Promoting Important Herpetofauna Areas (IHAs) in Europe

What are they and where could they be?

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Reptile and Amphibian Conservation Europe

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Today

- Why is it important to define IHA's?

- Step 1: **Which information is available?** Case study using information present in the Natura2000- Emerald sites network
- Step 2: Defining a **road map to move forward** with identification of IHAs
- Step 3: An approach to speed up attribution of species to protected areas

- Next steps: **what can you do?**
- General conclusions

Why is it important to define IHA's?

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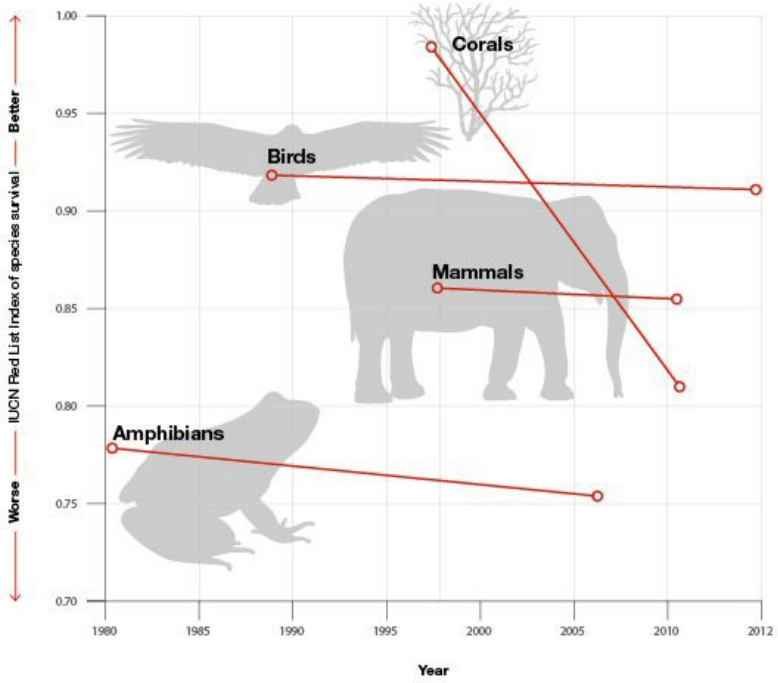
Global Living Planet Index



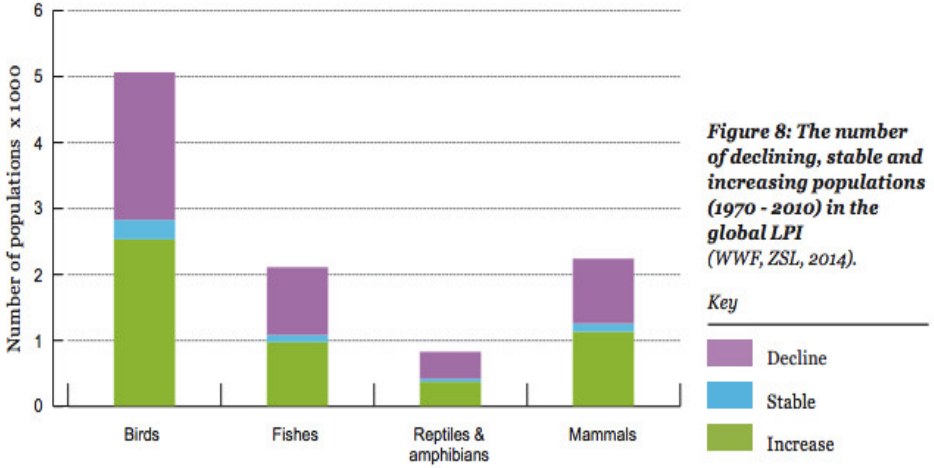


Figure 8: The number of declining, stable and increasing populations (1970 - 2010) in the global LPI *(WWF, ZSL, 2014).*

Article

Ongoing declines for the world's amphibians in the face of emerging threats

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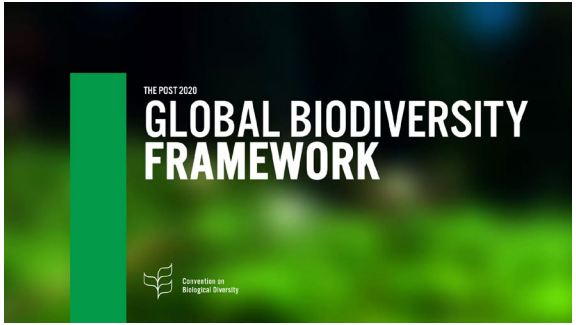
Systematic assessments of species extinction risk at regular intervals are necessary for informing conservation action[1,2]. Ongoing developments in taxonomy, threatening processes and research further underscore the need for reassessment[3,4]. Here we report the findings of the second Global Amphibian Assessment, evaluating 8,011 species for the International Union for Conservation of Nature Red List of Threatened Species. We find that amphibians are the most threatened vertebrate class (40.7% of species are globally threatened). The updated Red List Index shows that the status of amphibians is deteriorating globally, particularly for salamanders and in the Neotropics. Disease and habitat loss drove 91% of status deteriorations

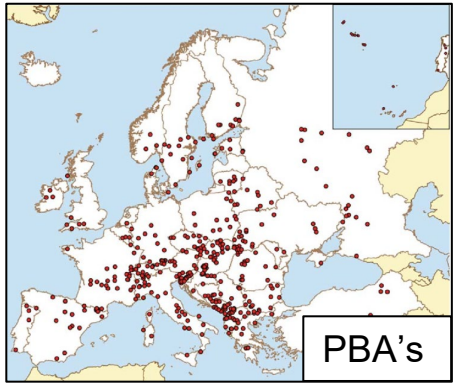
Identifying IHA's: which aims?

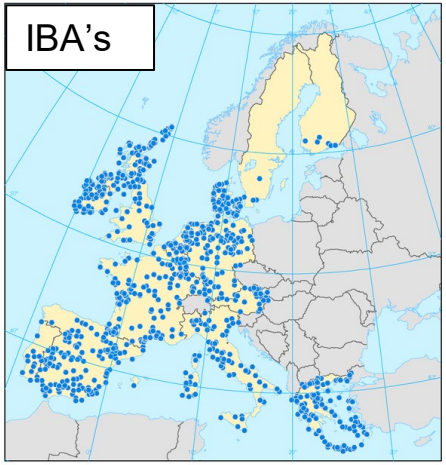
- **Identify areas of significance for the conservation of reptiles and/or amphibians and the habitats upon which they rely.**
- Provide a transparent and reproducible approach to identifying IHAs.
- Raise awareness of reptile and amphibian species and their threats.
- The EU 2030 Biodiversity Strategy and post2020 Global Biodiversity Framework aim at protecting a minimum of 30% of the (EU's) land areas.



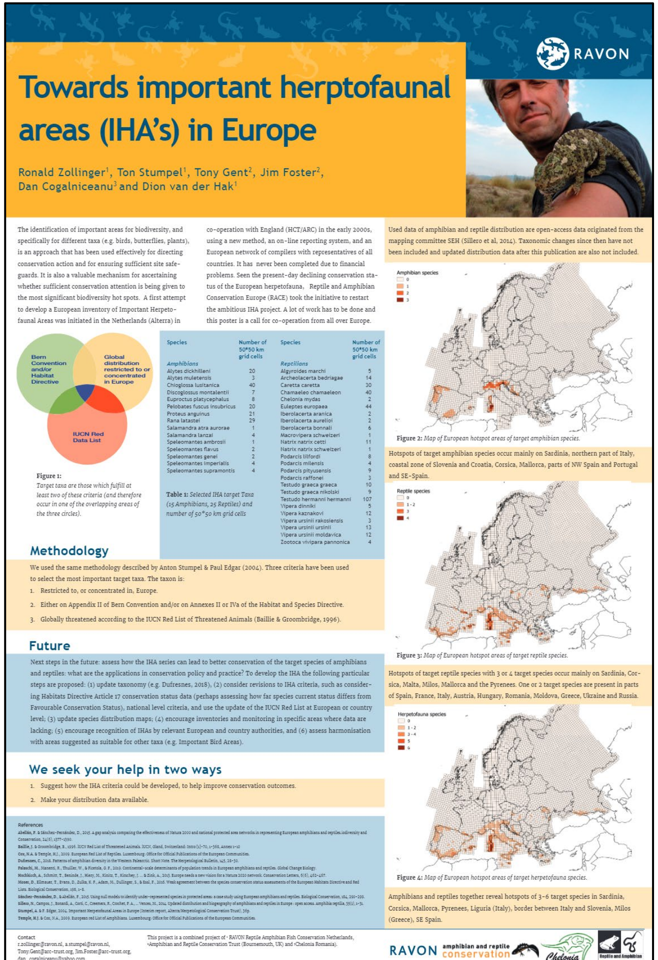
Identifying IHA's: necessities

- IHA's may be selected from **existing protected area networks**. Also, **new areas** may need to be added.
- Defining IHA's relies on **good distribution knowledge** on reptiles and amphibians throughout Europe.
- Similar 'Important Areas' exist for birds (IBA's, 1981 onwards) and Butterflies (PBA's, since 2006).





