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DISCUSSION PAPER

Livestock depredation and large carnivores in Europe: Overview for the EU Platform

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Authors: Katrina Marsden, Laura Schwarz, Iven Froese, Carla Klusmann, Johanna Eul, adelphi;Yorgos Merzanis, Spyros Psaroudas, Tasos Hovardas, Callisto

Data and input was provided by : Liam Singer, Xenia Wietlisbach, Université de Fribourg; Raffael Hickisch; Moritz Klose, WWF; Maria Falkevik, Kari Langöen, Värmland County Board; Michael Schneider, Västerbotten County Board; Jérôme Patrouiller, DDT 38; John Linnell, NINA; Luigi Boitani, LCIE; Valeria Salvatori, IEA; Bernard le Roux, Dialogues; ELGA - Hellenic Agricultural Insurance Organization; Nives Pagon, Tomaž Berce, Tine Gotar, Matej Bartol, Rok Černe, Slovenia Forest Service; Bükk National Park Directorate; Aggtelek National Park Directorate; Ministry of Agriculture; José Vicente López-Bao, Spanish National Research Council (IMIB-CSIC); State Forest Service Lativa; Croatian Ministry of Economy and Rural Development; Nature and Forest Agency Belgium; WWF Slovakia; Landesamt für Umwelt Brandenburg, Bayerisches Landesamt für Umwelt, Vetmeduni Forschungsinstitut für Wildtierkunde und Ökologie; Mari Lyly, Suomen riistakeskus, Finnish Wildlife Agency; Österreichzentrum – Bär Wolf Luchs; Naturvårdsverket, Direction Départementale des Territoires (DDT); Friends of the Earth Carnivore Conservation Programme Czech Republic; Environmental Board of Estonia - Nature Conservation Department; Progetto LIFE WolfAlps; State Service for Protected Areas under the Lithuanian Ministry of Environment; Bij12, Romanian Ministry of Environment, Water and Forests; KORA Carnivore Ecology and Wildlife Management

Publisher: adelphi consult GmbH, Alt-Moabit 91, 10559 Berlin,
+49 (030) 8900068-0
office@adelphi.de
www.adelphi.de

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1. Glossary

- Agri-environment-climate – funded through the EAFRD, these schemes aim to support farmers in reaching a range of environmental objectives
- CAP – EU Common Agricultural Policy. The EU policy and funding mechanism dealing with agriculture and rural development
- CSPs – CAP Strategic Plans. The plans developed by every member state giving their intentions for the use of the CAP funds 2023-2027
- EAFRD – the European Agricultural Fund for Rural Development, funding of the CAP, providing the EU contribution to the national or regional RDPs
- EAGF – European Agricultural Guarentee Fund, funding of the CAP, providing direct support to farmers, ecoscheme funding and supporting a number of other schemes and market mechanisms 100% funded by the EU
- Ecoschemes – funded through the EAGF, these schemes aim to support farmers in reaching a range of environmental objectives
- Interreg – EU programme for regional project financing funded through the European Regional Development Fund
- LCIE – Large Carnivore Initiative for Europe, the IUCN Species Survival Commission specialist group on large carnivores, including a range of (mainly) European scientists specialising in large carnivore biology and social sciences.
- LGD – Livestock Guarding Dogs
- LIFE - LIFE programme is the EU's funding instrument for the environment and climate action
- LIFE ELC – EuroLargeCarnivore – a LIFE project focusing around better communications and coexistence with large carnivores across the EU
- NUTS - The nomenclature of territorial units for statistics is a geographical system, according to which the territory of the European Union is divided into hierarchical levels. NUTS 0 is the countries, NUTS 1 the regions such as the German *Länder*, up to NUTS 3 at district level such as the French *Départements*.
- PAF – Priority Action Framework, the framework in which EU Member States describe how they will fund Natura 2000 and priority species and habitats through EU and national funds
- RDPs – Rural Development Programmes, the national or regional programmes co-financed by the EU through the EAFRD, supporting a range of rural development (social, environmental, economic) actions

2. Introduction

The fact that large carnivores depredate livestock (and to a lesser extent hunting dogs and beehives) is the main cause of conflict and hence main barrier to coexistence between humans and large carnivores across Europe and beyond. Large carnivores were deliberately exterminated from most of the European land mass for this reason. Their comeback is due to changes in policy moving from deliberate persecution to protection. At the same time, policy-driven agricultural intensification and concurrent abandonment of extensive pastures led to a return of forest land and prey species[1,2]. The remaining extensive agricultural systems are those that suffer most from the return of large carnivores as livestock are maintained outdoors and pasture is often located in the vicinity of woodlands or other landscape features used by wildlife[3].

