Atlas of European Mammals, 2nd Edition

Meeting of Delivery Group
Prague, CZ, 20-22 April 2018

Present
See Appendix 1

Meeting programme
See Appendix 2

20th April
A meeting of the Steering Group was held. This will be reported separately.

Afterwards, during a welcome party, delegates were welcomed to the meeting by Tony Mitchell-Jones. Posters were presented on the EMMA2 project (the Steering Group), Bats of Ukraine: GIS, fauna, distribution (Lena Godlevska) and "SmartBirds" record mammals in Bulgaria. A mobile application and website for collecting and recording wildlife (Nedyalkov N. & Popgeorgiev G).

21st April
1. Tony Mitchell-Jones welcomed delegates to the meeting and thanked the sponsors of the meeting, the Netherlands Biodiversity Information Facility, for their support. He also thanked the Habitat Foundation, the Dutch Mammal Society and the Nature Conservation Agency of Luxembourg, who contributed to the organisation of the meeting, and Vladimir Vohralík of Charles University, who managed the local facilities and organisation.

   He then gave a brief history of the EMMA (**E**uropean **M**ammals on **MA**ps) project and the ambition for the second edition. The proposal would significantly increase the area covered by the atlas, extending it to cover the whole of geographic Europe.

	First edition	**2nd edition**
Area covered	6.7 million km^2	11.59 million km^2
Grid cells (50 x 50km)	2670	4676
Species	194	264

   Following the first atlas, the same approach to data collection would be used, with coordinators appointed for each country. He reported that the network of coordinators was now complete, though not all could be present at the meeting.

   The objectives for the meeting were to:
   - Report on progress so far

- Clarify the data requirements
- Propose ideas for the collection and management of biodiversity data
- Share experiences and consider new ideas
- Identify gaps in guidance, funding, personnel or other resources

2. Friederike Spitzenberger presented the draft species list for the project. This had been developed by the taxonomic group for the EMMA project. She explained that the expansion of the species list from 194 to 264 species was a consequence not only of the considerable expansion of the area covered but also because of significant changes in taxonomy. The latter was largely the consequence of the widespread use of genetic methods, which have brought huge changes to taxonomic methods. She pointed out that these changes are still continuing and that further changes can be expected during the lifetime of the project. Any species list is thus subject to change.

   In preparing the species list the group applied a pragmatic approach and treated as species those taxa that were treated as such in reviewed studies, unless subsequent reviewed studies have shown this to be erroneous. This means that the published name and rank of a taxon is maintained unless a more profound knowledge of the facts has been published in an adequate taxonomic study. Our current species list does not make arbitrary changes in the names and the rank of a described taxon.

   Coordinators are advised to check the website from time to time for updates to the species list.

   Tony Mitchell-Jones explained the boundaries of the EMMA2 area. In the east, the boundary follows closely that used in the *World Geographical Scheme for Recording Plant Distributions*. Administrative boundaries are followed, where possible and the boundary follows the Kuma-Maynich line, thus excluding the Caucasus. Although not included in definitions of Europe, EMMA2 includes the Macaronesian islands, to maintain continuity with the first atlas.

3. Laurent Schley chaired a session where national coordinators made a brief oral presentation on the current data-collection situation in their country and progress to date. Delegates (and some NCs who were not able to attend the meeting) also submitted brief written reports which are included in Appendix 3. There was also a report from the large carnivore coordinator – Alexandra Sallay. Laurent commented that an impressive amount of work towards the atlas had already been started and that progress remained in step with the timetable. The European atlas has clearly stimulated the setting-up of new national atlas or database projects in several countries and encouraged new work in others. The national reports in the Appendix provide a valuable snapshot of the current state of mammal recording in each country.

4. Henk de Vries from the Netherlands Biodiversity Information Facility (NLBIF) gave a presentation about the Global Biodiversity Information System (GBIF), which accepts, stores and provides biodiversity data from anywhere in the world. The GBIF operates through

national nodes in member countries, such as the Netherlands, and promotes the sharing of biodiversity data in an open and transparent way. GBIF is committed to the principle of Findable, Accessible, Interoperable and Reusable (FAIR) data. Data can be shared using an Integrated Publishing Toolkit and each dataset is associated with a sharing licence of one type. Data can be uploaded and downloaded. Everybody interested can use the system for downloads, uploading is done by more than 1100 publishers all over the world. NLBIF has sponsored this meeting because it is interested in intensifying the use of GBIF for exchange of data about mammals. The European Mammals Atlas will become available in GBIF, but more detailed information of the records is welcome. Standard formats for datasets can be found at GBIF.org. Henk encouraged participants to check what mammal data were already on GBIF for their country and hopes many participants will use GBIF to make their records of mammals available to others.

5. Unfortunately, Branko Karapandža, common names coordinator, was unable to be at the meeting. Tony Mitchell-Jones explained that the intention is to include the common names of species in many languages in the atlas, as for the 1st edition. The first step is to decide which European languages should be included and Branko will be considering this issue before beginning to gather names. The format of illustrations for the atlas is yet to be decided, as this depends on discussions with the publisher. Likely options are colour photographs, colour drawings or black and white drawings.

6. Maurice La Haye, from the Dutch Mammal Society, gave a presentation on *Agouti*, an on-line system for cataloguing data from camera-traps. He pointed out that camera-traps are now widely used and generate a huge number of pictures which need to be examined. If a system can be set up that allows anyone with a camera-trap to upload all their photos this makes sure that data are not lost. Uploaded photos can then be examined by trained volunteers and any species present catalogued. The system is still being developed but appears close to completion. Discussion centred on the issue of whether pictures should be assessed before being stored or catalogued or where there was an advantage in storing all pictures. In the former case, photographers might reject pictures of species they had no interest in, thus losing potentially useful data. In the latter case, the volume of pictures places a large burden on volunteers to assess and catalogue them.

22nd April

7. Ferdia Marnell chaired a session on *Atlases and databases; case studies from across Europe*. Four case studies were presented, illustrating the varying ways in which the project is being delivered across Europe. The case studies were presented by:
   Andrey Lissovsky (Russia)
   Irina Solovej (Belarus)
   Milan Paunovic (Serbia)
   Patrick Haffner (France).

   Summaries of these presentations can be found in the country updates in Appendix 3.

8. The session on 'Data collection and management: species and geographic standards' was opened by Andrey Lissovsky who summarised a small questionnaire on progress. This showed that majority of countries that responded had a national database and that many were making good progress towards their goal. With 5 years of data collection still to go, the project appeared to be on track.
   Tony Mitchell-Jones then presented technical information about the atlas grid (CGRS), methods of converting georeferenced data to the CGRS grid, data-flows for the atlas and the data structure needed to submit national datasets. A discussion on data management highlighted the need for clear guidance on topics such as the treatment of records with imprecise georeferencing, the recording of vagrants and wandering individuals (especially wolves, jackals and wolverines) and the tagging of records to allow traceability. The Steering Group will prepare or update this guidance over the coming months.

9. Dennis Wansink gave a presentation about ways of improving cooperation between mammalogists across Europe so as to achieve greater influence in mammal conservation. He proposed that the atlas project could provide a good stimulus for improved cooperation and that the network of contacts for the atlas could start this process.

10. The proposed content of the atlas was introduced by Tony Mitchell-Jones. The overall plan would be similar to the first edition, with introductory sections including Contents, List of Coordinators and Steering Group, Authors of species accounts, Foreword and Acknowledgements. Chapters would include History & Overview, Origin of European mammals (Prof. Nadachowski), Study area and mapping system, Collection and validation of records, Mapping periods and symbols, Species list and taxonomy and Species accounts layout. Beyond that, the atlas would feature a double-page layout with species account and map, with some pages including two or even three species, where there was no possibility of range overlap. As previously, the country accounts would be credited to the coordinators and would be their opportunity to list collaborators. Species accounts would be credited to authors and the Steering Group would be considering how to choose account authors over the next year or so. The volume would also contain the common names of species in many languages as well as a summary of the international legal and conservation status of species.

    The Steering Group is currently in discussion with publishers about the atlas and it seems likely that these discussions will result in a publication contract fairly soon. It is not yet clear whether the final publication will be in black and white, two-colour or full colour. As well as the published atlas, which will be attractive to libraries, Universities and Research Institutes, maps prepared using the atlas database will be freely available on the SEM website. The final atlas database, at the 50 x 50km resolution used in the atlas will also be uploaded to GBIF.

11. In discussion, delegates identified a number of areas where improved guidance from the SG would be helpful in steering data collection and management. These included information about interpreting localities, the treatment of wandering and vagrant individuals of a number of species, updates to the species list and the data structure required for the atlas. There was a clear need for a data coordinator to help with the data-management work and ensure

consistency in the atlas database (since filled by Damian McFerran). For some countries, where mammal recording is less developed, there is also a clear need for further resources, particularly field equipment and help with data management software. The SEM will try to help with this, either by bidding for resources itself or by supporting bids for national coordinators. For example, some funding may be available through the Eurobats Projects Initiative, which has already supported a number of projects that will produce bat records that could be included in national databases.

12. Tony Mitchell-Jones closed the meeting by thanking the sponsors, NLBIF, for their support and Vladimir Vohralík and his team for the excellent local organisation. He thanked delegates for their impressive contributions and commented that significant progress had already been made with this ambitious project and that the enthusiasm and commitment of the delegates gave him great confidence that the project would be complete to timetable.

