €35,000 for expert work, for example, researching the species, preparation and instructing of restoration work;
- €15,000 for international cooperation including seminars;
- €91,000 for habitat restoration;
- €14,000 for durable goods, namely a tractor and mowing equipment; and
- €11,000 for activities raising public awareness (Rannap, Rannap and Vuorio, 2008; Rannap pers comm, 2018b).

The Dragonlife LIFE Project budget was €1,050,430, of which, €369,378 was spent in Estonia. Project management costs across both countries and both species amounted to €114,000. In Estonia, approximately €330,000 of expenditure related to Common Spadefoot Toad, specifically:

- €42,000 for expert work, for example, researching the species, preparation and instructing of restoration work
- €28,000 for international cooperation including seminars;
- €103,500 for habitat restoration and eradication of IAS (the restoration work frequently involved temporarily draining ponds and removing sediment to eradicate fish); and
- €43,000 for activities raising public awareness (Environment Board, 2016; Rannap pers comm, 2018b).

The Estonian Environmental Investment Centre financed restoration of 26 degraded ponds between 2013 and 2016 (Rannap pers comm, 2018a).

The Estonian Five-Year Species Action Plan for Common Spadefoot Toad (2016–2020) has a projected budget of €122,500 funded by the State Forest Management Centre (RMK), the Environment Board and others. During 2016–2017 it is estimated that approximately €15,000 was spent on the species’ conservation (Rannap pers comm, 2018b).

RMK has a budget for its nature protection works, which include improvement of water body habitats for rare amphibians among many other activities. Although only a very small proportion of the totals relate to water bodies, the amount spent on all nature protection in 2012 was €2,233,900, of which €594,900 was financed by RMK and €1,639,000 came from sources including the State budget and Undertakings for Collective Investment in Transferable Securities (UCITS). In the four subsequent years, the total spend averaged €2.3 m of which
€0.94 m was the RMK contribution and €1.4 m was from other sources (Ratassepp, 2017; Rannap pers comm, 2018b).

**Future actions:**
A number of actions were carried out by the Dragonlife project after the Genuine Improvements of interest were generated. Invasive alien species were removed from numerous water bodies in 2013–14. These were primarily fish (10 ponds), mainly Prussian Carp (*Carassius gibelio*), but aquatic plants were also significant, especially Canadian Waterweed (*Eleodea canadensis*) and New Zealand Pigmyweed (*Crassula helmsii*). Being a major element of the project plan, comprehensive guidelines for eradication of IAS using the most effective environmentally-friendly methods were published based on the experience gained (de Vries, Rannap and Briggs, 2012; Environment Board, 2016).

The main conservation actions foreseen in the Estonian Species Action Plan for Common Spadefoot Toad are:

- restoration and creation of breeding ponds (in 2016 five ponds were to be restored);
- managing breeding ponds and their surroundings;
- improving the status of terrestrial habitats;
- raising public awareness (three interpretation boards were to be erected in 2016-2017 and a triptych on ponds restoration was to be compiled in 2016); and
- annual national monitoring (Environment Board, 2016).

In the period 2013–2016, 26 degraded ponds in which Common Spadefoot Toad had historically bred were restored. These were located in southern, south-eastern and northern Estonia. In addition, Prussian Carp fish were successfully removed from nine ponds. This work was financed by the Estonian Environmental Investment Centre (Rannap pers comm, 2018a).

Estonia’s 2014–20 Prioritised Action Framework (PAF) sets the target of improving the status of freshwater turloughs in Natura 2000 areas from Unfavourable – bad to Unfavourable – inadequate, through measures including the minimisation of agricultural pollution, with Common Spadefoot Toad cited as a benefactor of this action. In Natura 2000 protected agricultural areas (other than semi-natural grassland), the aim is to maintain or improve the conservation status of a range of species including Common Spadefoot Toad. Measures will include appropriate regulation of the water regime of polders and selecting management methods (mowing, grazing, crop rotation, partial or temporary abandonment) that meet the habitat needs of target species (MotE, 2013).

**Achievements**

**Impacts on the target species**


Among the ponds restored and newly dug in Estonia by the Dragonlife project, 92 are located in Common Spadefoot Toad’s distribution area, and breeding is already taking place in 31 of them. While the greatest increases build on the successes of the previous project in south-eastern Estonia, the species is newly breeding in nine ponds at the single project site in central-eastern Estonia and one pond in each of three sites out of a total of six in northern Estonia (Environment Board, 2016). Consequently, by directly addressing the key pressure of the lack of high quality breeding sites, the projects achieved a significant geographic improvement in the distribution of the species across Estonia (Rannap pers comm, 2018a).