The main pressures on extensive systems come from a market that does not recognise the additional labour associated with extensive livestock raising, nor the significant external costs (pollution, animal welfare impacts, land use) associated with indoor livestock production[4,5]. Most of these global-scale drivers appear unchangeable to the average land manager. The return of large carnivores, and especially the wolf, is an additional pressure on an already overcharged system and therefore receives much public and political attention, including continued demands to re-examine the conservation status of the wolf and to consider reducing its protection, especially in areas where pastoralism is culturally important. The highest profile of these calls recently was a 2022 EU parliamentary resolution which asked to better address the impact of large carnivores on livestock farming and rural communities[6].

As part of the service contract supporting the EU Large Carnivore Platform, the Secretariat was asked to support the Platform members in collecting and presenting data on large carnivores and livestock. This report aims to:

- Present data on damages caused by large carnivores per Member State (numbers and value where available)
- Compare damages to overall large carnivore numbers
- Compare damages to the number and location of grazing livestock
- Present information on the availability of support through EU funds
- Illustrate the above with case studies from different member states

[1] Chapron et al. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science* 346 (6216). pp. 1517-1519. DOI: 10.1126/science.1257553.
[2] Hinojosa et al. (2018). Constraints to farming in the Mediterranean Alps: Reconciling environmental and agricultural policies. *Land Use Policy* 75. pp. 726-733. DOI: 10.1016/j.landusepol.2017.11.047.
[3] König et al. (2023). Planning for wolf-livestock coexistence: landscape context predicts livestock depredation risk in agricultural landscapes. *Animal* 17. DOI: 10.1016/j.animal.2023.100719.
[4] Molnár (2022). Transforming Intensive Animal Production: Challenges and Opportunities for Farm Animal Welfare in the European Union. *Animals* 12 (16):2086. DOI: 10.3390/ani12162086
[5] European Environment Agency (2020). Water and agriculture: towards sustainable solutions. DOI: 10.2700/73735. ISBN: 978-92-9480-359-7
[6] European Parliament (2022). Protection of livestock farming and large carnivores in Europe. Document: RC-B9-0503/2022. (https://www.europarl.europa.eu/doceo/document/TA-9-2022-0423_EN.html) Last accessed: 26.5.23

3. Monitoring and measuring livestock depredation in Europe

In this section, we examine the data on livestock depredation in Europe and compare it with large carnivore population figures. Analysis is focused mainly on the wolf as more data is available on this species and they are the cause of the majority of damages, especially to extensively grazing sheep (Linnell and Cretois 2018)[7].

3.1 Data availability

Measuring the impact of large carnivore depredation on grazing livestock is complicated by the difficulties of accessing accurate and comparable data, a challenge well identified and explained in previous overviews such as Linnell and Cretois (2018)[8] chapter 3. The main challenges are outlined below.

3.2 Large carnivore population monitoring

In this report, the IUCN Specialist Group, the Large Carnivore Initiative for Europe (www.lcie.org) population estimates for large carnivores are used for large carnivore range and population figures. These are based on a questionnaire which is distributed to members of the LCIE and other experts. The survey collates information on population size, distribution, management system, conflict, and compensation payments. The survey was last carried out in 2012-2016[9] with an update for wolf populations (not distribution) for the Bern Convention in 2022[10]. Data is compiled from official national monitoring as well as for research and conservation projects. Where we refer to LCIE data in this report, these are the sources used.

This is the best available data but since there is no standardised monitoring in place across Europe, accuracy can vary significantly between countries and double counting of cross border populations cannot be excluded. In many countries, stakeholders (including livestock breeders, hunters and conservationists) question the veracity of official figures and disputes around population figures, remains a source of conflict.

