

RESPONSIBLE HERPETOLOGY JOURNAL

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- BREEDING KAISER'S NEWTS AT ANTWERP ZOO, BELGIUM
- THORNY DEVIL HUSBANDRY WITH ALICE SPRINGS REPTILE CENTRE
- BREEDING MARGINATED TORTOISES
- EXILED FROM EDEN: HERPETOLOGY & FOLKLORE



Photo Credit by Bryan Minne & Laura Ruyssseveldt.

- REPTILE EXHIBITIONS IN CHERKASY "ROSHEN" ZOO, UKRAINE
- A TOUR OF RATTLESNAKE RANCH, ARIZONA
- CAPTIVE MANAGEMENT OF EMERALD TREE BOAS



When the Conservation of Amphibians and Reptiles is not Enough...



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EMYS-R: A SOCIO-ECOLOGICAL EVALUATION OF WETLAND RESTORATION IN FAVOUR OF THE REINTRODUCTION OF THE EUROPEAN POND TURTLE AND ASSOCIATED BIODIVERSITY: A PAN-EUROPEAN APPROACH

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Why Emys-R?

In the present context of the 6th mass extinction of species, habitat restoration and reintroduction of threatened species are considered as operational strategies for limiting biodiversity erosion and as nature-based solutions for reconnecting people to nature. Species reintroduction consists of releasing captive-bred individuals of a

species in its formerly natural habitat (Fig. 1). Such conservation actions face two major constraints for their success as:

- a) they depend on the intrinsic capabilities of captive-bred individuals to survive and reproduce in the wild;
- b) they require suitable habitats in restored, if not natural, areas for the population to settle and expand.



Figure 1. View site Woerr, France. © Jean-Yves Georges.

Reintroductions are usually associated with prior habitat restoration. Yet, the actual benefits of prior habitat restoration on the success of species reintroductions and on associated biodiversity and more generally, the overall relevance of such usually expensive conservation initiatives, are poorly documented.

Wetlands are among the richest ecosystems in terms of biodiversity and biomass. They provide numerous ecological services to societies, including freshwater cleaning. Yet, in Europe, wetland surface area has decreased by 90% since the 18th century. Furthermore, wetlands suffer from a negative public perception as they are commonly considered to be risky areas for public health and safety. Meanwhile, wetlands' local wildlife has dramatically declined, with amphibians and reptiles being

amongst the most threatened vertebrates nowadays. This is all despite these animals being recognized as bioindicators for a wetlands' health status. This indication can be applied to both natural and restored wetland habitats.

The European pond turtle, an emissary for bringing together people and nature?

The European pond turtle *Emys orbicularis* (Linnaeus, 1758) (hereafter referred as *Emys*, Fig. 2) is a prominent example of biodiversity loss related to wetland mismanagement. This small-sized freshwater turtle is emblematic of Europe's wetlands and has suffered the most dramatic decline of all reptiles in the continent. Its current European distribution (from Spain to Latvia) is much more restricted than its historical range,



Figure 3. The European pond turtle *Emys orbicularis* is an emblematic inhabitant of wetlands with positive public perception that may contribute bringing together people and nature.

© Jean-Yves Georges.

and the species has even become extinct in several regions. Emys has received much attention from scientists, land managers and stakeholders because:

- a) Its status as a Threatened species requires concrete actions;
- b) It is considered to be an umbrella species, meaning the actions aiming to conserve the species also benefits other species including numerous amphibians;
- c) Turtles can develop positive perceptions by the public, making them obvious emissaries (echoing 'EMYS-R') for communication, public education and stakeholder engagement in environmental causes.

Over the last three decades, Emys has benefited several conservation initiatives throughout Europe. However, these initiatives have been developed in highly-contrasted socio-ecological contexts which has lead to potentially divergent successes. Habitat restoration may lead to adverse

consequences, such as the settlement of alien invasive species that represent major threats for local wetlands and their biodiversity. Overall, the actual results of these reintroduction projects, and more generally their medium-term success, has received little promotion. As a result, new restoration and reintroduction projects cannot, or can only sub-optimally, build on existing knowledge. A key question therefore remains unanswered:

What are the most (cost-)effective, socially supported, wetland restoration methods suitable for the reintroduction of the European pond turtle and associated local wildlife throughout Europe?