Appendix 1: Attendees

Aleksandër Trajçe	Albania
Alexander Saveljev	Russia
Alexandra Sallay	Large carnivores
Andrey Lissovsky	Russia
Axelle Bonbled	Admin (LU)
Boris Kryštufek	Slovenia
Boris Sheftel	Russia
Carlos Fonseca	Portugal
Damian McFerran	UK(NI)
Dennis Wansink	Habitat Foundation (NL); invited speaker
Dime Melovski	Macedonia
Ester Rut Unnsteinsdottir	Iceland
Ferdia Marnell	Ireland
Friederike Spitzenberger	Austria
Gabriel Chişamera	Romania
George Mitsainas	Greece
Giovanni Amori	SG (IT)
Hans Baagøe	Denmark
Heikki Henttonen	Finland
Henk de Vries	GBIF (NL); invited speaker
Henryk Okarma	Poland
Igor Trbojević	Bosnia & Herzegovina
Irina Solovej	Belarus
Jan Zima	Czech Republic
L Javier Palomo	Spain
Laurent Schley	Luxembourg
Lena Godlevska	Ukraine
Linas Balčiauskas	Lithuania
Maria da Luz Mathias	Portugal
Maria Jesus Celaya	Spain
Maurice La Haye	Netherlands
Mikhail Rusin	Ukraine
Milan Paunović	Serbia
Nedko Nedyalkov	Bulgaria
Patrick Haffner	France
Per Ole Syvertsen	Norway
Svetlana Miteva	Funding (NL)
Szilárd Bücs	Romania
Thomas S Jensen	Denmark
Tony Mitchell-Jones	SG (UK)
Triin Edovald	Estonia
Uudo Timm	Estonia
Vladimir Vohralík	Czech Republic
Zsolt Hegyeli	Romania

Unable to be present:

Anders Angerbjorn	Sweden
Anna Loy	Italy
Boyan Petrov	Bulgaria
Branko Karapandža	Common names
Daniela Hamidović	Croatia
Dmitriy G. Smirnov	Russia
Ekaterina Obolenskaya	Russia
Ferdinand Bego	Albania
Fiona Mathews	UK
Gabor Csorba	Hungary
Henrik Thurfjell	Sweden
Ian Montgomery	UK
Jan Herr	Luxembourg
John Borg	Malta
Liam Lysaght	Ireland
Luisa Rodrigues	Portugal
Marcel Uhrin	Slovakia
Marina Radonjić	Montenegro
Mustafa Sözen	Turkey
Nikola Tvrtković	Croatia
Nikolay Spassov	Bulgaria
Oleg Ermakov	Russia
Peter Boye	Germany
Simon Capt	Switzerland
Thierry Kervyn	Belgium
Valeriy Stakheev	Russia
Victoria Nistrianeau	Moldova
Yordan Koshev	Bulgaria

Appendix 2: Meeting programme

Friday 20th April		
Time	**Topic**	**Speaker/Convenor**
16.00-18.00	Meeting of Steering Group	
18.00 – 20.00	Welcome and poster session	
Saturday 21st April		
9.30	Arrival	
10.00 – 10.30	Introduction to the project (background, methods, proposed publication)	Tony Mitchell-Jones
10.30 – 11.00	Species list and geographic extent of project	Friederike Spitzenberger, Tony Mitchell-Jones
11.00 – 11.30	Coffee	
11.30 – 12.30	Brief updates from coordinators (all that wish to say something about the current situation and work in progress)	Laurent Schley
12.30 – 14.00	Lunch	
14.00-14.30	Updates continued	
14.30 – 15.30	Global Biodiversity Information Facility (GBIF), overview and biodiversity information standards	Henk Devries, GBIF
15.30 -16.00	Coffee	
16.30 – 17.00	Common names (and species illustrations)	Tony Mitchell-Jones
17.00-17.50	Agouti: a system for cataloguing camera trap data	Maurice La Haye
19.30	Common dinner in Restaurant Šumava	
Sunday 22nd April		
9.30	Arrival	
10.00 – 11.00	Atlases and databases; case studies from across Europe	Ferdia Marnell
11.00 – 11.30	Coffee	
11.30 – 12.30	Data collection and management. Species and geographic standards	Andrey Lissovsky
12.30 – 14.00	Lunch	
14.00-14.45	Discover the Mammals of Europe. A citizen science approach	Dennis Wansink
14.45 – 15.15	Atlas chapters: country accounts, species accounts. Authorship and contents. Publisher	Tony Mitchell-Jones
15.15-15.45	General discussion; next steps; resources needed	Ferdia Marnell
15.45 – 16.15	Coffee and depart	
16.30 – 18.30	Meeting of SG	

Appendix 3: Country reports

Albania

Aleksandër Trajçe & Ferdinand Bego

Research on mammals in Albania has increased considerably in the last decade, compared to previous years. Following the collapse of the communist regime in the 1990s, Albania was mostly a 'blank spot' on the map when it came to data and information regarding the distribution of most mammal species. Since the mid-2000s progress has been made with data generation and mapping, by the work conducted within the frame of conservation and research projects by non-profit organisations, academic institutions and more recently since 2015, by state authorities as well. An important contribution was also offered foreign researchers who had visited Albania more frequently after the collapse of communist regime.

The Balkan Lynx Recovery Programme, which started back in 2006 and is still ongoing has contributed substantially to data generation, especially for medium and large terrestrial mammals. In the frame of the programme, a first country-wide questionnaire survey was conducted on 13 mammal species and the project was the first to introduce camera-trapping methodology in Albania, which has been implemented from 2008 onwards.

Research on small terrestrial mammals (STM) conducted by local and foreign researches during the last two decades has generated data on the distribution and status of STM species, however more efforts should be made to confirm the presence and distribution of few species that are potential but not yet reported in Albania, especially those related to subalpine and alpine habitats.

Since 2014, an EU-funded Natura 2000 "NaturAL" project has contributed to information generation on small, medium and large terrestrial mammals and they have created a national database on biodiversity, with information that is updated by project members through information collected in the field (BIONNA database, www.bionna.al).

A draft-atlas on bats in Albania has been prepared and is ready for publication. This is based on data published by foreign and local researchers on bats, as well as by recent data collected in the frame of NaturAL project.

Data on otters has increased as well, by the conduction of two research theses and the implementation of a pilot-monitoring scheme in the three largest lakes of Albania.

Data on cetaceans are rather scarce and mainly collected through surveys on stranding animals and data gathered through questionnaires with fishermen in main harbours of Albania.

Austria

Friederike Spitzenberger

The database of Austrian mammals comprises more than 100 000 datapoints. The data consists of observations in the field, museums specimens, and records from faunistic literature. A book "The Mammal Fauna of Austria" was published in 2002. Since then, data collection has become rare and opportunistic for several reasons. First, science-based faunistics got out date. Second, most of the nine federal states of Austria which are alone responsible for nature protection in their respective territories show little interest in making data public which inform on the distribution of mammals protected under the European nature protection legislation.

Thus, the Austrian contribution to the second version of the Mammals of Europe will consist mainly of data collected before 1999, of results of own research conducted since 2000 and sporadic information published by NGOs, project holders, hunter magazines and newspapers.

Belarus

Irina Solovej

There is no National mammals atlas in Belarus. It is only planned to create a national atlas of mammals in 2021-2023. However, there are sufficiently complete data about species composition of mammals and material has been accumulated that can be used for Atlas. But at this stage we will be able to fill only the UTM 50 km grid.

There are a few main sources for information on mammals and their distribution in Belarus. There are quite a few books about species inhabiting Belarus, where their meeting places are described, and for a number of species the population density is estimated, biology and biotopic distribution are described.

All game species are monitored yearly by based on report hunting management unit. They estimated population size and distribution. The data is publicly available on a Belarusian State Information Resource "State Cadastre of the Animal World" (belfauna.by). Information about 21 game species of mammals has been given since 1991. Here the hunters also provide data on the number of wolves. Other large predators - lynx and brown bear - are protected species and listed in the Red Data Book of Belarus. For these species, the Academy of Sciences should monitor. However, the allocated funds are not sufficient, so only observations at several monitoring sites are conducted.

For small mammals (rodents and insectivores), there are some research projects, but they are carried out locally (scientists - in the most interesting areas or for solving any economic problem) and are concentrated in protected areas or in places of practical work by biology students. Such data is mainly published in scientific articles, conference proceedings, scientific reports, and in the media if the species is rare in Belarus. Practically unknown is the spatial distribution of Gliridae - we know only their species composition in Belarus and several places of finds of individual species are noted. In connection with the depressed state of the water vole population, it is necessary to establish its current distribution.

The bats remain the least studied group of mammals in Belarus. This applies both to species composition, and to spatial distribution and other issues of their biology and ecology.

The new information portal is the Data Base named florafauna.by. In 2012 work began on the creation of a national database on biodiversity in Belarus. Anyone who is willing and able to contribute to the study of Belarusian wildlife is invited to contribute to the development of this national biodiversity database. The online database florafauna.by is a locally driven project to support registration and mapping of biodiversity data.

The next information portal is "Fauna of Belarus: Vertebrates" - (gurkov2n.jimdo.com). The site was created by a private person. The site is based on analyses of the publications of Belarusian and foreign scientists and shows information on the biology and distribution of vertebrates in Belarus.

For Atlas, we collect information published in recent years (since 2000) on the distribution of mammal species and we put this on the map of the administrative regions of Belarus. Only validated and verified species records will be collate and made available to the map. These data can easily be transferred to the European atlas.

So, we are developing our own database on mammals on our own. In this we are assisted by the staff of the Information Systems Department of the Belarusian State Technological University.

Belgium (not represented at meeting)

Benoît Manet and Vinciane Schockert

A mammal atlas is under publication for the **Region of Brussels**. Therefore, the distribution of most of the mammal species has been documented and will be available for the European atlas.

For **Wallonia**, data are available for many species. They come from different databases (scientific collaborators linked to the Administration (DEMNA: OFFH database) and citizen sciences through a famous naturalist association (Natagora : www.observations.be). They mainly concern:

- "common species": fox, hedgehog, red squirrel, … (mainly citizen sciences and data provided by wildlife rescue centers);
- Mustelids: badger (mainly traffic victims + setts), stone marten, the other species being less represented;
- Ungulates (and globally other game species) : red deer, roe deer, wild boar + fallow deer, sika deer, muntjac, mouflon…;
- Exotic species: mainly muskrat and raccoon, some other exotic species (raccoon dog, nutria…) being less frequent so far.