In 2005 before restoration actions began, there were 8 breeding ponds for this species within the 12 Great Crested Newt LIFE project sites. The combined impact of the two projects has seen the number grow significantly, to 18 in 2006 and 29 in 2008. When Dragonlife sites are included, surveys in 2010 located 17 further ponds holding breeding Common Spadefoot Toad, prior to conservation work. By the end of the Article 17 reporting period in 2012, the number of known breeding ponds among Great Crested Newt and Dragonlife project sites had increased to 145 and reached 202 ponds according to the latest (2015) survey (Environment Board, 2016; Rannap pers comm, 2018a).
Other impacts (e.g. other habitats and species, ecosystem services, economic and social)

The Dragonlife project covered two species, and many actions taken benefit both Common Spadefoot Toad and Yellow-spotted Whiteface (*Leucorrhinia pectoralis*) dragonflies. Yellow-spotted Whiteface has been found breeding at ponds created by the project and expanded its distribution in Estonia significantly during the project years (Environmental Board, 2016).

As small water bodies are important for many other species, project actions also contributed to wider biodiversity maintenance in Estonia, through habitat creation and management, removal of IAS, and, developing management guidelines and publicity on conservation (Environmental Board, 2016).

Study of the ponds restored or created during the two LIFE projects, shows small water bodies constructed for wildlife have wider conservation significance. They hosted more species (amphibians; dragonflies; damselflies; diving beetles; water scavenger beetles) than ordinary man-made ponds (created by local people) or natural ponds in the landscape (Soomets, Rannap and Lõhmus, 2016). Thus, pond construction for the protected amphibians can serve broader habitat conservation aims.

Pond restoration has been taken up in Estonia beyond the Dragonlife Project’s remit. For example, a company running a gravel pit restored six ponds in an area where extraction ceased in 2013, and, other ponds were created by state bodies during the project timeline (Environmental Board, 2016).

The successful efforts to use the two LIFE projects’ species and habitat for education programmes (Rannap, Rannap and Vuorio, 2008; MoTE, 2015) is an important social benefit.

Conclusions and lessons learnt

The key targeted conservation measures that led to the improvements

- Creating an inventory of existing water bodies, analysing data about them and establishing the habitat requirements of target species prior to pond restoration/creation.
- Restoring and creating suitable ponds for the toads to breed.
- Experts with the species supervised each pond’s creation from beginning to end of both LIFE projects.
- Removal of Invasive Alien Species (IAS), mainly fish and aquatic plants.
- Improving the quality of land surrounding the ponds in terms of the species’ requirements.
- Dialogue with local people and landowners, and, publicity and education.

Conservation measures that have not been sufficiently effective

- Restoration of old farm ponds can fail because they can be too deep and steeply sided, and are often surrounded by old trees so they remain shaded even after clearance. Thus, they can still be unsuitable for Common Spadefoot Toad to breed (Rannap pers comm, 2018a).
- Removing fish from ponds can prove to be unsuccessful if the pond is not pre-dried and the entire organic deposit is not removed (Rannap pers comm, 2018a).

Factors that supported the conservation measures

- The landscape scale of the project has been highlighted as fundamental to success.
- The ponds were created in clusters.
- The nucleus of the Dragonlife project team was involved and remained in place from project design to completion. Indeed, it was extremely important to have a passionate individual or core group of individuals who are concerned about certain species or habitats and willing to act. This not only ensures successful project implementation, but maintenance of ongoing conservation efforts (Rannap pers comm, 2018a).
- The high level of international cooperation in the Dragonlife project enabled common problems to be identified and solved better, and, knowledge and experience to be exchanged with experts in a wide range of European countries.
- Levels of engagement with local people and landowners in order to garner support and bring initially-concerned landowners on board.
Factors that constrained conservation measures

- International partnerships are not easy to manage – differences in legislation, tax systems, and procedures for registering working time – add difficulty, primarily to the financial reporting aspect of a project.
- As there are few experts, having many project partners each subcontracting much of the work can create bottlenecks.
- Resistance to cooperation or negativity on the part of some landowners.
- The weather was sometimes a significant constraint for pond-digging.
- Estonian NGOs are often too small to meet the financing requirements of LIFE projects and finding co-financing is usually difficult.