Emys-R: a transdisciplinary participatory action-oriented project

To answer this question, mentioned above, EMYS-R is a pan-European transdisciplinary participatory action-oriented research consortium (Fig. 3)

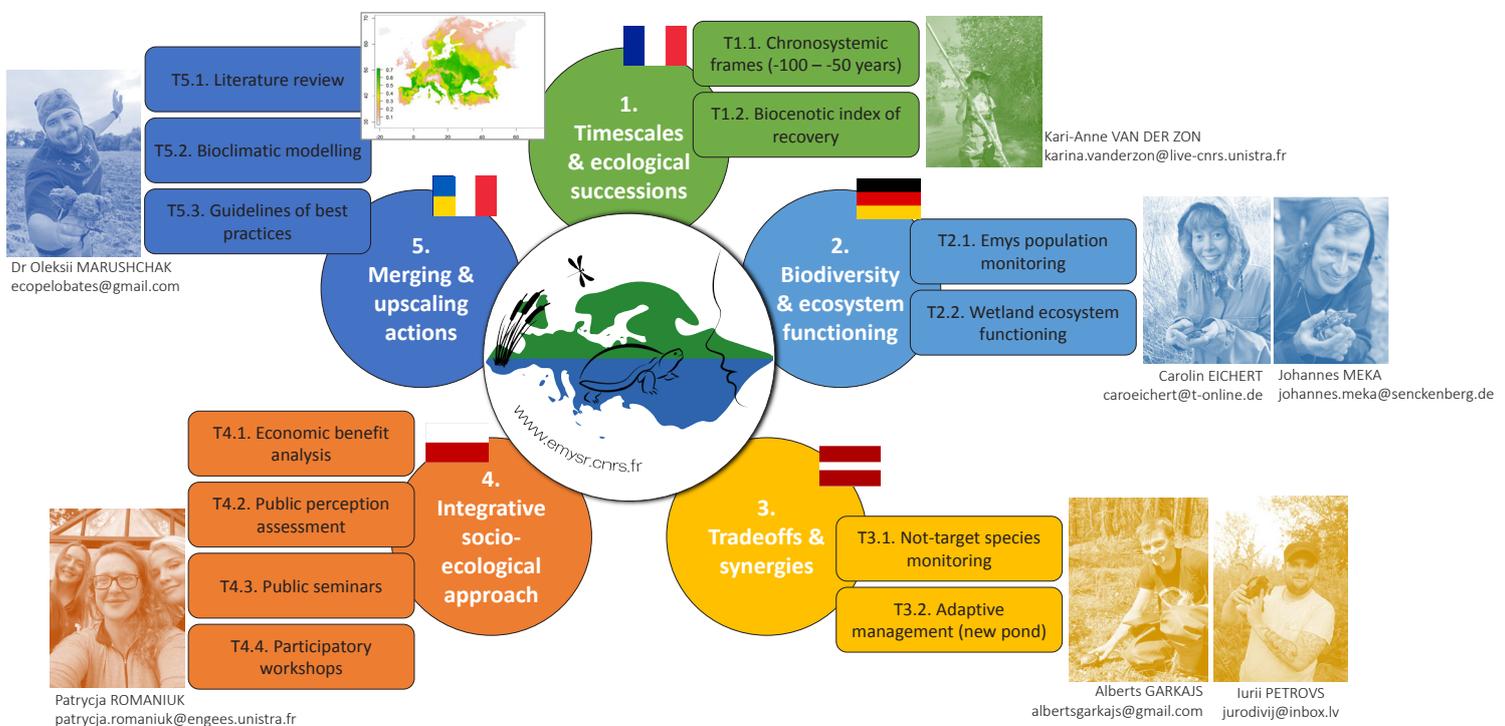


Figure 3. The Emys-R taskforce, two postdoc and seven internationally co-supervised PhD candidates, collaborate through five complementary work packages with support from partners throughout Europe.