Standardized data have also been collected through specific protocols:

- Night counts with spotlights (ungulates in the South of the Region, hares (and rabbits) in the north of the Region + other nocturnal species (pine marten, raccoon, badger, …) seen during these inventories.
- Specific agreements with universities and NGOs for small mammal inventories (all the mustelids, glirids, shrews, bats, felids,…)
- Specific monitoring of the beaver
- Specific wolf network aiming to report any indication of presence of this species

However, we still lack some information concerning species:

- that are not specifically studied or not taken into account by species monitoring, like:
    - Small rodents (under completion through barn owl pellet analyses) and mole;
    - Domestic species (data are available but need to be gathered from specific institutions)
- That are not efficiently reported (lack of accuracy) or difficult to study:
    - Destructible species (polecat, stone marten)
    - Cryptic species (common hamster, weasels, otter, wolf, lynx…)

For **Flanders**, comparable data are available although the status of several species is different from their status in Wallonia. Data come from different databases as citizen sciences (Natuurpunt association – waarnemingen.be). The last regional atlas for Flanders was published in 2003. This atlas includes records of more than 90 species during the period 1987-2002. A new red list of native mammal species updated in 2014. Of the 66 species of mammals that have occurred in Flanders since the beginning of the last century, five have been extinct, and 25 species are at risk: six are 'Seriously endangered', eight are 'Endangered' and 11 are 'Vulnerable'. Furthermore, there are 12 species (18%) 'Almost at risk'. We consider the remaining 19 species (29%) as 'Not currently at risk'. There are insufficient data available for five species (8%). A total of 45% of all species are in danger and / or extinct (Maes et al. 2014).

Bosnia and Herzegovina

Igor Trbojević

Currently, 14 scientists (researchers) from Bosnia and Herzegovina have been engaged in the project of the second edition of Atlas of European Mammals. This team was composed and divided into four scientific areas: large and medium carnivores, herbivores, bats and small mammals. The purpose of this team is to collect data on all mammals that exist in the B&H area. The team is most focused on gathering data on fieldwork. There are several reasons for this: no national or regional database on mammals; historical data on mammals have already been used in the first edition of the Atlas; museum collections are not updated, and their data is treated as historical.

Due to the nature of the work that needs to be done for this project, the team is faced with many problems, among which are: a large volume of work (the land area of B&H is 51,197 km²; a small number of fresh data on target species); some parts of B&H are still under mines (minefields); lack of financial resources for fieldwork, lack of equipment (photo traps, small mammalian cages, bats capture nets, bat detectors)...
So far, around 20% of the work has been done. We found presence of 93 mammal species, and for two other species we are looking for new evidence of presence (perhaps 95 in total). So, we have certainly expanded the list of species with 12 new species (81 species in first edition of Atlas):
Bats – 30-32 species (9 new species: *Barbastella barbastellus*, *Myotis bechsteinii*, *Myotis brandtii*, *Myotis dasicneme*, *Myotis daubentonii*, *Pipistrellus pygmaeus*, *Plecotus kolombatovici*, *Plecotus macrobullaris* and *Tadarida teniotis*). Two species need to be checked on the field: *Rhinolophus mehelyi* and *Nyctalus lasiopterus.* For 30 species the distribution was made (94% if we have 32 species).
Small mammals – 41 species (3 new species: *Erinaceus europaeus*, *Castor fiber* and *Myocastor coypus*). For only 6 species we have done distributions (15%).
Herbivores – 6 species. For 5 species the distribution was made (83%).
Large and medium carnivores – 14 species. For 9 species the distribution was made (64%).

Bulgaria.

Nedko Nedyalkov

In Bulgaria, there is still neither an atlas nor a national database, but in the last decade much has been done in this way.
Data for some rare or priority (protected by national and international laws) species already have been collected during some recent projects (2011-2014) – national monitoring and mapping species and habitats within NATURA 2000 network.
Red squirrel (*Sciurus vulgaris*), **european souslik** (*Spermophilus citellus*), **Romanian hamster** (*Mesocricetus newtoni*), **common hamster** (*Cricetus cricetus*), **mouse-tailed dormouse** (*Myomimus roachi*), **lesser mole rat** (*Nannospalax leucodon*), **wolf** (*Canis lupus*), **jackal** (*Canis aureus*), **steppe polecat** (*Mustela eversmanni*) и **marble polecat** (*Vormela peregusna*), **pine marten** (*Martes martes*), **other** (*Lutra lutra*), **wild cat** (*Felis silvestris*), **brown bear** (*Ursus arctos*) **chamois** (***Rupicapra rupicapra***) and **red deer** (*Cervus elaphus*).

In the last few years data for alien mammals were collected during the East and south European network for invasive and alien species (ESENIAS) project (2015-2017) – coypu (*M. coypus*), muskrat (*O. zibetica*), racoon dog (*N. procinoideus*), brown (*R. norvegicus*) and black rat (*R. rattus*).
Every one of this project has their own type of database, and no one is open and public accessible. But from other hand a big gap exists for some common and widespread species as common voles – presented by two sibling species *Microtus arvalis* and *M. mystacinus* (*M. levis*), for house mice – *Mus musculus* and *M. domesticis*. Very little has been done since the first Atlas. Only data from genetically confirmed specimens will be included.

Research on mammals in Bulgaria are conducted mainly by scientific institution and organization as National Museum of Natural History – Sofia; Institute of Biodiversity and ecosystem research, Sofia university, but also from some NGO's (BALKANI – large mammals (lynx, brown bear, chamois, wolf), Green Balkans – mainly on bats, Bulgarian Society for the Bird Protection (BSPB) – small mammals).

We will use citizen science data collected by mobile application "SmartBirds": The data is verified by expert, and we will use only data collected by experience and trained people. Up to day (17.04.2018) there are about 2400 records of mammals.

So different type of data and databases exist which is a big challenge for us to join all this data in one uniform database.

The database will include all published data since 1900, museum collection, scientific reports and observation. The database contains about 10 000 records of bats, and about 7000 for the rest terrestrial mammals.

Croatia (not represented at meeting)
Nikola Tvrtković, Daniela Hamidović & Jasna Jeremić

During this year a review of available data (both published and unpublished) will be finalized which will serve as a basis for gap analysis of missing data concerning species and areas. We expect relatively low amount of data on insectivores and rodents since 1999 based on the current status of review since most of data were collected during second half of the XX century. Furthermore, there is a serious gap in data available on small carnivores since they aren't in focus of research and most of them are game species. We would rely on the database on game species from the Ministry of Agriculture which we plan to access during this year.

During 2019-2022 the Croatian Agency for Nature and Environment (CAEN) will conduct a large project funded by EU and we expect new data on following mammal groups/species – bats, large carnivores (wolf, lynx), Balkan vole, common hamster, common and forest dormouse and otter. Development of the database is also foreseen through above mentioned project. If marine mammals would be included in EMMA2 we will also have old and new data on dolphins from publications, documentation of Veterinary Faculty, some NGO-s and aerial survey.

New data on bear collected through LIFE+ Dinalp Bear project will be available. Additionally, we expect data on beaver, wild cat and bear through Management plans for those species that are conducted and will be developed by the Ministry of Agriculture. Invasive species will be mapped through EU funded Invasive species project conducted by CAEN that started recently so new data on small Indian mongoose, muskrat, racoon, racoon dog, coypu and barbary sheep should also be available for EMMA2. We also distributed information to all protected areas and nature departments (all national parks, nature parks and public institutions responsible for nature conservation and protection on county level) and make a note to fill in an observation form of any sick, injured, dead or alive mammal species. The form is available on the web page of the CAEN (www.haop.hr). The NGO BIOM adjusted iNaturalist database for Croatia for the faunal recordings so it is also additional source of data that we may use (http://www.fauna.hr/).

Czech Republic
Jan Zima

Mammal research and mapping efforts are well-developed in the country, and a national atlas of the distribution of all mammal species was already published (Anděra and Gaisler 2012). Furthermore, the distribution records are regularly updated and accessible at the open web page of Biological Library which is administrated and coordinated by Dr. Miloš Anděra. Information on the web page is provided also in English.

Anděra M., Gaisler J., 2012: Savci České republiky. Popis, rozšíření, ekologie, ochrana (Mammals of the Czech Republic. Description, Distribution, Ecology and Protection). Academia, Praha, 285 pp. (in Czech with English summary).

Biological Library web page

https://www.biolib.cz/en/speciesmapping/id1/

Denmark

Hans J. Baagøe & Thomas Secher Jensen

The Atlas of Danish Mammals (Dansk Pattedyratlas, Baagøe and Jensen 2007) presents maps in 10x10 km UTM squares for all 88 mammals then registered in Denmark. The database behind the atlas contains 57.960 entries incl. the whales, and is available on the internet, but only on a 10x10 km solution (DanBIF). Whereas the majority of the data are from 2000-2005, a large number of data, especially for some species, are from up to 2-3 decades before 2000. A "filtered" version including only data from 2000 and later will be used as the main source for the maps of the new Atlas of European Mammals. For some of the Danish mammal species distribution mapping has been continued to some degree until present. This includes the 17 species of bats but also a number of other species that have attracted special interest, and two species are new to Denmark: *Canis lupus* and *Canis aureus*. We will accumulate information on all species from all available published sources and reliable data collections, including also museum records, and contact all mammal specialists for further information. Finally we plan complementary species mapping in case we reveal 50x50 km squares with evident lack of information on certain species. Only data verified and identified to species by competent mammal specialist will be included.