[7] Linnell & Cretois (2018). Research for AGRI Committee – The revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.
[8] Ibid.
[9] Kaczensky et al. (2021). Distribution of large carnivores in Europe 2012 - 2016: Distribution maps for Brown bear, Eurasian lynx, Grey wolf, and Wolverine, Dryad, Dataset. DOI: 10.5061/dryad.pc866t1p3
[10] LCIE (2022). Assessment of the conservation status of the Wolf (*Canis lupus*) in Europe. Document: T-PVS/Inf(2022)45. (https://rm.coe.int/inf45e-2022-wolf-assessment-bern-convention-2791-5979-4182-1-2/1680a7fa47) Last accessed: 26.5.23.

3.3 Depredation data

There is currently no one system for measuring and collecting information on causes of death of livestock in general or damages by predators specifically. In general, the availability of data on livestock depredation by large carnivores depends on whether a member state has a compensation system in place and how that system functions. Almost all EU member states do have some compensation system, however implementation practices vary. It is only worthwhile for livestock breeders to report damages if they have a reasonable likelihood of being compensated and, in some member states, receiving compensation is such a long, bureaucratic process that most breeders do not bother. In some countries, such as Bulgaria, compensation is paid for bear damages but not for wolf. In Italy, the system varies between regions and changes on a frequent basis[11]. This leads to frustration and a lack of claims. In central Italy, Marino et al. (2016)[12] found that only 5% of the farmers subscribed to an insurance scheme for having damages compensated, while at least 34% of the farmers suffered damages without declaring it to the authorities. At the other end of the scale, in Norway, inspection is complicated by the terrain and compensation can be received even in cases where the certainty level is fairly low[13].

Practices for inspecting damages also vary. Large carnivore damages can be identified by a trained individual through inspection of the injuries caused and in the case of uncertainty by using DNA testing. However, this is only possible when a carcass is found in a relatively short time period. Carcasses may also be scavenged by several different wild animals or by a large carnivore after death (mortality from another cause). Ascertaining cause and effect is therefore not simple. The level of training afforded to those carrying out the inspections varies from thorough training and integration into a team, to seasonal contractors who carry out the job for a few months. The pressures on inspectors should also not be underestimated. They are the first port of call for an incident and may often be dealing with highly distressed breeders. They have a clear social role as the main bridge between authorities and breeders as well as an inspection / policing role[14].

Box 1: Examples of damage collection systems

Sweden

In Sweden, the regional county boards are responsible for managing the compensation system and checking that damages are caused by large carnivores. In counties where wolves have been present for longer, such as Värmland, inspectors are regular members of the county board team with a range of responsibilities. There is a hotline for calling an inspector in the case of an incident. Recently, it has been decided to make the hotline only available during working

[11] Gervasi et al. (2022). Stima a dell'impatto del lupo sulle attività zootecniche in Italia. Analisi del periodo 2015 – 2019. Relazione tecnica realizzata nell'ambito della convenzione ISPRA-Ministero della Transizione Ecologica per "Attività di monitoraggio nazionale nell'ambito del Piano di Azione del lupo"
[12] Marino et al. (2016). Ex post and insurance-based compensation fail to increase tolerance for wolves in semi-agricultural landscapes of central Italy. *European Journal of Wildlife Research* 62 (2), pp. 227–240.
[13] Linnell & Cretois (2018). Research for AGRI Committee – The revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.
[14] Maria Falkevik pers. comm.

hours (to normalise small damage incidents). In the case of serious damages, the county can be contacted through other emergency lines.

Inspectors across Sweden receive training at the Wildlife Damage Centre[15]. For new employees a three-day training is proposed. Regular training updates are also held. Training involves learning to inspect animal carcasses and recognising the different types of damage. In general, a trained inspector can recognise damages in this way, but DNA testing may be carried out in the case of uncertainty or if a case is contested by the claimant.

There is also a strong social aspect to damage inspection. Inspectors are the first point of call for livestock breeders who may be very upset, especially in the case of a first incident. They need to balance an appropriate, sympathetic reaction with a thorough inspection to ascertain the real cause of livestock death. As representatives of the County Board, they have a role to play in showing that the administration is sympathetic to breeders and available to listen to them.