Identifying IHA's: first steps



- A start to define IHA's was made by Anton Stumpel (Alterra) and Keith Corbett (Herpetological Conservation Trust) in 2003.

Poster from the 20th SEH – European Congress of Herpetology in Milan in September 2019: '*Towards Important Herpetofaunal Areas (IHA's) in Europe*'

- 2 out of 3 criteria
- 15 amphibian and 25 reptile species
- Selection leads to merely Mediterranean areas

Identifying IHA's: current challenges

- The most recent European herpetofauna atlas (2014) uses a coarse 50x50km grid.
- Higher resolution distribution data is fragmented in national atlases and citizen science databases.
- Changes in taxonomy and nomenclature of European herpetofauna were frequent during the last 20 years.

- **How to proceed with identification of IHA's?**

Step 1: Information availability

A case study using metadata and coverage of the Natura2000 and Emerald site network

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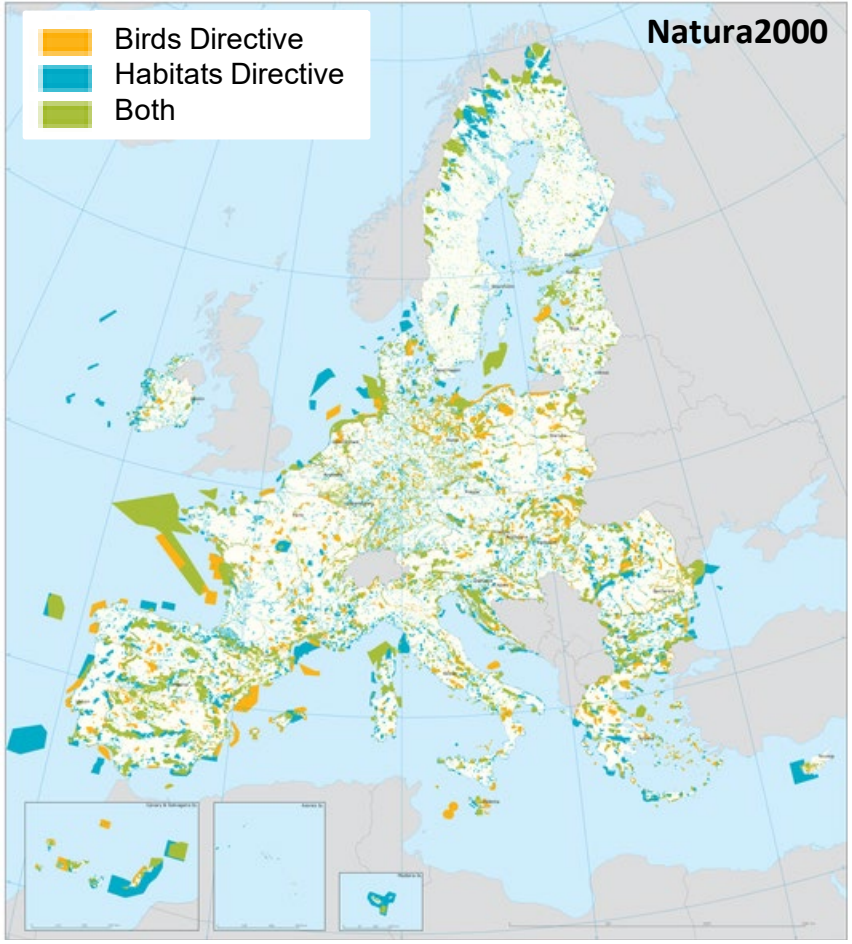
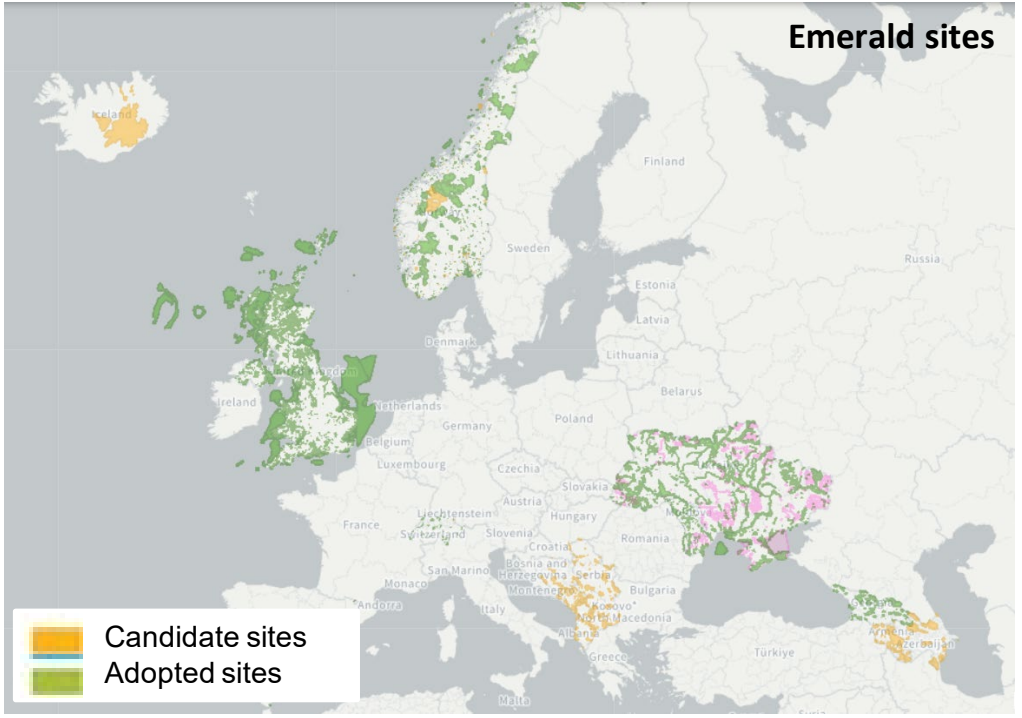
Natura2000 & Emerald Sites





Maps courtesy of the Council of Europe (http://emerald.eea.europa.eu/) and the European Environment Agency (https://www.eea.europa.eu/data-and-maps/figures/natura-2000-network-terrestrail-and)

Case study: goals

- Focus on three main questions:

1. **Which species are currently listed**, and **to what extent are these attributed to sites**? For example, not all countries attribute Annex 2 species to sites.
2. Countries can choose to withhold information, for instance out of conservation concern - **which metadata is available?**
3. Which are the **main challenges to overcome**?

Case study: approach

- Approach:

1. Obtain and clean Natura2000 and Emerald metadata, 2023 versions.
2. Process changes in taxonomy and nomenclature using the most recent European herpetofauna species list (2020).
3. Compare Natura2000 and Emerald coverage with most recent European reptile and amphibian atlas (2014) to assess information availability.

Case study: why clean up taxonomy?

- Species and subspecies get attributed to Natura2000 and Emerald sites throughout the years. These entries **do not get updated** once taxonomy or nomenclature change.

- Europe hosts **301** reptile and amphibian species*.
  185 of these are N2000-listed (Emerald site reference list is under construction).
  477 (!) reptile and amphibian species and subspecies names are present in N2000 and Emerald site metadata.

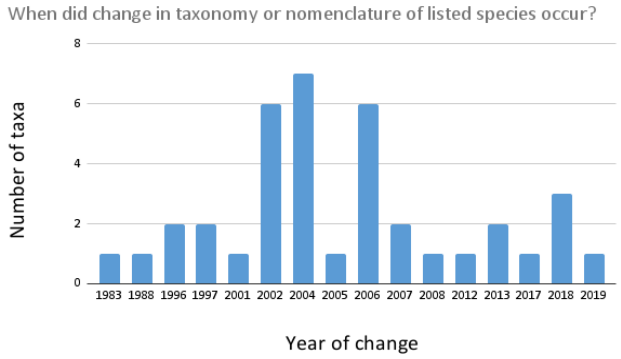
- Why? Outdated taxonomy (and typos).