Estonia

Triin Edovald

Currently we do not have an up do date atlas of mammals in Estonia. Between 1980-1990 the Estonian Theriological Society organized data collecting for the first atlas of Estonian mammals. After that only data concerning protected species, large game and species listed in European habitat directive has been collected systemically in the process of the national monitoring programme.
We also have a database for nature observations made by volunteers and an app for making these observations. In year 2017, 9159 observations where made (1/3 of them using the app). There are almost 29 000 observations in relation to mammals in the database made between 2005-April 2018. In these past years there have been some new findings for Estonian mammal fauna, for example the golden jackal (*Canis aureus*) and Mediterranean water shrew (*Neomys anomalus*). Also, there are some new methods used for registering mammals like track cameras and radio telemetry systems which give us new kind of data about the distribution and abundancy of mammals. For these reasons we are now planning the second atlas of Estonian mammals which will also be an input to the Atlas on European mammals. In our atlas we will present maps in 10x10 UTM squares for all the mammal species in Estonia (the number of the latter being currently around 70).
In the next couple of years, we want to fill the gaps we have in the existing data. We plan complementary species mapping in case we find 10x10 km squares with evident lack of information. It is known for us that we lack data on small mammals and bats, also on species who are hard to differentiate (hedgehogs, martens etc.). We also carry on with citizen science projects to involve more volunteers in collecting data about mammals.

Finland

Heikki Henttonen, Eeva-Maria Kyheröinen & Ulla-Maija Liukko,

Monitoring of mammals in Finland is based on several species or species group programs that are coordinated by different organizations or research groups.
Small mammals
To monitor and predict dynamics of small mammals, rodents in particular, there is a number of long-term monitoring sites (national rodent monitoring) that will be trapped twice a year (Fig 1 a). These

sites have been running, depending on locality for 30 – 60 years. Monitoring is run by Luke (until 2015 former Finnish Forest Research Institute). In addition we have quite a large number of local, more targeted study sites that deal with specific ecological questions in small mammal ecology like lemming migrations, studies on birds of prey, collecting parasites and pathogens of small mammals, etc. In 1960 – 2005 late Asko Kaikusalo did a lot of additional mapping studies in various parts of Finland. Also laymen send their interesting observations to Luke. Observations on *Sicista betulina* are compiled by Heikki Henttonen (Luke) and Ulla-Maija Liukko (Syke).

Large and medium-sized mammals (game animals)

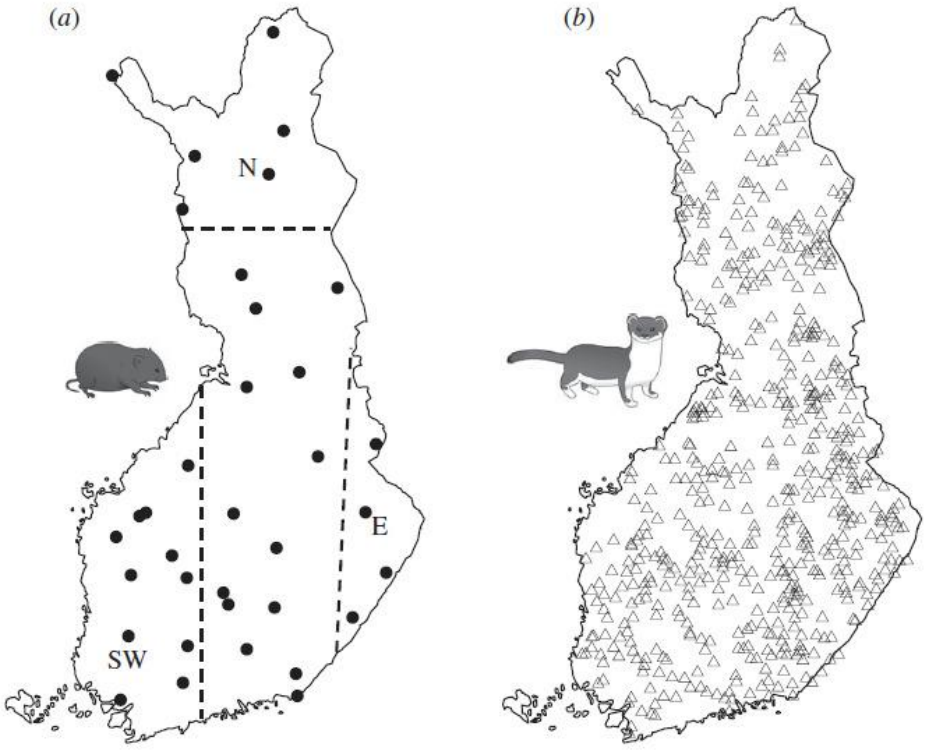
The Finnish wildlife triangle monitoring is run by Luke (until 2015 former Game and Fishery Institute). Monitoring is based on snow tracks on permanent 4x4x4 km triangles (Fig 1 b), and the field work is done by volunteers. This scheme is essential for winter active nonhunted mammals like weasels, stoats and squirrels, but it also gives important information for hares, pine martens, deer, moose, lynx, otter, and wolf.

Large predators have their own specific monitoring programs. There is a network of contact people who collect all the observations within their game administration unit. The wolf packs have radio-collared individuals, and DNA-based wolf monitoring has been started; volunteers collect wolf excreta in winter along the tracks. The genetic data base allows for building family trees and identification the background of new packs. All bear observations (individuals, sows with cubs etc.) are collected via contact network digitally by Finnish Game Center and analysed by Luke.

Finland has a web based system for collecting hunting statistics. Hunters report their catch including species, date and locality. It is obligatory to report species that are sometimes caught as a bycatch, like polecat in the connection of mink hunting. Moose and deer statistics are obligatorily carefully reported.

Several endangered or vulnerable species have their own specific monitoring and conservation programs. These species include the arctic fox , wild forests reindeer, seals including the endangered landlocked Saimaa seal, flying squirrel, both beaver species, and even common porpoise nowadays.

Figure 1. Permanent long-term monitoring sites for small mammal dynamics (a), and wildlife triangles (b).



Bats

Data on the occurrence of bat species have been collated from several sources (articles and reports, databases of observations, museum specimens) by Ulla-Maija Liukko, Eeva-Maria Kyheröinen and Torsten Stjernberg. These data (ca. 12 000 records) have been used in a manuscript of bat atlas, with updated species distribution maps, to be submitted in the near future. No systematic field work has been conducted in this project. Monitoring of bats is done both in winter and summertime, but not in a very large scale. In winter, circa 100 hibernacula are surveyed yearly. These are mainly in Southern Finland. In summertime acoustic monitoring is done by some volunteers. Triangular counting route is used, similar to BCT's Field survey. Also passive monitoring is done, the most systematic form of which is a project where bat activity is monitored throughout the season, with Wildlife Acoustics SM3 detectors located in biological stations across the country.

Red data book assessments

The status of Finnish mammals has been evaluated at 10 years intervals in 1990, 2000 and 2010 according to IUCN criteria. In addition, an extra mammal evaluation was done in 2015 partly due to quick changes in large predators. The next evaluation will be published in 2019. This work is coordinated by the Ministry of Environment, Syke and Finnish Mammal Society, and all relevant organizations are included (Ministry of Environment, Ministry of Forestry and Agriculture, Finnish Mammal Society, Luke, Syke, Forest and Park Service, Finnish Game Centre). In these assessments the distribution and population size/trends of all mammal species have been/will be are evaluated.

France

Patrick Haffner

The last (and only) atlas dedicated to the French Mammals was published in 1984. It did not cover overseas territories and, for marine mammals, did not collect data at sea. Nevertheless, the knowledge of the mammals of France has considerably progressed during the last 30 years. Many regional atlases have been published and associations of amateur mammalogists have been set up overseas, collecting a lot of data on these territories. The French Society for the Study and Protection of Mammals (SFEPM) as well as the National Museum of Natural History (MNHN) have therefore decided to publish a new atlas that will synthesize the knowledge on mammals of France acquired from 2000. It will include overseas territories and sea data of marine mammals, about 440 species. This one will be published in 7 volumes. The first, devoted to marine mammals (cetaceans, marine carnivores and sirenians) was published in 2016. The next will be devoted to ungulates and lagomorphs. The end of the publication is planned for 2025, which will allow a good coordination with the European project EMMA2.

The French mammal atlas project does not organize national inventories but synthesizes the data collected in the context of regional inventories or by public institutions working on mammals. This collection is based on a protocol called SINP (Information System on Nature and Landscapes) which collects data on all species of flora and fauna. These data are collected by regional platforms (databases) and then centralized at the INPN national platform managed by the UMS PatriNat (MNHN). The mammalian data are then extracted from this database. UMS PatriNat also collects mammal data directly from the data producers (most often from ONG's) in regions that do not yet have a SINP platform.

The data concerning the European part of France can be directly used for EMMA2. This concerns 122 species. Already, a comprehensive dataset is available for seals. For the moment, for all 122 species in metropolitan France, the INPN contains about 700 000 data that can be used for the EMMA2 project.

Greece

George P. Mitsainas

Regarding mammalian recordings in Greece, there are several specialists that are systematically working on the different mammalian groups: A couple of bat specialists have enlarged by large our knowledge on the species distribution and population status in Greece in the recent years. Small mammals are gradually getting increasing attention, even though our knowledge on numerous, particularly hard to trace, species remains obsolete and needs to be updated. Medium-sized mammals have also attracted attention during the last years and most large mammals are systematically being recorded and monitored by various groups and organizations.
Mammalian specialists in Greece are either employed in Universities and research institutes, in the private sector (e.g. environmental consulting companies), in environmental NGOs or are even self-employed. Unfortunately, no national network has been established so far among these mammalian specialists, aiming at data accumulation, sharing, validation etc. Besides, this was evident in the first edition of the Atlas, when only a few colleagues contributed data from Greece. Therefore, one of the biggest challenges, as far as the Greek contribution is concerned, will be to bring as many of these specialists on board in this effort as possible and to accumulate and standardize data to the Atlas' specifications from as many sources as possible (published data, museum collections, reports from various projects, such as those stemming from the implementation of Article 17 of the Council Directive 92/43/EEC, unpublished data from specialists etc.). Thus, a national database needs to be created, that will store all this information and feed the Atlas project with the appropriate data, following its validation by experts.