Figure 4. Present geographical distribution of the European pond turtle and location of the three study cases in France, Germany and Latvia where so far 500, 200 and 100 individuals have been introduced in newly created and restored wetlands. © Jean-Yves Georges.

gathering researchers and stakeholders with complementary knowledge and expertise on past, present and future wetlands, biodiversity and management from France, Germany, Latvia, Poland, and Ukraine. One postdoc and six internationally co-supervised PhD candidates collaborating through five complementary work packages run their research based on:

a) Existing long-term databases from three study sites where wetland restoration and *Emys* reintroduction have been implemented and monitored in contrasted contexts in France, Germany and Latvia (Fig. 4);

b) Original field data and forecasting models created during the project;

c) Existing literature and support from partners throughout Europe, including similar conservation initiatives in Greece, Italia, Lithuania, Slovenia and Spain, the European Association of Zoos and Aquariums (EAZA) and the European society dedicated to ecological restoration (SER-chapter Europe).

Assessing the relevance of habitat restoration and species reintroduction

To reach this goal, namely to find out what are the most (cost-)effective, socially supported, wetland restoration methods suitable for the reintroduction of the European pond turtle and associated local wildlife throughout Europe, *Emys-R* will test three main hypotheses based on seminal theories in natural, social and humanity sciences.

Based on the general theory and concept of ecological restoration, PhD candidate Kari-Anne van der Zon (Fig. 5) is investigating whether the success of wetland restoration depends on the past ecological context and subsequent natural ecological successions that directly depends on the used management strategy. Using biocenotic indices based on macrophytes and macroinvertebrates community and population assessment, habitat mapping and environmental genomics, she aims to characterize natural ecological successions and classify the degree of recovery of the ponds. Such



Figure 5. Emys-R aims at monitoring ecosystem functioning of restored wetlands after Emys reintroduction. Here PhD candidate Kari-Anne van der Zon sets a multi-channel probe for measuring water quality. © TBD

metrics are also used for assessing the economic benefits of restoration.

Based on Darwin's and life history theories, PhD candidates Carolin Eichert and Johannes Meka are investigating whether the success of the reintroduction (i.e. population settlement and spread) is affected by the intrinsic adaptive capabilities of captive-bred individuals to survive and reproduce in the wild, and the actual degree of recovery of each release site. During intensive field

sessions (Fig. 6), the individual health of every captured *Emys* is monitored based on traditional biometry measurements, completed by an original health index based on gut microbiome characterized by eDNA metabarcoding. Regular recaptures of Emys through time also aim to characterize the population structure, dynamics and trends, and to identify whether individual traits (sex, age, size at release) and environmental conditions drive such trends.



Figure 6. Reproduction in the wild is a major – yet not sufficient – step for a successful reintroduction. Here, two wild-born *Emys* captured (trap in the background) on the Woerr study site, Lauterbourg, France. © Jean-Yves Georges.

Researchers will assess the functioning of the ecosystem after *Emys* reintroduction by reconstructing the trophic food web centred around the *Emys* using environmental genomics. Then, the actual behaviour and habitat use of free-ranging *Emys* is monitored by deploying ultra-miniaturized autonomous recorders on adults. Furthermore, a multi-scale, multi-species approach focusing on non-target species is implemented by three PhD candidates. The research will be conducted on host-parasite interactions in amphibians and reptiles (Iuri Petrovs) and eels (Alberts Garkajs). Finally, populations of threatened amphibians and invasive crayfish (Fig. 15) are monitored in the field where experimental ponds have been co-created by land managers and scientists for testing adaptive management. This approach aims to enhance their suitability for *Emys* and amphibians while preventing invasive crayfish to settle (Fig. 7-14).

Based on the recent call for a new philosophy of nature, PhD candidate

Patrycja Romaniuk aims to assess what kind of governance practices, and more specifically community-led stewardship, can promote public engagement and conservation awareness and drive a sustainable coexistence between people and wetlands. Based on qualitative methods, including semi-structured interviews, she evaluates people's perceptions and uses of natural and restored wetlands before and after *Emys* reintroductions (Fig. 6, 17-19). She will analyse the relationship between perception, motivation to act, and the actual behaviour of people in and for wetlands. Participatory public seminars and multi-stakeholder workshops have also been implemented to initiate deliberative reflections on the values of nature amongst countries and to develop an innovative blueprint of stakeholder engagement in a systemic dialogue and prompt action for the sake of sustainable management and conservation of wetlands.