**Speybroeck et al. 2020 Amph. Rep. http://dx.doi.org/10.1163/15685381-bja10010*

Case study: why clean up taxonomy?

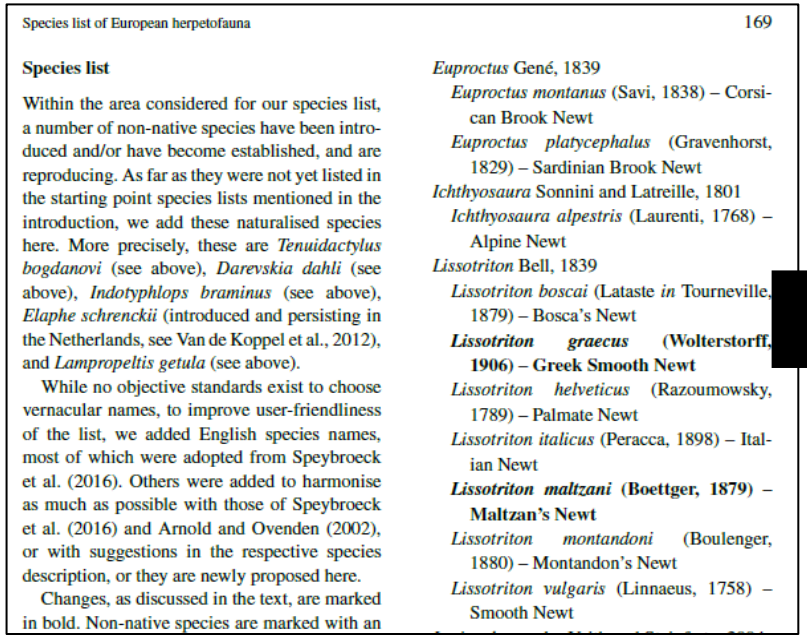
- Taxonomy of European reptiles and amphibians is **currently stabilizing**. Changes during the past 20 years reflected expectable increases in knowledge. These changes may initially cause confusion, but are **necessary to adequately protect biodiversity**.

- **49%** of scientific names in the June 2023 Emerald & N2000 metadata are either outdated when compared to the recent EU herp list, or contain multiple species.



Case study: why clean up taxonomy?

- To prepare for analyses, we cleaned up N2000 and Emerald metadata using the 2020 EU herp list from the Societas Europaea Herpetologica (SEH).



Species list of European herpetofauna 169

Species list

Within the area considered for our species list, a number of non-native species have been introduced and/or have become established, and are reproducing. As far as they were not yet listed in the starting point species lists mentioned in the introduction, we add these naturalised species here. More precisely, these are *Tenuidactylus bogdanovi* (see above), *Darevskia dahli* (see above), *Indotyphlops braminus* (see above), *Elaphe schrenckii* (introduced and persisting in the Netherlands, see Van de Koppel et al., 2012), and *Lampropeltis getula* (see above).

While no objective standards exist to choose vernacular names, to improve user-friendliness of the list, we added English species names, most of which were adopted from Speybroeck et al. (2016). Others were added to harmonise as much as possible with those of Speybroeck et al. (2016) and Arnold and Ovenden (2002), or with suggestions in the respective species description, or they are newly proposed here.

Changes, as discussed in the text, are marked in bold. Non-native species are marked with an

Euproctus Gené, 1839
- *Euproctus montanus* (Savi, 1838) – Corsican Brook Newt
- *Euproctus platycephalus* (Gravenhorst, 1829) – Sardinian Brook Newt

Ichthyosaura Sonnini and Latreille, 1801
- *Ichthyosaura alpestris* (Laurenti, 1768) – Alpine Newt

Lissotriton Bell, 1839
- *Lissotriton boscai* (Lataste *in* Tourneville, 1879) – Bosca's Newt
- ***Lissotriton graecus*** **(Wolterstorff, 1906) – Greek Smooth Newt**
- *Lissotriton helveticus* (Razoumowsky, 1789) – Palmate Newt
- *Lissotriton italicus* (Peracca, 1898) – Italian Newt
- ***Lissotriton maltzani*** **(Boettger, 1879) – Maltzan's Newt**
- *Lissotriton montandoni* (Boulenger, 1880) – Montandon's Newt
- *Lissotriton vulgaris* (Linnaeus, 1758) – Smooth Newt

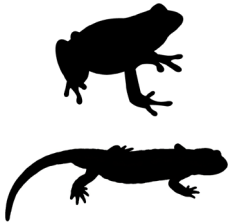
	Dataset	Taxon name in dataset	OK or ISSUE	ISSUE detail	Comment
2	Emerald other species	*Bufo bufo*	OK		
3	Emerald other species	*Coronella austriaca*	OK		
4	Emerald other species	*Dolichophis caspius*	OK		
5	Emerald other species	*Elaphe dione*	OK		
6	Emerald other species	*Elaphe longissima*	ISSUE	Name change	Change name to *Zamenis longissimus.*
7	Emerald other species	*Iberolacerta aurelioi*	OK		
8	Emerald other species	*Lacerta viridis*	OK		
9	Emerald other species	*Malpolon monpessulanus*	ISSUE	Name change	Only record is from Georgia; change name to *Malpolon insignitus.*
10	Emerald other species	*Mediodactylus kotschyi*	ISSUE	Name change	Only record is from Ukraine; change name to *Mediodactylus danilewskii*
11	Emerald other species	*Mediodactylus kotschyi danilewskii*	ISSUE	Name change	Only record is from Ukraine; change name to *Mediodactylus danilewskii*
12	Emerald other species	*Ophisaurus apodus*	OK		
13	Emerald other species	*Podarcis muralis*	OK		
14	Emerald other species	*Podarcis taurica*	ISSUE	Name change	Change species name to *Podarcis tauricus*
15	Emerald other species	*Rana dalmatina*	OK		

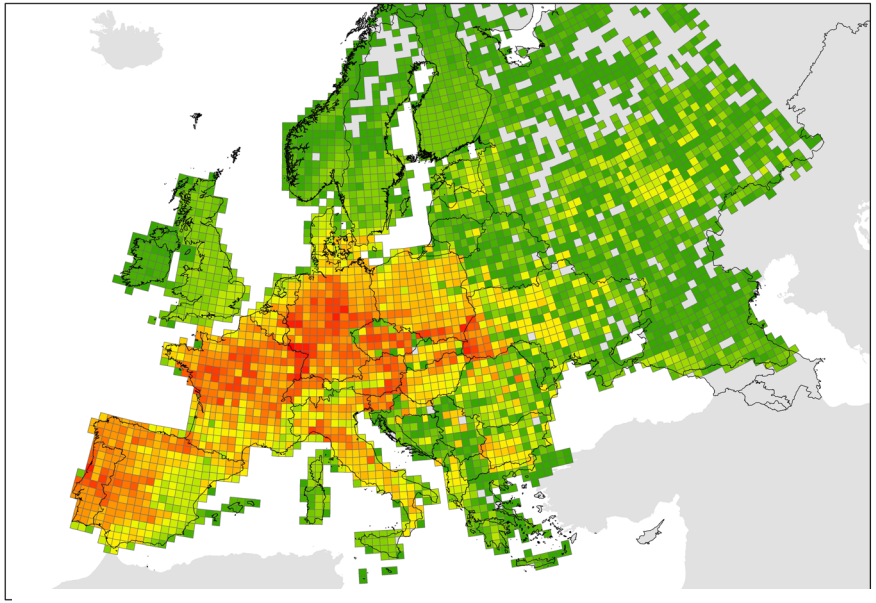
Case study: results

- Approximately **229** reptile and amphibian species and subspecies are listed in Natura2000 and Emerald sites (not all metadata issues could be resolved).
- Comparing with the most recent European amphibian & reptile list, appr. **80** % of species are listed.
- Annex II species attribution to sites shows little consistency between member states, leading to gaps on the map.
- Protected sites focused on non-herp species or habitats may contain reptiles or amphibians, but these are often not listed for the site.