Iceland

Ester Rut Unnsteinsdóttir

Terrestrial mammals are few in Iceland and only one native species occurs, the Arctic fox (*Vulpes lagopus*), others were introduced. The Icelandic Institute of Natural History (IINH) is responsible for research and monitoring native fauna. In addition, a special agreement between authorities and a local research unit regarding research on reindeers (*Rangifer tarandus*), introduced in the east-region (East Iceland Nature Research Centre). Marine mammals are the most common mammals of Iceland, monitored and studied by the Marine and Freshwater Research Institute (MFRI) and the University of Iceland (http://rannsoknasetur.hi.is/about_research_center). Atlas of Icelandic mammals was published in 2004 (Páll Hersteinsson) but is sold out long time ago. The editor, Professor Páll Hersteinsson (1951-2011) was personally responsible for the publication.
Scattered studies have been conducted on terrestrial mammals, mostly as graduate projects for MSc and PhD degrees. The results have been published in various papers and book chapters, including the atlas from 2004.
IINH is responsible for mapping and monitoring Icelandic nature and is now working on a Redlist for Icelandic mammals. This is the first time such a list will be published but Redlist of plants and birds already exists and is updated regularly. The work is ongoing but will be useful for the European Atlas contribution from Iceland. It is based on newest information on mammal populations, received from specialists in each group. The mapping for terrestrial species is based on a standard 10x10km grid used by IINH for mapping Icelandic nature. The maps for seals is locations of haul-out areas which are now just being published in a monograph later this month, by IINH. The mapping of whales will be based on MFRI, and their collaboration with neighbouring countries. We will include a check list of all species known to have been in Icelandic nature but deal specially with those who are known to live in the wild and those who are regarded "Icelandic". It is really convenient that all this is taking place at the same time, so that we have brand new information on Icelandic mammals for the Atlas.
As Iceland is an isolated island in mid-Atlantic, there are few pathways for mammals so that vagrants are mainly marine mammals (polar bears, seals and whales) and occasional bats. Recently, a raccoon

was discovered alive, that most likely came via sea transport, in a container. Vagrants are killed, as soon as they are seen on land (but not on sea) and therefore not likely to settle.

Republic of Ireland

Ferdia Marnell & Liam Lysaght

The first Mammal Atlas for Ireland was published in 2016. The 207-page atlas covers the entire island, i.e. both Northern Ireland and the Republic of Ireland. It also encompasses Ireland's entire territorial waters and includes both terrestrial and marine species. 72 species are mapped in all, including some recently established non-native species. Two maps are included for each species, one covering the period up to the end of 2009, the other covering 2010-2015. A species account for each species is also presented. These were specially written by 42 individual authors.
The Atlas brings together almost 250,000 mammal sightings from more than 2,000 recorders. The data includes 57 different datasets as well as online submissions and submission through the National Biodiversity Data Centre's dedicated biodiversity capture app. Despite the completion of the Irish atlas, the data submission is still continuing and is expected to continue throughout the recording period for the European Atlas. The NBDC's online recording system can be seen here: http://www.biodiversityireland.ie/
Notable projects that are currently underway and will ultimately feed into the Irish mammal dataset for EMMA2 include the national bat monitoring programme, funded by NPWS and managed by Bat Conservation Ireland, the national hare survey (2017-2019) and NPWS's seal monitoring programme. Ireland expects to have a comprehensive dataset to contribute to the EMMA2 project and no problems with data compatibility or transfer are expected.

Italy

Anna Loy

Mostly conducted by researchers in national research institutes and universities, most of them members of the Italian Mammal Society (Associazione Teriologica Italiana www.mammiferi.org)
The mammal research by **universities and national research centres** in Italy is devoted to all groups. Georeferred dbase on small mammal communities from owl pellet data are ongoing through various initiatives. A database is going to be published online on University of Molise website on small mammals recorded in owl pellets from 1972 to 2017 on 23 species in 189 sites of Central Italy (http://therio.unimol.it:8080/therio/openmice/). A database is available at CNR – Institute of Ecosystem Studies on small mammal species (n = 25) obtained by literature on barn owl pellet referred to the last 40 years concerning 293 sites and 86.754 records of Italian Peninsula and islands. An ongoing project at Università Sapienza is collecting and georeferencing data on mammal occurrences posted on the fb page of the Italian Mammal Society.
Other public institutions: Ministry of Environment As member of the EU, following Art. 17 Italy has to report every six years on the distribution of mammals listed in annexes II, IV, and V in the Habitat Directive (92/43/CE). Obligations by EU Habitat Directive also allowed to collect distribution data on mammals HD listed in annexes II, IV and V in Natura 2000 sites, including all bat species, used to produced management plans of sites.
Italian ministry is also committed to provide distribution of alien species in Italy following EU regulation 1143/2014 on Invasive Alien Species. Data collection on mammals are ongoing
The Italian Ministry of Environment supported the project CKmap2000 (http://www.faunaitalia.it/ckmap/) that allowed to collect 16.379 records on 80 species of Chiroptera, Soricomorpha, and Rodentia, spanning from 1819 to 2006.

Regional atlases of Mammals have been produced for Veneto (2017), Lazio (2011), Umbria (2003), Lombardia (2001), that will concur to the Italian atlas. Also, some atlases have been produced for specific areas (provinces): Grosseto (Tuscany), Forli' (Emilia Romagna)

The **Italian Mammal Society** is

- Promoting initiatives of Citizen Science to collect data on mammal occurrence (ornitho.it https://www.ornitho.it/index.php?m_id=1 , iNaturalist https://www.inaturalist.org/projects/mammiferi-d-italia , CSMON http://www.csmon-life.eu/pagina/campagne/27), and on road kills of the Eurasian otter (therio.unimol.it:8080/lontra).
- Collecting distribution data on alien species following an agreement with the Italian Ministry of Environment to accomplish the EU regulation for alien invasive species of Union interest
- Producing a Check list of the Italian Mammals to be published by December 2018.
- Producing the Atlas of Italian Mammals, and realizing the Data Bank of Italian Mammals structured following the Darwin Core standard (https://www.gbif.org/darwin-core). At present the bank hosts about 68.000 georeferred data on 73 species, mainly carnivores, ungulates, lagomoprhs, and sciurids.
  The mammal Atlas is planned for 2020.
- Collecting data from researchers members of the Association on poorly represented species in CS initiatives (Soricomorpha, Rodentia, Chiroptera).

Data for 10x10 UTM grid cells on Chiroptera, Erinaceomorpha, Soricomorpha, and Rodentia are available from the project Ckmap (till 2000) http://www.faunaitalia.it/ckmap/

Lithuania

Linas Balčiauskas

The Atlas of Lithuanian Mammals, Amphibians and Reptiles (Lietuvos žinduolių, varliagyvių ir roplių atlasas, Balčiauskas et al., 1999) was published using 10x10 km non-UTM grid. However, data were and are collected with better precision, and grid-changing software was implemented. Some maps are available on internet, with no data availability (http://www.gamtostyrimai.lt/lt/users/viewGroup/id.24/pageId.26), and data on the small mammals are presented in (http://www.gamtostyrimai.lt/lt/users/viewGroup/id.24/pageId.35). Data on the species new to the country, *Neomys anomalus, Procyon lotor, Canis aureus*, are in good representation. Large carnivore data were collected in 2015–2018 during special citizen science project (all in the GIS format). Roadkill data were collected in 2002–2018, representing 30 mammal species (all in GIS format). We will use network of hunter respondents to add data on all game species. Data on rare species, mainly bats, are collected in government-run database (not freely available) – permission needed to use these data, and no meta-information will be presented. Worst represented data will be for small mammals. We have no funds to make special investigation on rodents and shrews, however, some 50x50 squares could be covered.

Luxembourg

Laurent Schley & Jan Herr

In Luxembourg, the National Museum for Natural History (MNHNL) is responsible for the national biodiversity database, RECORDER. All data collected for EMMA2 will be fed into RECORDER. The MNHNL will contribute to EMMA2 through management of their database.
Luxembourg has a territory of 2586 km^2, covering seven EMMA2 cells, none of which is located entirely in the country. Nevertheless, Luxembourg will produce a complete dataset for all seven cells, based on species occurrence on its territory.

In autumn 2017, the Nature Conservation Agency of Luxembourg hired a biologist on a one-year contract to
assemble all available data in 2017,
identify gaps, and
collect new data in the field to fill (most of) the gaps.
Major gaps were found only for small mammals (rodents & shrews). A study using *Tyto alba* pellets to identify presence of small mammals has filled nearly all of these gaps. Because of a rather dramatic decrease in *Tyto alba* populations and its disappearance in some areas, and because some small mammal species are rarely found in *Tyto alba* pellets, some gaps remain. We currently assess ways to fill those.
We expect to be ready to deliver the Luxembourg dataset at the end of 2018, although this might be subject to changes, f.ex. due to the geographic expansion of *Castor fiber*, *Canis lupus* and *C. aureus*.

Macedonia

Dime Melovski

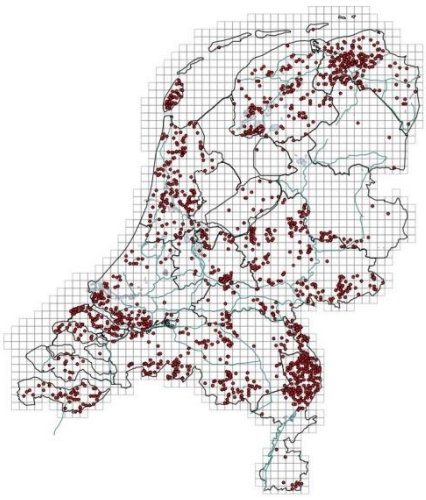
Mostly conducted by **Macedonian Ecological Society**.
Previous research that was done by other mammologists in the country have been already published and will be subject to our contribution.