Quick wins that could be applied elsewhere for the species

- Given the finding that landscape scale activity is generally required to achieve success with rare amphibians, there are unlikely to be quick wins. However, the projects’ publications on habitat requirements and removal of aquatic IAS will facilitate the swifter development of actions taken elsewhere.

Examples of good practice, which could be applied to other species

- The combination of a well-researched action plan, landscape scale restoration and international cooperation form a solid and synergistic triumvirate for species recovery.
- The LIFE projects generated many insights relevant to the recovery of populations of rare amphibians, such as the need for a greater scale and the strategy of clustering new ponds near to a source population.
- The development of techniques for removing aquatic IAS was positive, and a guidelines booklet (de Vries, Rannap and Briggs, 2012) from the project is available online for application in similar circumstances.
- The work with landowners and local people in general (for example, guided tours, meetings, discussions in the field), raising their awareness of the importance of ponds as amphibian breeding sites, greatly influenced their attitude towards small water bodies and their wildlife (Rannap pers comm, 2018a).

References


Rannap, R pers comm, University of Tartu (2018) Written feedback on draft and answers to questions sent on 22 February 2018.


Authorship
Prepared by Tom Stuart of IEEP, as part of the European Commission study on identifying the drivers of successful implementation of the Birds and Habitats Directives (under contract ENV.F.1/FRA/2014/0063), carried out by the Institute for European Environmental Policy, BirdLife International, Deloitte, Denkstatt, Ecologic, ICF Consulting Services and PBL Netherlands Environmental Assessment Agency.

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Permission to use photo granted by Merike Linnamägi.
Annex 1. *Pelobates fuscus* conservation status at EU and Member State levels

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<tr>
<td>RO (STE)</td>
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<td>FV</td>
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<td>FV</td>
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<td>U1 (=)</td>
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<tr>
<td>EU overall (STE)</td>
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<td>FV</td>
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<td>U1</td>
<td>U1</td>
<td>U1 (=)</td>
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Source: Member State Article 17 reports as compiled by ETC-BD on EIONET
https://bd.eionet.europa.eu/article17/reports2012/
Annex 2. LIFE Nature Projects that aimed to help conserve *Pelobates fuscus*

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Project N°*</th>
<th>MS</th>
<th>Type Of Beneficiary</th>
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</thead>
<tbody>
<tr>
<td>DRAGONLIFE Securing <em>Leucorrhinia pectoralis</em> and <em>Pelobates fuscus</em> in the northern distribution area in Estonia and Denmark</td>
<td>LIFE08 NAT/EE/000257</td>
<td>EE, DK</td>
<td>National authority</td>
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<td>Protection of the Great Crested Newt in the eastern Baltic region</td>
<td>LIFE04NAT/EE/000070</td>
<td>EE, DK, FI</td>
<td>National authority</td>
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<td>SemiAquaticLife - Re-creating habitat complexity for semi-aquatic fauna</td>
<td>LIFE14 NAT/SE/000201</td>
<td>SE, DE, DK</td>
<td>Regional authority</td>
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<td>Life/Amphibia/2012/PL - Amphibians protection on the Natura 2000 areas in north-eastern Poland</td>
<td>LIFE12 NAT/PL/000063</td>
<td>PL</td>
<td>NGO-Foundation</td>
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<td>Schutz der Knoblauchkröte - Species conservation project Common Spadefoot (<em>Pelobates fuscus</em>) in parts of the Münsterland (North Rhine-Westphalia)</td>
<td>LIFE11 NAT/DE/000348</td>
<td>DE</td>
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<td>ECONAT - Development of Pilot Ecological Network through Nature Frame Areas in Southern Lithuania</td>
<td>LIFE09 NAT/LT/000581</td>
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<td>LIFE-AMPHIKULT - Management and Connectivity of Amphibians in the Cultural Landscape of Lower Saxony</td>
<td>LIFE08 NAT/D/000005</td>
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<td>AMBITION - Amphibian Biotope Improvement in the Netherlands</td>
<td>LIFE04 NAT/NL/000201</td>
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*Source:* Life Programme database, projects with species = ‘*Pelobates fuscus*’ and one project found during the literature review, which had this species’ conservation as a secondary objective