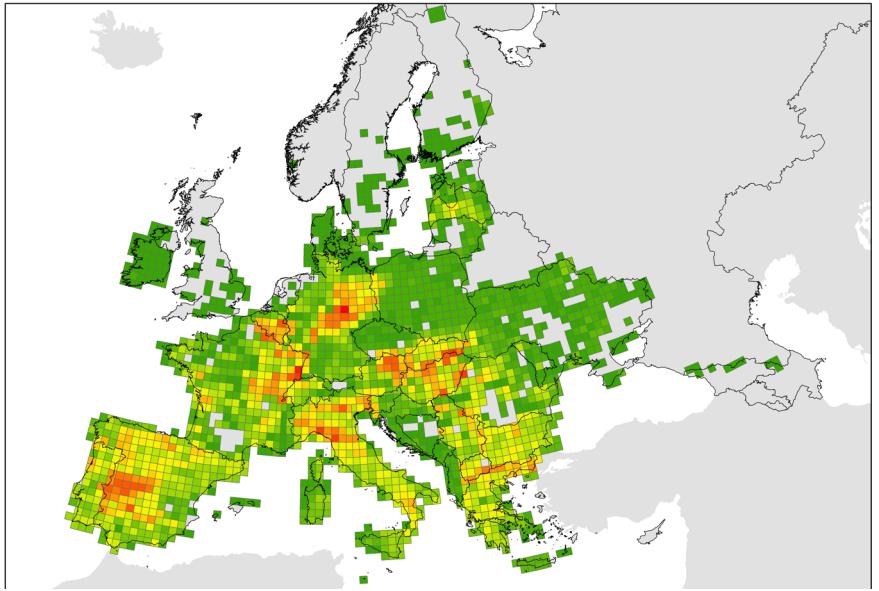
Case study: results amphibians

- Results displayed on a 50x50km grid.
- Warmer colors mean more species (ranging from 1 to 18).





European atlas data (2014); 64 listed species (complexes)



N2000 & Emerald metadata (2023); 81 listed (sub)species

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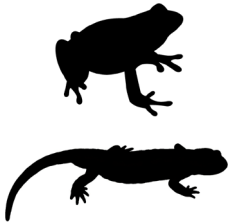

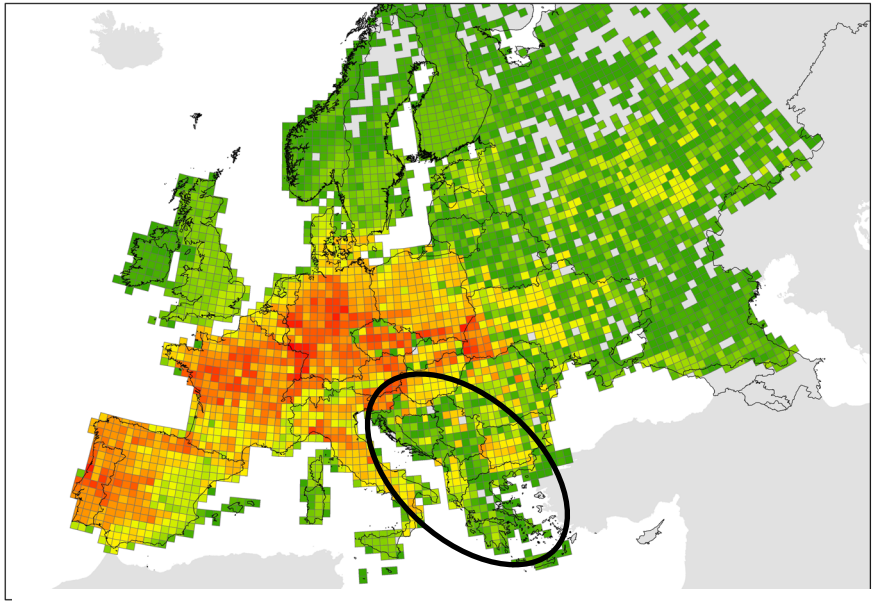

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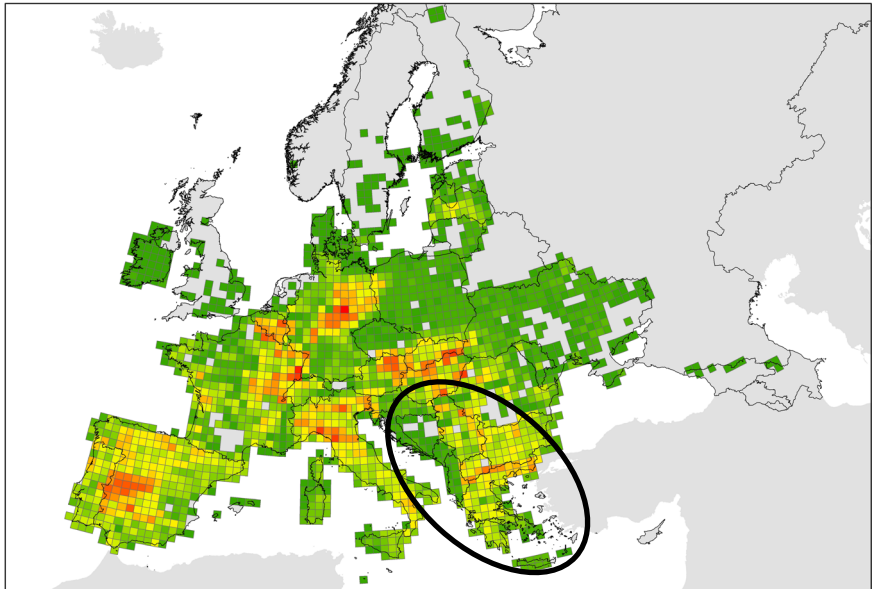

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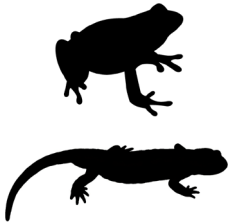