The mammal research in Macedonia has been mostly concentrated on large mammals and particularly large carnivores. With the start of the Balkan Lynx Recovery Programme in 2006 a nation-wide research using questionnaires has been performed where people that are presumably knowledgeable on large mammals stated their opinion on distribution, trends, signs and possible conflicts with livestock and other human properties. This data base offers a lot of data on the following species: lynx, bear, wolf, jackal, red deer, roe deer, wild boar, fox, brown hare, chamois and wild cat. Since 2008 intensive camera-trapping sessions in the core area of the Balkan lynx revealed density estimations and population size in the reference area. In the recent times we have started density estimates on roe deer.
Small mammals, rodents and insectivores, have been target of our research opportunistically in the frame of faunistic investigation within certain project covering specific areas of interest in the country.
Bats are researched also as part of the projects in specific areas, and in opportunistic manner.

The Netherlands

Maurice La Haye

The Netherlands is a small country with a large number of observers. This results in a very good knowledge of presence and absence of all kind of species, including mammals. Quite recently, in 2016, a new Atlas has been published, presenting the distribution of more than 100 mammalian species, including whales, dolphins and seals.
The Dutch Mammal Society (www.zoogdiervereniging.nl) has a key-role in validation of data and coordinates several monitoring schemes, such as bat hibernations counts, monitoring bats on attics, auto transect counts, owl pellet monitoring, counting rabbits and day-active-mammals, mustelid inventories with camera traps and so on. These monitoring schemes are part of the Network Ecological Monitoring and deliver information on distribution, but also trends in number.



All locations with owl pellets in the NL (left), period 2012-2017. On the right screen-shot of www.muizenpluizen.nl red = positive for root vole (Microtus oeconomus arenicola)

Besides these programmes, a lot of data on mammals is collected by other institutes and websites. The most prominent being www.waarneming.nl, with its international equivalent www.observado.org. It is worth taking a look at these websites.

The last few years, new techniques are used to collect data on elusive mammals. A well-known example is the batlogger, now widely used for automatically monitoring bats, but also eDNA is now widely used.

In het Netherlands the National Database of Flora and Fauns has a central role in data-collection from all kind of organisations and databases. The distribution data of species are accessible to different levels of detail, depending on authorization level. The data on mammals (and other species) are open for the public on www.verspreidingsatlas.nl.

Norway

Per Ole Syvertsen

The Norwegian Zoological Society (NZF) initiated a national mammal atlas project in 1993, incorporating data from 1980 onwards. The database that existed by July 1996 constituted the main Norwegian contribution to the first EMMA project. The database was, however, still being actively fed with new data until 2004 (to some extent also later). From the onset, data were only collected and entered on a 10x10 km grid square basis, but this was later changed, and most records have been recorded with a precision of 1x1 km or finer (e.g., for bats usually 100x100 m). The database holds more than 90 000 entries (including cetaceans in the Northeast Atlantic).

In 2008 the Norwegian Biodiversity Information Centre established a Species Observations System, in collaboration with NZF and several other NGOs. Here, any registered user can submit details of faunal and floral records. This web-based database currently holds about 4 000 records of bats and 75 000 records of other mammals. The data can easily be aggregated to fit the 50x50 km grid squares of the EMMA project. There are of course issues relating to data reliability for this citizen science project, particularly concerning bats and small mammals. The majority of such records, however, are of mid-sized and larger species that constitute fewer identification problems. The NZF database has so far not been imported to the Species Observations System. It should be noted that both databases contain an unknown number of replication of records.

In addition to these data sources there are reliable records from mapping of bats that need to be extracted from project reports, and museums need to be approached for recent records.

All in all, we are optimistic that Norway will be able to submit a good coverage of the country for most species by the end of the record collection period, at least for the mainland.

Poland

Henryk Okarma

The Atlas of Mammals of Poland http://www.iop.krakow.pl/ssaki/ is a project which has been initiated by major Polish scientific centers conducting mammal research: Institute of Nature Conservation PAS; Department of Systematic Zoology, Adam Mickiewicz University in Poznań; Museum and Institute of Zoology PAS; Mammal Research Institute PAS in 2010. Data on distribution of 112 mammal species registered in Poland are collected in and presented on maps with 10' x 5' grid (approx. 10x10 km). Distribution maps are available in the internet. The database includes only records since 1980, currently about 550,000 entries. Collection of data is still going on. Each record contains date, location (some with GPS coordinates), character of observation, and info on observer). For each mammal species a national coordinator has been selected who is responsible for data verification and species identification. Since basically no funding is available for field work, data are submitted by not only professional mammal researchers, but also foresters, hunters, naturalists and nature enthusiasts.

Portugal

Maria da Luz Mathias & Carlos Fonseca

The list of Portuguese Mammals includes around 76 species, including marine carnivores. Recently, a preliminary Atlas of Mammals for Portugal (except bats) containing 12.000 entries on a 10 x10km grid was produced. Maps are available on the internet (http://atlas-mamiferos.uevora.pt/index.php/mapas/). Following previous meetings promoted by the country coordinators, taxonomic group's coordinators were designated, potential sources of data and types of data were identified and criteria for data validation were defined. We decided to adopt with some adjustments the SCALP criteria, firstly developed in the framework of SCALP (Status and Conservation of the Alpine Lynx Population) (included below).
Thus, in a first step the data above referred will be validated according to selected criteria and origin and will be taken as a first database for the Atlas of European Mammals. A first information on bats will be taken from the Portuguese Atlas of Bats published in 2013 (10 x10km grid). This procedure will allow the identification of gaps of knowledge in some taxonomic groups or species.
Simultaneously contacts will be established with Museums and other public and private institutions and recognized specialists in order to increase and improve missing information.

Romania

Zsolt Hegyeli (mammals other than bats)

Over the past two decades, Romanian mammal survey and monitoring activities have been characterized by a strong geographic bias (Transylvania and part of the Carpathians), as well as a taxonomic one (large carnivores).
Data collection for EMMA2 is partly coordinated by Zsolt Hegyeli (Milvus Group Association), and focuses on all available published information, as well as on personally collecting information from reliable mammal specialists as well as amateur enthusiasts (in the latter case only using a limited number of species).
Only a few mammal species (otter, Eurasian beaver, European ground squirrel) have had nationwide surveys. Comprehensive regional surveys were those targeting blind mole rat species, common hamster, steppe mouse, wolf and bear. Data resulting from most of the above surveys will be utilized for the atlas. Other important sources include small mammal trapping sessions and owl pellet

analyses, camera trapping and roadkill surveys, among others. Records from conservation projects and programs will also be utilized.
A social media (Facebook) page with the aim of collecting mammal records was launched in 2013, and this citizen-science approach has since produced hundreds of records about lesser known species, as well as many more about common taxa.
Considering the numerous “difficult” species as well as the low number of mammal experts in Romania, an initiative was made to set up a data validation committee, however this has not been formed yet.
Most of the data are being/will continuously be uploaded to OpenMammalMaps, which is an open source database, albeit with data hiding possibilities, managed by Milvus Group.

Bücs Sz.L., Jére Cs., Csősz I., Pocora I., Pocora V., Barti L. (Bats)
In order to have the most reliable and complete bat data set from Romania, the national coordinator for bat data will work with scientific advisors (co-authors of the present text). Together we will compile the readily available Romanian bat data sets from a series of projects from the 2010-2018 period, including the evaluation of several Natura 2000 sites and other protected areas (Fig. 1).

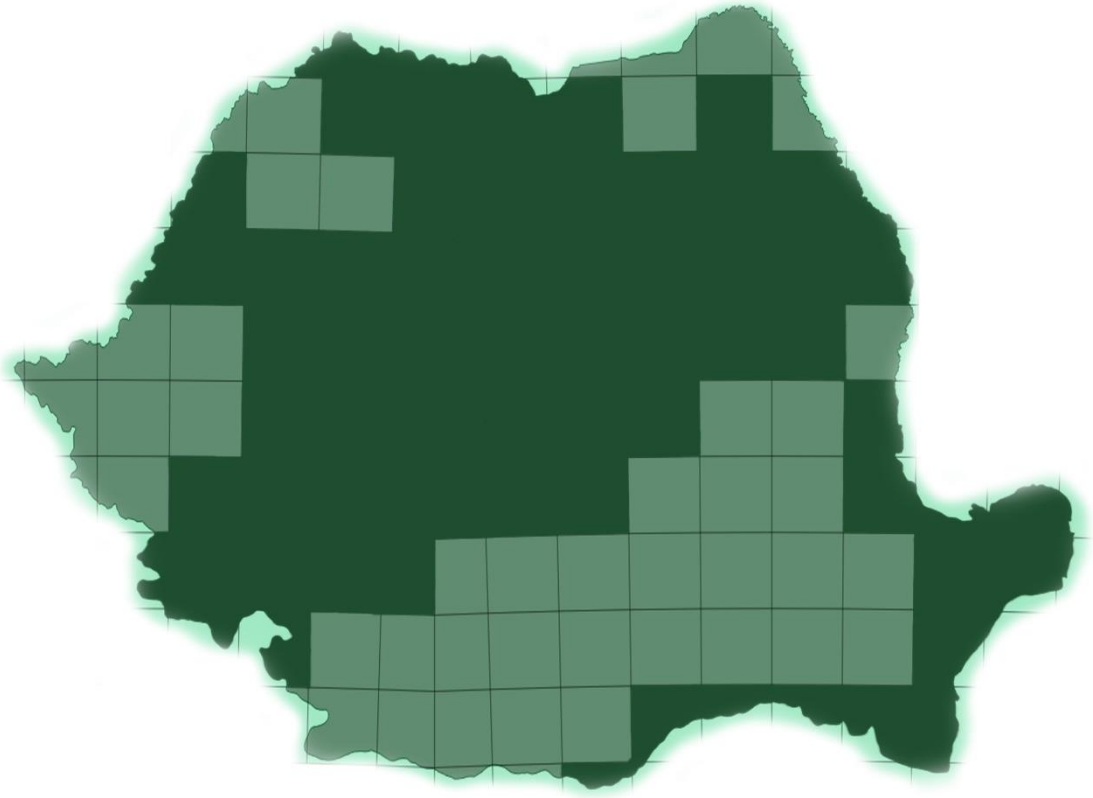


Fig. 1. Romanian 50x50 km quadrats overlaid with Natura 2000 sites and other protected areas where current bat data is readily available (dark green squares) by the authors. Light green squares will be filled with data from recent literature sources, as well as from own studies done outside protected areas, including urban areas.