Compensation is received if the death is caused by large carnivores but not, for example, if dogs have caused the damage. Compensation should only be provided in the case that appropriate protection measures are in place. There is some flexibility for the regions to interpret "appropriate" according to the land area and risk. Generally, in the case of a first attack, compensation would be given even if stock is not appropriately protected. In such a scenario, measures to best protect the flock against future damage would be discussed. In the case of future attacks, the inspection would check whether advice had been taken. Well-installed fencing with no specific inroads (e.g. gaps over water) would be considered an appropriate protection measure and there is no requirement for electric fencing or specially funded wolf fencing.

France

A clear system is set up to show responsibilities between the Departmental Directorate of Territories (DDT) and National Office for Biodiversity (OFB) / park staff within a protected area. The DDT is responsible for managing the system of recorded damages and dispensing compensation. The OFB is responsible for carrying out inspections on the ground.

The following steps are carried out:

- Report of damage by breeder (within 72 hours): hotline provided which is answered in office hours or recorded out of office hours with call back.
- OFB, DDT, park staff alert each other to the attack via WhatsApp group.
- Inspection by agent (OFB or park) (within 48 hours) and information recorded (see below).
- Check of information by DDT including calling agent or farmer if inconsistencies are found.
- Information used to determine if wolf can be excluded as the cause of death.

[15] Swedish Wildlife Damage Centre, VSC: https://www.slu.se/en/Collaborative-Centres-and-Projects/wildlife-damage-centre/ Last accessed: 26.5.23.

- If wolf cannot be excluded (and there is no technical reason for not compensating – see below), compensation is paid within 2 months.

Inspection

Information is gathered at the site of the attack and recorded in the app "Geopred"[16], managed by DREAL and OFB, which has been in use since May 2023 and allows rapid sharing of information. Information collected consists of a form containing around 60 information fields including:

- Administrative section – where, when, who, size of herd, means of protection (based on a declaration on honour from the breeder).
- Information on the victim(s) – general conditions, state of body, clues about the presence of predators, traces of predation, bite types, consumption. This can also be recorded on a diagram showing where the wounds are. Photos can be taken (compulsory for cattle).

Compensation is paid according to the national-level grid.

Germany

In Germany, the federal states are in charge of establishing compensation schemes and appropriate inspection systems. The regions gather damage data over the calendar year and report it in a pre-agreed template to the DBBW. There is some variation in the protocols used. In general, receiving compensation payments for livestock damages is linked to the installation of those prevention measures which are required by the individual state. Generally, the minimum requirement is considered to be electrical fencing of 90 cm in height. However, the extent of financial support, as well as required prevention measures, differs between the federal states. For example, the state of Saxony Anhalt requires mobile electrical fences for the protection of sheep and goats, which are comparatively low standards. In contrast, the state of Hessen has much higher requirements for protecting sheep and goats: protective fences beyond the minimal requirement (both electrical and non-electrical), digital technologies for wolf defence, protection against digging under fences, installation of overnight-barns or -pens and livestock guarding dogs.

In the case of a wolf attack in Lower Saxony, for example, the injured party must contact a trained volunteer "wolf consultant" (appointed by the Lower Saxony State Agency for Water Management, Coastal Defence and Nature Conservation, NLWKN). The consultant reports to the NLWKN which is responsible for approving or rejecting the claim. An official record of the animals killed, injured or otherwise affected is required for each individual case in order to determine the wolf as cause of damage. The NLWKN is responsible for centrally gathering all reported depredation events. While there is no mandatory reporting deadline, reporting is required "immediately after noticing the damage". Assessment of each case is to be carried out within 24 hours after reporting. In order for the compensation payment to be granted, the wolf must be indicated with explicit certainty or with high probability.

[16] https://www.auvergne-rhone-alpes.developpement-durable.gouv.fr/geopred-mobile-mentions-legales-a22592.html

The compensation payment includes compensation for kills, further consequent losses due to miscarriages or abortions and veterinary costs (up to a maximum of 100% of the respective value of the animal, including the cost of medication). Compensation payments also cover trained hunting dogs and livestock guarding dogs or other herd protection animals. For sheep, goats, and fenced deer, prevention measures must be in place to receive compensation.

For Lower Saxony, the required prevention measures are electrical fences and electrical braid fences of 90cm in height, wire mesh fences of 120 cm height, including electrical undermining protection, and livestock guarding dogs. For cattle and horses, no prevention measures are required; however, livestock must be kept in accordance with the requirements of good professional practice and the resulting minimum standards for fencing animals must be implemented. The upper limit is 5,000€ per animal and 30,000€ per year per livestock owner[17].