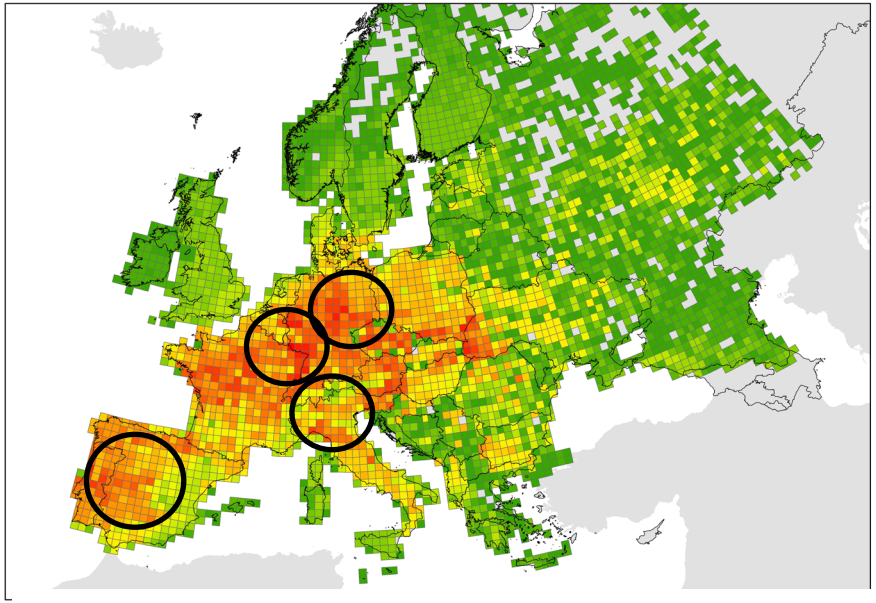

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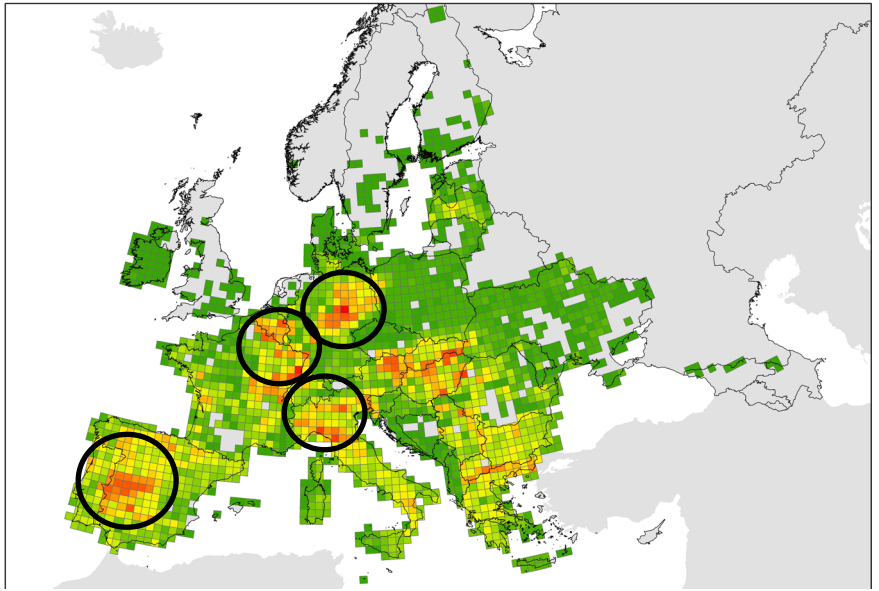
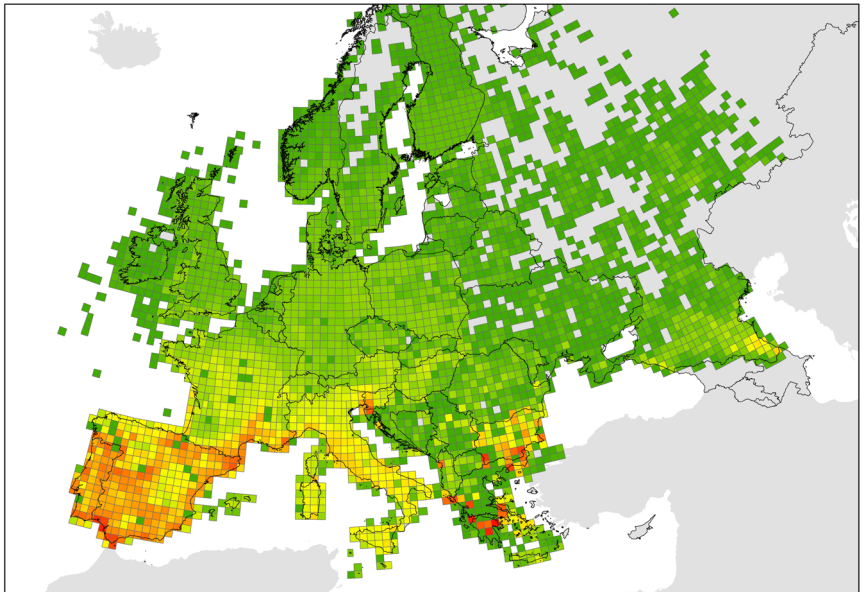


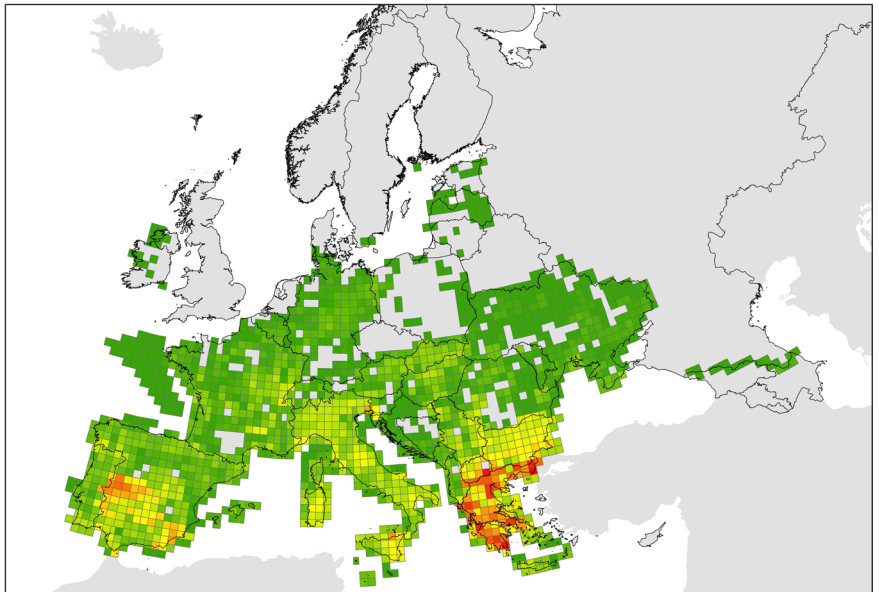
N2000 & Emerald metadata (2023); 81 listed (sub)species

Case study: results reptiles

- Results displayed on a 50x50km grid.
- Warmer colors mean more species (ranging from 1 to 33).



European atlas data (2014); 110 listed species (complexes)



N2000 & Emerald metadata (2023); 119 listed (sub)species

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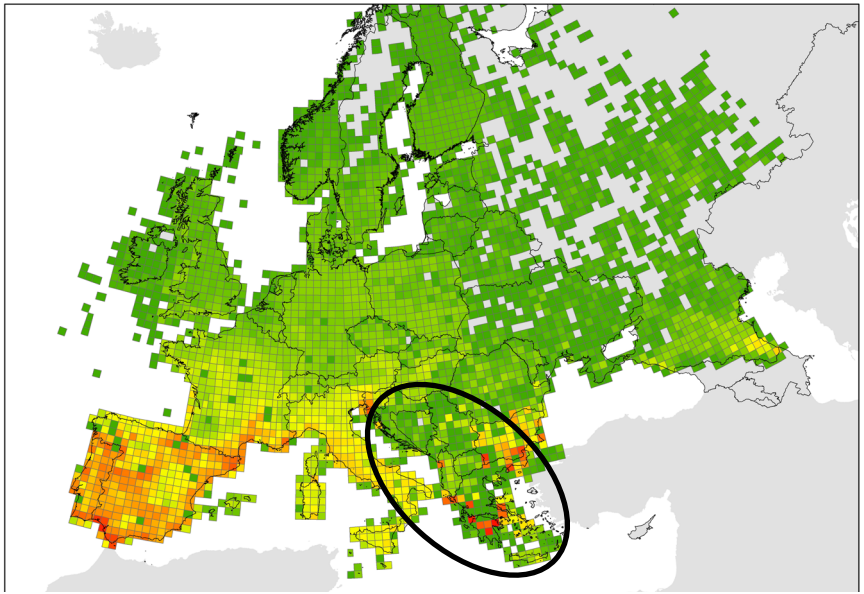

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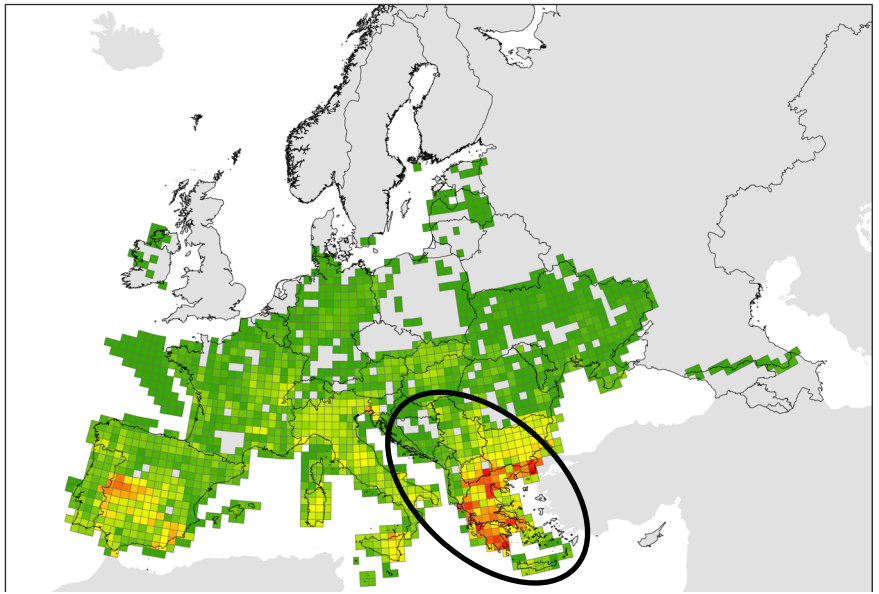

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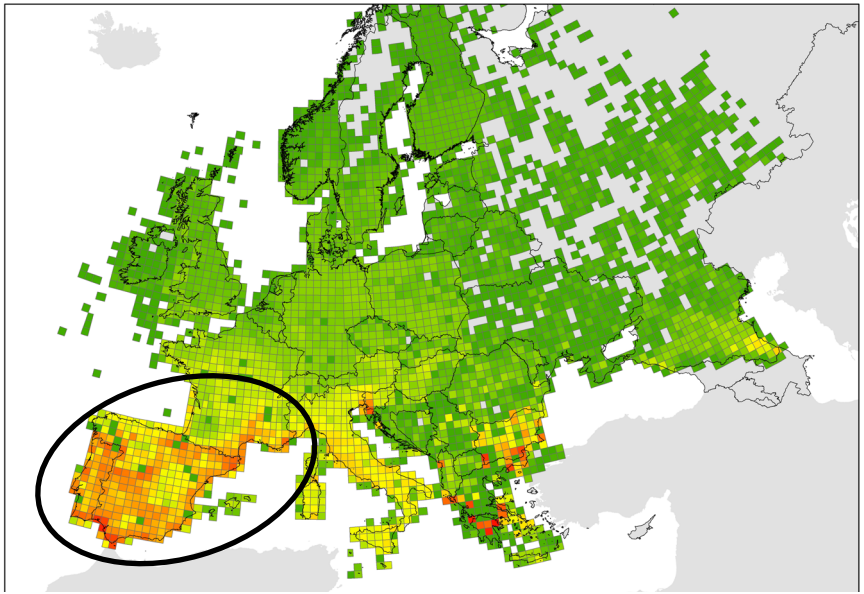