After collecting all readily available data, we will look for gaps in the data set, and (1) complete the dataset with information from own studies done outside protected areas, (2) existing recent literature, and (3) ask the Romanian bat research community to contribute in filling the remaining gaps (if any remain). Received data will go through a validation process and we will discard data that is not a reliable record of a certain species, for example difficult species without photo proof, or

ultrasound records without exact or questionable identification, or recorded in atypical habitats. For several bat species, full, nationwide datasets are readily available. These are *V. murinus, P. austriacus, P. kuhlii (Barti, 2010), E. nilssonii* (Jére et al. 2018, accepted)*, M. capaccinii, M. emarginatus, M. alcathoe* (Barti et al. 2018, submitted)*, M. aurascens, M. dasycneme* (Görföl et al. 2018, accepted)*, N. lasiopterus (Estók* et al. 2017*), N. leisleri, R. blasii* (Jére et al. 2017)*, R. mehelyi* (Csősz et al. 2015)*, R. euryale* (Uhrin et al. 2012) and *H. savii* (Uhrin et al. 2016). Species for which not full, but good coverage datasets are available, and need little work are for example *R. ferrumequinum, R. hipposideros, M. schreibersii, M. myotis* and *M. blythii.*

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Russia

Andrey Lissovsky

Russian territory included in the EMMA2 project covers 3 578 000 km^2 that is 30.5% of EMMA 50x50 cells. The eastern border reaches Ural Mts, the southern — Kuma–Manych Depression; other borders coincide with the state borders of Russia.

Distribution of mammalian species was studied actively before the 1990-ies. A lot of paper literature devotes to the subject in question. Two big Museum collections cover the territory of European part of Russia also. The databases of these collections are in various conditions. A great deal of unpublished reports is kept in archives of Hunting and Medical services.

A new database http://zmmu.msu.ru/rusmam/ was constructed recently that should serve data collection for the EMMA2 project. The database collects data on species identification, locality description, date, author, sort of data, information on moderation, bibliography etc. Every record is moderated by experts. Geo data include lat/long (WGS84; 0.0001° precision) + inaccuracy radius. The database includes several modules that serve data collection from naturalists and photographers; zoologists and Museums; literature and unpublished reports (the last is in progress). In the days of EMMA2 meeting in Prague, 4446 records were entered into the database. This year the main emphasis on the converting of museum and report data into digital format will be made. General percent of the data readiness is about 10%.

Serbia

Milan Paunović and Branko Karapandža

There is neither a published mammal atlas nor an official national database of mammal data in Serbia.
The only mammal atlas project that's ongoing in Serbia is National Atlas of Bats, within the scope of the project of Monitoring of bats and their roosts and habitats in Serbia funded by the Ministry of Environmental Protection of Serbia. The projected date of publication of the Atlas is the end of 2019 or beginning of 2020. Distributional and ecological data on bats were collected for years by the researchers gathered around the Natural History Museum in Belgrade, and collated as a part of mentioned ongoing project, as well as several other small projects.
Data on all other mammal species (except for bats) were collected by different researchers and institutions, and there are several databases held by different institutions and in different stages of development, but none of them accessible on the internet or available to public.
The most significant part of mammal data is deposited in the Mammal Collections of Natural History Museum in Belgrade and in Museum's Database, which contains the most complete data set of all official mammal databases. Also, since recently, there is a database established and managed by the Faculty of Biology, University of Belgrade, within the scope of the projects of Red Data Book Serbia and Ecological Network of Serbia, that already contains some data on mammals. Some mammal data are also held by Institute of biological research in Belgrade and the rest minor part is available from published records, reports from protected areas, game management reports, citizen reports, etc., but those are not contained in any of the official databases yet.
There is also internal mammal database, developed by Branko Karapandža and Milan Paunović some 20 years ago, now shared between most of the mammal workers in Serbia gathered around Natural History Museum in Belgrade and the two of us. This is the most complete database, containing data from museum collections, literature and other sources, as well as our personal data.
Data from our internal database and that of the Natural History Museum are available and ready for use within the scope of the EMMA. Those data are mostly georeferenced, at least to UTM/MGRS 10x10 km grid cells, and thus easily transferable to EMMA grid. Use of data from other databases and other sources is still under negotiation. All data would be subjected to expert validation.
on behalf of the Data Base of Natural History Museum in Belgrade and EMMA2

Slovenia

Boris Kryštufek

Slovenia is a small country (surface area of c. 20 thousand km^2) and not a single 50 km square of the UTM grid is entirely inside its borders. About 90 species of mammals were recorded since 2000, including three cetaceans. No major taxonomic problems were identified. Several institutions and NGOs collect occurrence data, but these are not organized in a central database. The information is therefore dispersed and not openly accessible. I will approach data holders with request to make

their information available for the Atlas. In my experience, the coarse (50 km squares) solution will pose no problem, however it will be difficult to get detailed primary information. Since the year 2000, most attention was devoted to groups of conservation concern (bats, large carnivores and cetaceans) and to game species. Small terrestrial mammals, including species from the Habitat Directive (common hamster, dormice), are neglected and one can expect gaps in records. For some species, most notably the muskrat, it will not be possible to document changes in distribution, which probably happened during last two decades. The quality of data for Slovenia will be therefore heterogeneous and, in some cases,, the only records available will predate the year 2000.

Spain

L Javier Palomo & Maria Jesus Celaya

The Atlas of Spanish Mammals (excluding bats) is a project carried out by the Spanish Society for the Conservation and Study of Mammals (SECEM). This project was started in 1992 and it is based on the UTM 10x10 km grid. A first edition of the atlas was published in 2002 (Palomo & Gisbert 2002) including 150.000 records. The second edition (Palomo *et al.* 2007) included 40.000 additional records. During this last decade we have incorporated new data, both bibliographic and unpublished provided by collaborators in the project. We have updated the list of species in the project (72 species) including 2 exclusive species from the Canary and 1 from the Balearic Islands. We have also updated, in our web, the digital record for the collection of data, and our goal is to implement a platform based on the web "observation.org" to involve citizen science.
We have three main sources of information: bibliographic, review of collections of Museums and Universities, and unpublished information sent by collaborators and volunteers. The existence of old data can distort the current distribution of the species. To avoid these circumstances, the year 1980 has been considered the deadline, except in the case of those species in which it has been found that the distribution area has not changed during the last decades. For each species, or group of related species, there is a coordinator / reviewer who will be responsible for verification the information and the generated maps.
In the study area there are approximately 5,600 UTM squares of 10x10 km, and we currently have more than 210,000 records covering more than 5,500 grids (98 %), the remaining grids are mostly small surface ones, on the coast line or on the borders with France or Portugal.

Bats
The Spanish Society for the Conservation and Study of Bats (SECEMU) is collecting registers for the 34 species of bats existing in Spain. Also, we have to specify between pairs of 6 species complex or cryptic bat species, as animals not identified to species will not be included in the EMMA2 atlas. That is why we are using specialists in each region, and not collecting data from citizen science. We are expecting that during this year the researchers and batworkers will send us the data.

Sweden (not represented at meeting)

Henrik Thurfjell

There are a few main sources for information on mammals and distribution in Sweden. The large carnivores (wolf, lynx wolverine and brown bear) are monitored yearly, both regarding population size and distribution, and it is collected in a database (www.rovbase.se) and concluded in yearly reports.
All game species are reported based on hunting management unit and the data is publicly available from the Swedish hunters' association (www.viltdata.se).
Other species are followed nationally by the county administrative boards and research projects such as otter and arctic fox, in some also the dormouse.

The bats are relatively well monitored as inventories with autoboxes with sound recordings are used when wind turbines are to be raised, combined with some research and monitoring programs it gives a fairly good idea of the distribution of the bat species.

For small mammals (voles and mice) there are some monitoring programs and research projects, but the focus is mainly on numbers rather than distributions.
For the marine mammals, there are relatively recent monitoring assessments of porcine (2015 by recordings across the Baltic), there is also yearly monitoring of seals.
For all mammals the public sightings are reported in artportalen (www.artportalen.se) currently with about 100k reported sightings, this may be especially important for mammals not under any other surveillance (moles, voles, hedgehogs, mice and rats, etc).
There are also expert judgements on the distribution per county of all mammal species from the redlisting process.

Turkey (not represented at meeting)
Mustafa Sozen
We continue to collect all distribution data of Turkish mammals from Theses, papers, conference presentations, newspaper news (especially road kill events), personal friends, nature photography webpages etc. We then eliminate unrealistic and unproven data. Then put each record on Google Earth with an explanatory note. In such a way we transferred thousands of record to computer. My plan is to prepare an Atlas of Turkish mammals by the end of 2024.

United Kingdom
Tony Mitchell-Jones (GB)
Damian McFerran, Pauline Campbell, Sally Stewart-Moore and Michael McCourt (Northern Ireland)

The UK has a well-developed biodiversity recording system, run by the National Biodiversity Network, which covers every species group. This is accessible on the web at https://nbnatlas.org/ .
Within the NBN, specialist groups promote recording schemes, storing their data within the national framework. All records are checked and validated by a network of county recorders.

The Mammal Society is currently running an atlas project to stimulate the submission of records and then prepare a new atlas of mammals in GB, based on the 10km squares of the British National Grid. It is proposed that the National Mammal Atlas will be published in winter 2018/19, so these data will be available for the EMMA project.

When needed, a dataset in the required format can be prepared from the NBN dataset by selecting records based on the correct date categories and converting them to the CGRS cells. At the resolution required for the European Atlas, we expect the coverage to be very good.

The Centre for Environmental Data and Recording (CEDaR) is the Local Records Centre for Northern Ireland (NI) and collects, collates, manages and disseminated environmental records. CEDaR is a partnership between National Museums NI (NMNI), NI Environment Agency (NIEA) and the local recording community.