Representing some people of the EMYS-R team



Figure 7. Jean-Yves Georges, project leader, IPHC, France.
© Patrycja Romaniuk



Figure 8. Kathrin Theissing, project manager, LOEWE-TBG, Germany. © Nicolas Busser



Figure 9. Johannes Meka, PhD candidate LOEWE-TBG and IPHC.
© Patrycja Romaniuk



Figure 10. Alberts Garkajs, Daugavpils University, Latvia.
© Kathrin Theissing.



Figure 11. Yuri Petrovs, Daugapils University, Latvia. © Nicolas Busser



Figure 12. Oksana Nekrasova & Oleksii Marushchak, Schmalhausen Institute of Zoology, NAS of Ukraine, Ukraine and IPH. © Volodymyr Liashenko



Figure 13. Caro Eichert, University of Trier, Germany.



Figure 14. Patrycja Romaniuk, Institute of Philosophy and Sociology, Polish Academy of Sciences, Warsaw, École Nationale du Génie de l'Eau et de l'Environnement de Strasbourg, Strasbourg, France.

Emys-R: a bridge to bring together people and nature

Emys-R aims to become a bridge between environmental knowledge, policy objectives and multi-stakeholder engagement. Our ultimate goal is to

disseminate a guide of best practices at local, regional, national and community levels for promoting the effectiveness and upscale conservation actions with similar current and forthcoming projects throughout Europe (Fig. 14).



Figure 15. Newly settled alien invasive species are major threats for wetlands and local biodiversity. Here calico crayfish *Faxonius immunis* (Hagen, 1870) (originated from North America) captured in Emys-targeting traps, Woerr study site, Lauterbourg, France. © Jean-Yves Georges.

Figure 16.

Reintroduction events are optimal opportunities for public education/awareness, for interviewing people about their perception of nature and conservation initiatives, and for recruiting participants to participatory public seminars and workshops.

Here PhD candidate Johannes Meka at a release event organised by NABU in Neuburg am Rhein, Germany. © Jean-Yves Georges.





Figure 17. Release of juvenile *E. orbicularis*. © Nicolas Busser



Figure 18. Theobald Charlotte Matthis in the field releasing *E. orbicularis*. © Iris Schmidt.

Finally, for taking into account large scale processes such as climate change, Dr. Oksana Nekrasova and Dr. Oleksii Marushchak (Fig. 12) are building bioclimatic models to assess distribution and abundance of all study species, native and exotic, throughout Europe over the next 50 to 100 years to identify the most suitable regions to implement such conservation initiatives. Part of such a long-term perspective, the study site laying at the French-German border, now referred as Neu Woerr, has recently been labelled by the French National Research Center (CNRS Ecologie Environnement) as Life Long Term Observatory, led by Jean-Yves Georges.

Undoubtedly, herpetoculture plays an important role in terms of reintroduction of *E. orbicularis* as well as restoring and supporting wild populations. This was proven many times, especially in Latvia, where captive breeding projects organised by Dr Mihails Pupins and Dr Aija Pupina and their teams made noticeable progress in expanding the natural range of the species in the most northern edge of its distribution. Similar projects are of great perspective and have been implemented throughout Europe in recent years. EMYS-R makes all possible efforts to help European pond turtles to survive in the modern world (Fig. 16-19).



Figure 19. Information boards highlighting conservation initiatives in the release sites are cost-efficient tools for long-term public awareness. Here in Silene study site, Latvia. © Jean-Yves Georges

You can follow Emys-R updates, publications and events on <https://emysr.cnrs.fr>, **Project Emys-R | LinkedIn** and **EmysR ecoevo.social**

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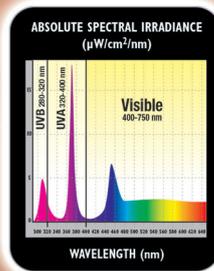
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