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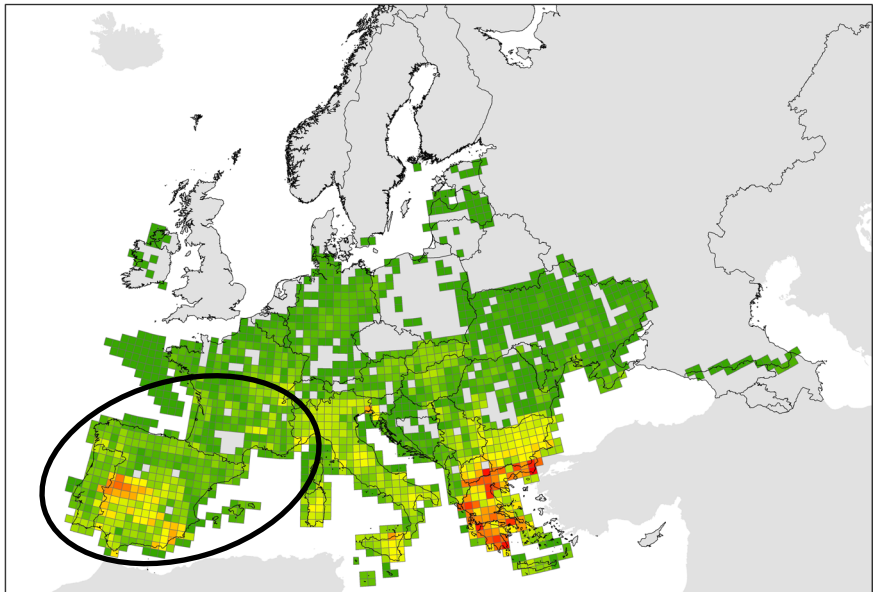

N2000 & Emerald metadata (2023); 119 listed (sub)species

Case study: conclusions

- When filtered and cleaned, N2000 and Emerald site herpetofauna occurrences form a **basis for IHA identification**.

- Yet, Annex II amphibian and reptiles are not consistently attributed to sites. Occurrence of non-listed species is not recorded in the N2000 and Emerald site metadata. **Gaps on the map remain**.

- Current European herpetofauna atlasdata is at 50x50km too coarse to be a solution. A new 10x10km atlas is in the making, but may also be too coarse to link species presence to (small) protected sites.

- **How to proceed?**

Step 2: defining a road map to move forward with identification of IHAs

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Defining a road map

We propose the following lines of action:

1. **Use Natura 2000 and Emerald sites as a basis**, as was done for Important Bird Areas and Prime Butterfly Areas.
2. **Thoroughly revise metadata** of established Natura 2000 and Emerald sites.
3. **Adopt the Key Biodiversity Areas (KBA)** approach to identify initial IHAs. Take a national-level approach.
4. Use **other distribution data sources** (e.g. citizen scientist observations) to speed-up attribution of species to sites

The KBA approach?

- In the previous section, we presented a case study focused on available Natura2000 and Emerald site information. Now, we continue with a broad overview of potential approaches and national-level efforts to define IHA's.

- The **Key Biodiversity Areas (KBA) approach** forms a red thread.

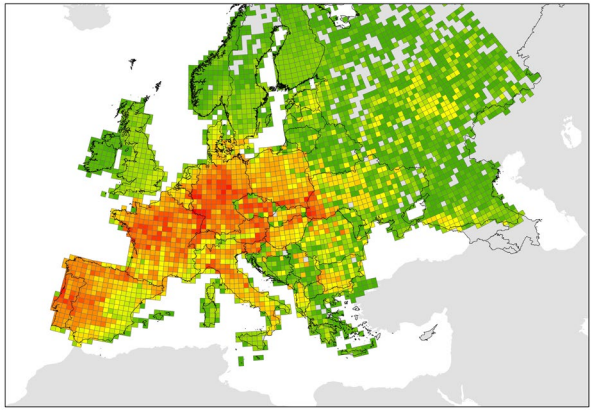
KBA
KEY BIODIVERSITY AREAS

The KBA Approach

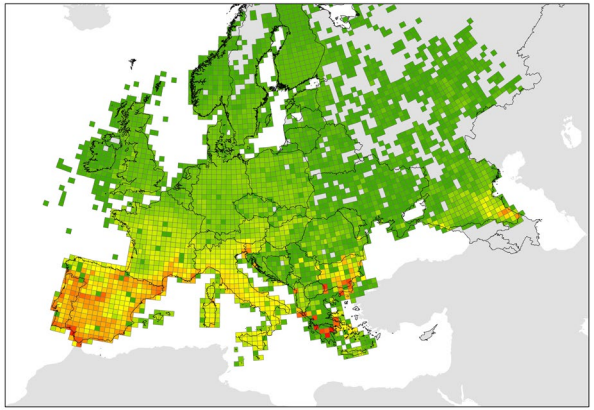
- The Key Biodiversity Areas (KBA) approach aims to identify, map and promote the conservation of the most important places for nature across the globe.
- KBA's are selected using various criteria, for instance on species threat status, assemblages of species and irreplaceability.
- **Identifying and proposing KBAs is aimed to be a nationally driven process**. Anyone with appropriate scientific data may propose a site, and consultation with stakeholders at the national level (both non-governmental and governmental organizations) is an essential part of the process.
- KBAs extend the Important Bird Area (IBA) concept, and lie at the basis of Prime Butterfly Areas.

Criteria matter

- **Criteria matter**; reptile endemism and richness in southern Europe are high, amphibian endemism is high in southern Europe but richness is highest in Central Europe.



Amphibian richness, 50x50km grid

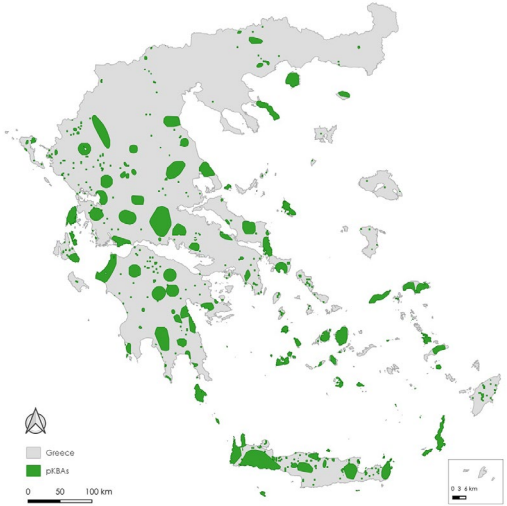


Reptile richness, 50x50km grid

Richness maps based on Societas Europaea Herpetologica (SEH) atlas data, including all European reptile and amphibian species.

KBA approach example: Greece

- Example; Greece. (bases on PhD thesis Konstantina Spiliopoulou)
- Greece has become the first European country to recognize KBA's in its laws and policies.
- In part based on reptile- and amphibian occurrence data.



KBA approach example: UK

- ARC Trust is developing an approach to define IHA's for the UK based on the KBA principles.

- A high geographic resolution of data is available, permitting ARC Trust to identify sites at 10 x 10 km scale (hectad).

- They used more 'flexible' criteria to a certain degree:

- A1 – Grids containing any Critically Endangered species at the national level
- A2 – Grids containing any threatened (EN, VU) species at the national level
- B1 – Grids containing in the top 10% of species diversity for each country (England, Scotland, Wales). For example, for England, this was any grids with 8 or more reptile and amphibian species recorded within it.