In their analytical framework, Gervasi et al. (2021) illustrate the difficulties determining whether there is a direct link between the damages to livestock caused by large carnivores to the population size (see Figure 1). The likelihood of damages occurring, in the first place depends largely on ecological factors related to large carnivore presence. This includes predator density but is also influenced by the availability of natural prey and whether the landscape is such that predators can hide (left of the diagram). Damages can be reduced by husbandry practices and the use of protection measures (right of the diagram). However, measuring these effects is complicated by a range of other management factors including how damage statistics are collected and the compensation process (centre of the diagram). This central aspect means that even if the factors on the right and left can be measured, it is not certain whether correct information on the number of attacks and damages caused is available.

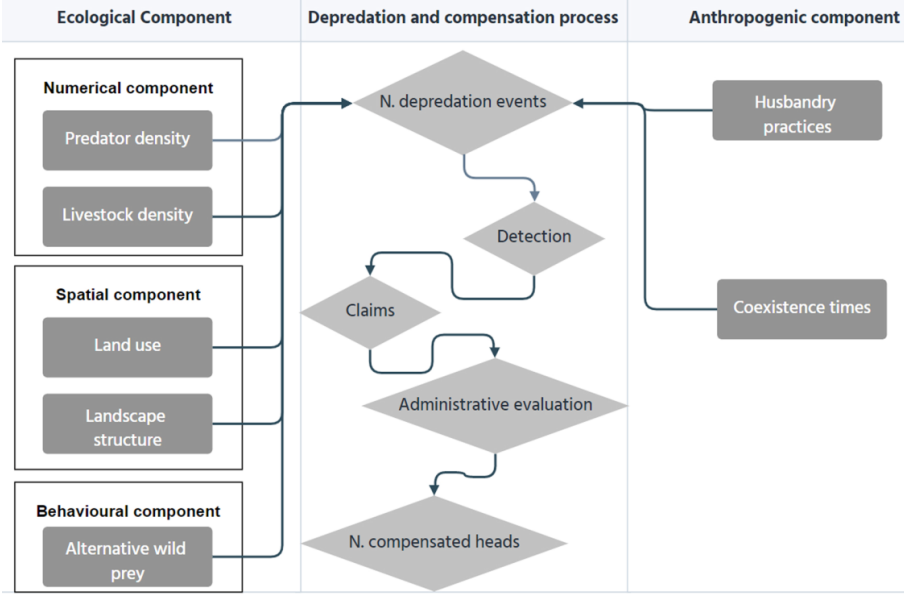

Figure 1: Conceptual diagram of the ecological and anthropogenic mechanisms generating the number of annually compensated sheep losses to large carnivores used by Gervasi et al as their analytical framework.

[17] Dokumentations- und Beratungsstelle des Bundes zum Thema Wolf (2022). Wolfsverursachte Schäden, Präventions- und Ausgleichszahlungen in Deutschland 2021. 41 S.

4. Comparing depredation data across the EU: challenges

Given the above challenges, it is clear that damage data must be interpreted carefully and that a range of factors contribute to the final reported depredation figures. Nonetheless, examining reported figures over time gives an idea of the extent of damages. If compensation and damage collection systems remain stable, the situation within a member state or region can be analysed and conclusions drawn on whether damages are increasing or decreasing and what some of the contributing factors might be.

A number of recent reviews have examined damage data across the EU. Linnell and Cretois (2018)[18] used data from the above-mentioned LCIE surveys and Eurostat figures on sheep numbers to compare sheep and wolf distributions to NUTS 2 level and depredated livestock on a national level. This provided a snapshot picture of the situation regarding large carnivores and livestock depredation, showing that depredation per large carnivore head varies significantly across Europe with extreme (high depredation) outliers in France and Norway.