The mammal species records are currently collated on three main databases:

- Recorder 6 (25,920 records, out of a total holding of 2.6 million); see Fig. 1 below.
- Marine Recorder (2,100 sightings, out of a total holding of circa 1 million)

- Bespoke NI Seals Database (83,840 sightings). This data set has been captured via an on-going monitoring and surveillance initiative (since 1980s) from several sites around the NI coast.

During 1997–2000, the NI Mammal Recording Scheme was managed by CEDaR. The records collected from this study were combined with previous mammal survey data and notes derived from Museum specimens. Results formed the basis of a web site (http://www.habitas.org.uk/nimars/). All records were subsequently made available to the *Atlas of Mammals in Ireland* (2016). In addition, CEDaR has partnerships with Government Organisations (GOs), non-Government Organisations (eNGOs), Universities, individuals and local & national Groups and Societies; making equipment and other resources available to ensure the flow of (mammal) records to the Centre. CEDaR has recently released the NI data set to *The Mammal Society* for an Atlas.

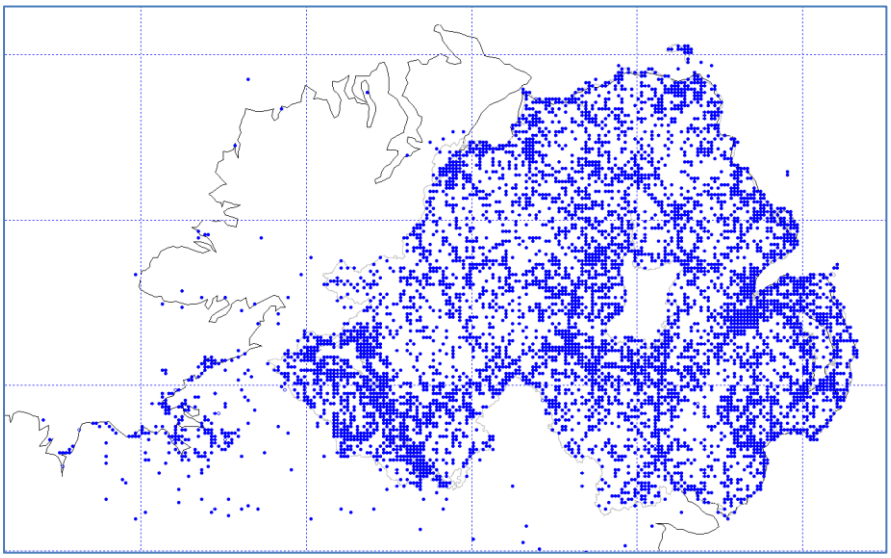

Figure 1. 1km distribution of NI mammal sightings. Records are displayed over 50km grid.

Furthermore, CEDaR facilitates a bat enquiry service, where calls received from the general public, etc. are logged and appropriate details recorded. Follow-up site visits may be required, with detailed information on species, location, etc. submitted on card by the individual that visits the site or collects the bat. These data are logged on Excel and summarised via CEDaR's Annual Report.

It is anticipated that a variety of systems will be used to collect records for the new *Atlas of European Mammals*, e.g., *CEDaR Online Recording* (http://www2.habitas.org.uk/records/), iRecord, Excel, Access, Recording Forms, etc. However, only validated and verified species records will be collate and made available to the project. Within NI, there is a network of verifiers that support the recording activities of CEDaR. This Atlas project is also being viewed as an opportunity to launch a new mammal recording scheme for Northern Ireland.

Ukraine

Mikhail Rusin on behalf of the National Mammal Atlas of Ukraine Team (mammals except bats)

In Ukraine we are working on a publication of National Atlas of Mammals. This will include terrestrial and marine mammals, but currently excludes bats. The projected date of publication of the Atlas is 2020. It will include data for three periods: 1991-2000; 2001-2010 and 2011-2020.
We will use a UTM 50km grid as a default layer. At the same time as we store precise coordinates for most of the points we are working on the possibilities of using other grids. For mapping we use

publication records, museum collections, reports from protected areas, game management reports, citizen reports, unpublished datasets from researchers. The localities would be subjected to expert validation. Dubious and unverified reports are currently marked as such and are not used for mapping.
Our Atlas is developing in conjunction with Ukrainian Biodiversity Information Network (ukrbin.com). This platform is also used to store the Ukrainian Atlas of Reptiles and Amphibians (which is a part of a new European Atlas).

Lena Godlevska (bats)
In Ukraine, there are no supported programmes on cadastres of mammals and bats in particular. Since 1999, I've kept my own data base on bats of Ukraine. For now, it includes ca. 10,000 unique geographically attributed records on 28 bat species from all regions of Ukraine in the period 1811–2018.
Data sources for the base were: 1) publications (over 380); 2) museum collections; 3) original data; and 4) data, kindly given by colleagues.

Details and review of the base and data were presented in a poster.

Large carnivores

Alexandra Sallay

Questionnaire

I have made a questionnaire addressing the National Coordinators, in order to evaluate the status of LC data during the entire EMMA2 project according to their responses. Not all of this information is available via the internet (e.g. future projects). Additionally, it will give us already an overview which countries will have issues to provide reliable records and the problems they have to face. Find it attached to this e-mail. I would like to submit it to all National Coordinators with your permission.

Project Register

I am working on a list, specifying for each LC species projects of the "recent" past and at present, noting the last dated publication. This list will be whole after receiving the completed questionnaires from the NCs.

Standardised LC records

To standardise the interpretation of the data collected, the records should be classified in three categories according to the following **SCALP criteria** (since 1990): The SCALP criteria allow to both combine and distinguish reliable and only partly reliable data for a better interpretation of the actual distribution.
C 1 "Hard facts": verified and undisputable records of presence as (1) animal found dead, (2) captured animal, (3) good-quality and georeferenced photo (camera traps), and (4) samples as excrements, hair for individual genotyping
C 2 "Confirmed and documented record" (the latter is not necessarily always the case) by an expert such as (1) killed livestock or (2) wild prey, (3) tracks, (4) howling (wolf, jackal), (5) faeces (with restriction) or other assessable field signs
C 3 "Unconfirmed category 2 observations": kills, tracks, scats and other field signs that are too old or badly documented, and all observations such as sightings and calls which by their nature, if not additionally documented, cannot be verified.
This procedure allows a critical review of biological records of LCs if not initially applied.
For wolves, for example, the identification of pairs and packs is usually done according to Marucco et al., 2014, LifeWolf Alps project. In the Wolflife project in Romania we used the same validation.

In order to ascertain the presence of the pack (a group of more than two wolves move together in a stable territory):
at least two C2 data (i.e. two trails of > 2 wolves) documented independently, and
at least two C1 data (i.e. genetic information along a wolf pack trail, or photo/video of the pack).
In order to ascertain the presence of the pair:
at least two C2 data (i.e. two trails of 2 wolves) documented independently, and
at least one C1 data (i.e. genetic information along the two wolves' trails, or photo/video of the pair).
In general, the monitoring methods differ according to species/population and weather / terrain condition and hunting tradition. Petra will send me a list that states the methodology for each country as it has been listed before in the report from 2013 for the European commission. The records have been and will be also validated in the future only by the monitoring system of each country. So far, the data from Slovakia, Ukraine, Belarus and Romania have been poor. Often funding aspects limit data collection. A fact that we cannot influence. According to Petra three-quarter of the countries have provided quality data.

Golden Jackal data
Within the framework of the Large Carnivore Initiative for Europe (LCIE), Nathan Ranc from the Harvard University, has coordinated the golden jackal distribution update for the period 2012-2016, at a resolution of 10x10km (categories: permanent presence, sporadic presence, expert-based presence; EPSG 3035). In addition of this relatively exhaustive distribution he can provide older (<2012) and more recent (>2016) data from systematic howling surveys and opportunistic records in various countries in Europe.
The data he is providing is based on following method(s):
Case 1: annual hunting data or several years of systematic howling survey
- permanent if >50% of years with presence
- sporadic if 50% or less of years with presence
Case 2: opportunistic data
- permanent if (1) two years or more with presence
OR (2) one year of presence of a group (C1/C2 data attesting of 2 or more jackals)
- sporadic if a single year of presence of a single jackal
Case 3: one year of systematic howling survey
- permanent if a pair or group of jackals was detected
- sporadic if a single jackal was detected
The data tends to be quite poor in Greece, FYROM and Montenegro, very poor in Ukraine and totally absent in Russia and Moldova. Furthermore, he is in need of more recordings from Romania, specifically from my living and working area. At the moment we are discussing a possible collaboration on this issue, especially the financial and logistical aspects. Furthermore Nathan is asking for some funding possibilities by the EMMA. He would like to participate at the Jackal Symposium in Greece at the end of October.

Mapping
Even if the higher resolution of 50x50km for the atlas is facilitating the mapping process, we face several problems when we overlap the 10x10 km cells with our larger grid. For example how to proceed in such a grid, if at the smaller resolution both sporadic observations and permanent presence are registered. This is often the case at marginal areas, but not only for dispersing animals. Since the grid size is quite large, the question arises if the differentiation of "sporadic" versus "permanent" makes a lot of sense. An approach would be to determine the type of a grid according to the number of occupied cells (10x10 km):
e.g. a 50x50 km cell with only a sporadic 10x10 km cell -> left out;
with only xx permanent cells -> sporadic ….
Or let´s say, a grid cell has to be occupied of at least 50% of permanent cells to achieve the status of "permanency".

Basically, all cells are based on individual records which can be classified as "sporadic" or "permanent" only over time. There have been very strong developments in large carnivore distribution in the last few years, particularly in Western Europe. Since we face a relatively long time of data compilation, essential changes can be still expected in the future. However, we have to take care to provide a realistic picture of the situation, because determination will always remain subjective.
I suggest discussing this issue with everybody at the meeting. If we decide to *feed* the atlas exclusively with the LC data from the LCIE, we could define the methodology of mapping in the final stages, after the end of collection, and verify how the maps look like with different scenarios.