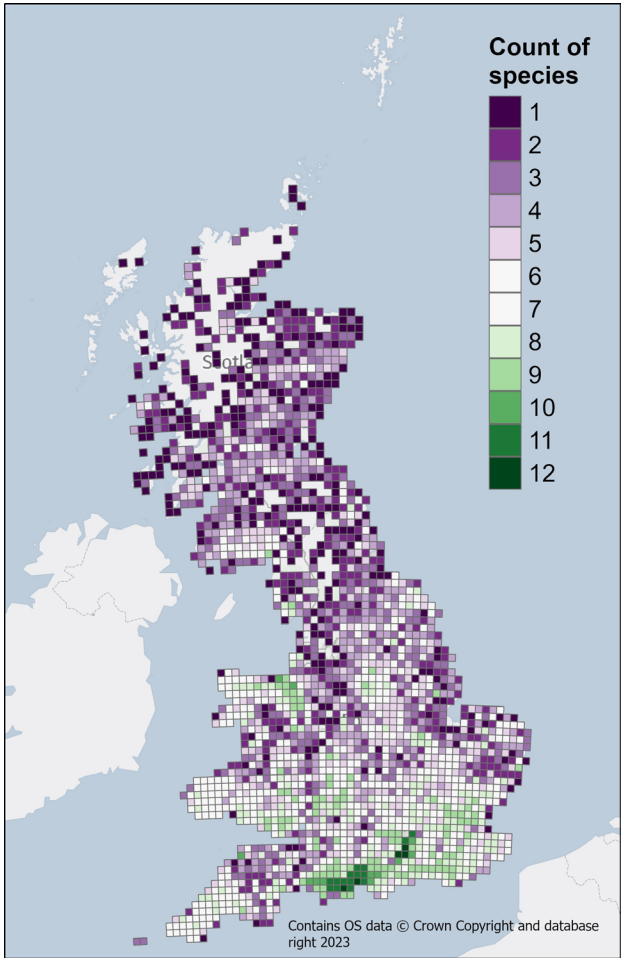
KBA approach example: UK

	IUCN red list											
	Global[a]	European[b]	GB[c]	England[c]	Wales[c]	Scotland[c]	Bern	Hab. Dir. (Ann. II or IVa)	Hab. Regs. 2010	Wildlife and Countryside Act (1981)	The Wildlife (NI) Order 1985
Bufo bufo	LC	LC	NT	NT	LC	NT	A3			Sch5: 9.5a	
Epidalea calamita	LC	LC	EN	EN	EN	EN	A2	A4	Sch2	Sch5: 9.4b, 9.5a, 9.4c	
Pelophylax lessonae	LC	LC	CR	CR	NA	NA	A3	A4	Sch2	Sch5: 9.4b, 9.4c	
Rana temporaria	LC	LC	LC	LC	LC	LC	A3	A5		Sch5: 9.5a	
Lissotriton helveticus	LC	LC	LC	LC	LC	LC	A3			Sch5: 9.5a	
Lissotriton vulgaris	LC	LC	LC	LC	LC	LC	A3			Sch5: 9.5a	Sch5
Triturus cristatus	LC	LC	LC	LC	LC	LC	A2	A2*, A4	Sch2	Sch5: 9.4b, 9.5a, 9.4c	
Anguis fragilis	LC	LC	LC	LC	LC	LC	A3			Sch5: 9.1, 9.5a	
Lacerta agilis	LC	LC	EN	EN	VU	NA	A2	A4	Sch2	Sch5: 9.4b, 9.5a, 9.4c	
Zootoca vivipara	LC	LC	LC	LC	LC	LC	A3			Sch5: 9.1, 9.5a	Sch5
Coronella austriaca	LC	LC	EN	EN	NA	NA	A2	A4	Sch2	Sch5: 9.4b, 9.5a, 9.4c	
Natrix helvetica	LC	LC	LC	LC	LC	NA	A3			Sch5: 9.1, 9.5a	
Vipera berus	LC	LC	NT	VU	NT	NT	A3			Sch5: 9.1, 9.5a	

Which species should trigger criteria?

Foster, J. et al. (2021). IUCN Red List assessment of amphibians and reptiles at Great Britain and country scale. Report to Natural England. ARC report. ARC, Bournemouth.

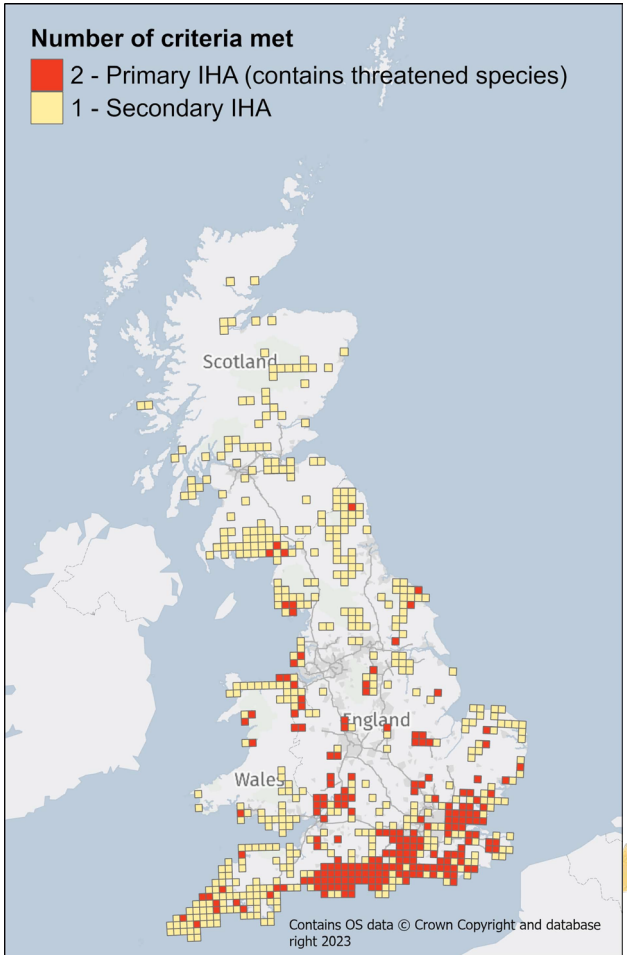
Preliminary selection of IHAs in the UK



Left: number of species per 10 x 10km grid

Right: Primary and secundary IHAs after using the selection criteria

Copyright maps, Rob Ward (ARC Trust)



Step 3: speed up attribution of species to the protected area network

How citizen science data can help

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Step 3: speed up attribution of species

- In the next slides, we provide an example of how citizen science observations can be used to **rapidly attribute more amphibian and reptile species to Natura2000 and Emerald sites** for subsequent IHA identification.
- **Inaturalist.org** alone hosts >500.000 European herp records, mostly from citizen scientists; **observation.org** hosts a similar high number.
- Geographical resolution of observations is often very high.
- Many citizen science observations are available without license or for scientific research.

Observation.org iNaturalist

Step 3: speed up attribution of species

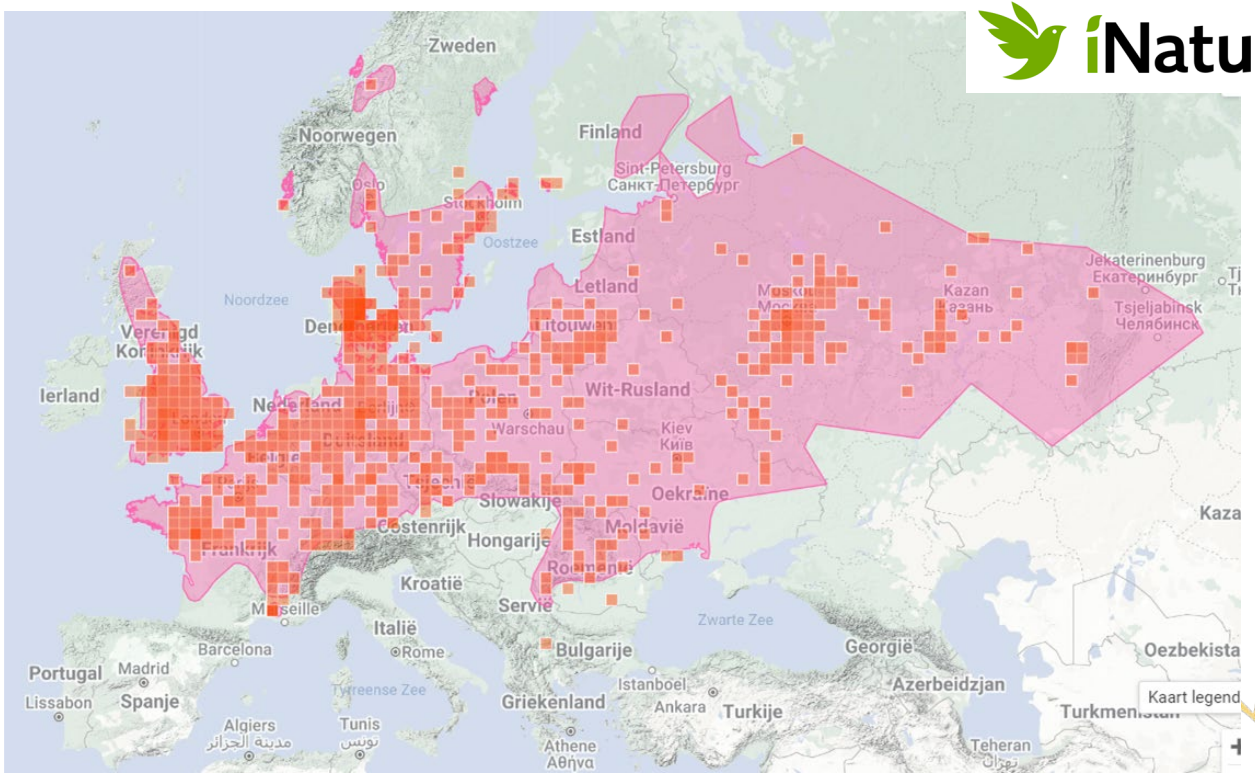
- Example: Great Crested Newt *Triturus cristatus* (H1166).
- Annex II & IV Habitat Directive.
- **June 2023 metadata covers distribution well**. Listed as present in **851** Natura2000 and Emerald sites.

Step 3: speed up attribution of species

- We downloaded the publicly-available, validated observations of Great Crested Newts.
- The opportunistic observations were matched to the Natura2000-Emerald Site protected area network.
- We identified sites for which Great Crested Newt was not yet listed.

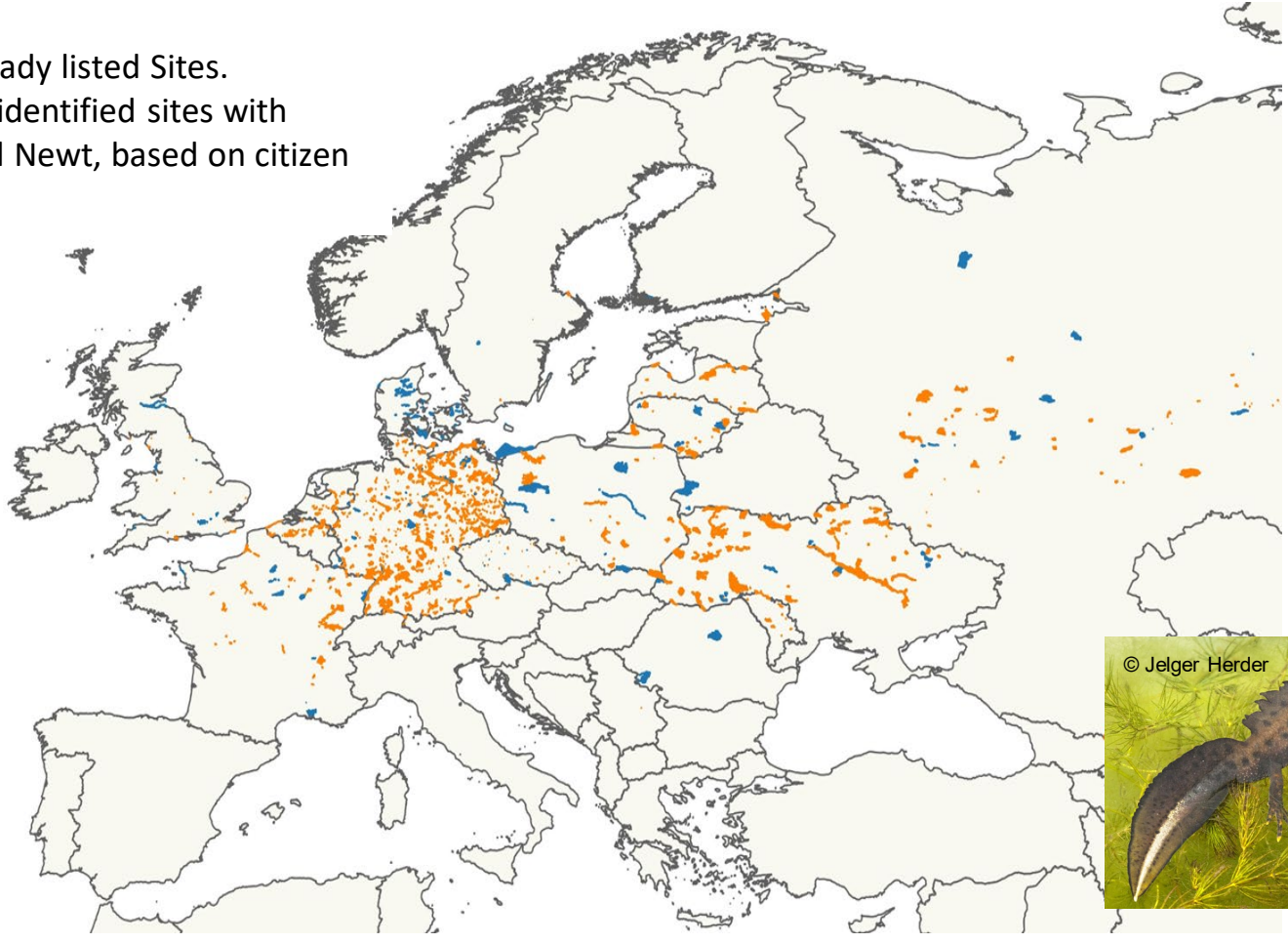
Step 3: speed up attribution of species

- Approximately 2600 validated observations on Inaturalist.org;



Step 3: speed up attribution of species

Orange = already listed Sites.
Blue = newly identified sites with Great Crested Newt, based on citizen science data.



Step 3: speed up attribution of species

- Great Crested Newt is currently listed for **851 Natura2000 and Emerald sites**.
- By using a snapshot of opportunistic, yet validated citizen science data from a single repository, we identified occurrence in **146 new sites** across the network.
- This is a **17%** increase.
- Citizen scientist observations are highly promising to **rapidly attribute more amphibian and reptile species to Natura2000 and Emerald sites** for subsequent IHA identification.

Next steps: what can you do?

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Next steps: what can you do?

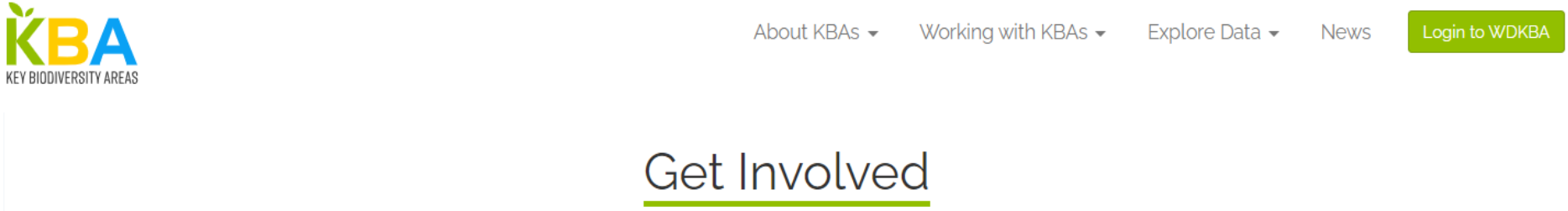
- We propose two parallel lines of action;

1. **Local action**: defining IHA's at national level, using (expert) knowledge on local distributions.

2. **European action**: selecting IHA's at European level, including species distribution modelling using atlas data aimed at filling gaps in maps.

Next steps: what can you do?

- Adapt criteria to the national situation (example UK).
- Build on the existing protected area network.
- Overviews and help regarding aspects such as criteria, collaborations, and funding are available at https://www.keybiodiversityareas.org/about-kbas/get-involved.



Recap and conclusions

- N2000 and Emerald site herpetofauna occurrences form a **basis for IHA identification,** but **gaps on the map remain**.
- We propose to **thoroughly revise Natura 2000 and Emerald metadata (herps)**, and to **adopt the Key Biodiversity Areas (KBA)** approach to identify initial IHAs.
- IHA identification should take place at national level, and weighed/compiled at European level.
- **Other sources of distribution data**, such as citizen scientist observations, should be used to speed-up attribution/detection of species to protected area network.
- In parallel, a Species Distribution Modelling approach can be used to assess potential importance of ‘blank spaces’ on the map. **SDMs can guide iterative improvement of the IHA network**.

Thank you for your attention!

Questions?

We thank Bruno Combal, Marc Hory, Marc Roekaerts, Frank Vassen, and Nick Warmelink, who facilitated our analyses.

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