National-level depredation figures cannot be used for a finer scale evaluation of the factors which might impact the depredation level. Gervasi et al (2021)[19] in a review of depredation in 10 EU countries over 5 years, measured damages on sheep to NUTS 3 level and performed statistical analysis on the evolution of the situation in these member states. They found a positive relationship between wolf distribution and compensation payments but not with other large carnivore species. One significant finding was that depredation levels were lower in the areas where large carnivore presence has been continuous compared to areas where they disappeared and returned. In some cases, “a few large carnivores can produce high damage, when the contribution of environmental, social, and economic systems predisposes for it, whereas large populations can produce a limited impact when the same components of the system reduce the probability that depredations occur. Time of coexistence plays in favour of a progressive reduction in the associated costs, provided that the responsible agencies focus their attention both on compensation and co-adaptation.”

Building on this approach but using different statistical techniques, Singer et al. (2023)[20] within the LIFE EuroLargeCarnivores Project established a system for collecting case-based damages on an annual basis directly from national or regional managing authorities. Data was collected from 21 countries over three years, and trends were isolated and compared with a range of variables. The idea of such a system was that it could be continued longer term with the eventual view of providing an indicator for conflict across the EU. Following this initiative, the data collection system was taken over for 2021 by the EU Large Carnivore Platform Secretariat and the results (in addition to the three years collected by Singer et al.) are elaborated in further detail in this report.

[18] Linnell & Cretois (2018). Research for AGRI Committee – The revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.
[19] Gervasi et al. (2021). Ecological correlates of large carnivore depredation on sheep in Europe. *Global Ecology and Ecology* (30). DOI: 10.1016/j.gecco.2021.e01798.
[20] Singer et al. (2023). The spatial distribution and temporal trends of livestock damages caused by wolves in Europe. *Biological Conservation* (282). DOI: 10.1016/j.biocon.2023.110039.

4.1 Method

The method, described in more detail in Singer et al. (2023), involves sending a standardised excel table to managing authorities of all EU member states as well as Switzerland and Norway to collect data at the regional level (NUTS3). The data collection tool was developed in collaboration with authorities, building upon the information they generally retrieve when measuring damages. If damage information was available online, this was used. The tables included the following fields:

1. the primary asset missing, injured, or killed in an incident (e.g. sheep, cattle, reindeer, dog);
2. the large carnivore species causing the respective incidents and the number of animals involved;
3. the assessment level or probability of the cause being identified correctly (ranging from 0- assessment pending to 5- confirmed);
4. the amount of compensation paid per incident;
5. the damage prevention measure implemented at the time of the incident in broad categories (e.g. electric fence, wire fence, livestock guarding dog);
6. the exact location where incidents were recorded (given both in coordinate format as well as specification of the place and administrative region); and
7. the date the incident happened and when it was officially reported.

Data submitted was not always complete. The team accepted information in different formats and integrated it into their tables before returning it to the data providers for further information in case of missing data. Nonetheless, in many cases, not all data specified above was provided and the excel sheets had to additionally be curated manually. In case geographical information was missing, the team identified the location based on the nearest village. If missing coordinates could not be obtained through geocoding, the data was discarded. In some cases, the assessment level was missing. In case this could not be ascertained, it was assumed that all cases reported were probable. In case it was reported, those with a probability of less than 50% were excluded[21]. Following data analysis, data providers were sent an overview of the findings on their member state.

Trends in livestock damage were estimated in R[22] for each NUTS3 region, for all affected species combined from 2018-2021 and for several individual species from 2018-2020. For the estimation of trends at least one incident from at least two years were required. To consider missing information and stochastic variation we followed the approach from Singer et al. (2023) using a Bayesian inference approach (Singer, Caduff et al. in prep) that allows for stochastic variation and differences in survey effort between regions. The method assumes for the incident counts to be Poisson distributed with a rate proportional to the occurrence and the reporting of the incidents. The method estimates trends over multiple years, integrating out the uncertainty when working with noisy data. Because of that, trends in livestock damages do not always coincide with an absolute increase or

[21] • For AT, BE, CH, DE, EE, EL, HR, LV, NL, NO, SE, SI, PL, HU, only incidents that occurred with a probability of at least 50% (rated as “confirmed” or “presumed correct”) were considered.
• For RO, FI, and ES, where no level of probability was provided, all incidents where compensation was paid were included under the assumption that if compensation was paid, the incident was likely caused by a wolf.
• CZ, FR, IT, LT and SK provided neither information on the level of compensation nor on probability. Therefore, all incidents were included in the analysis.
• For EE, CZ, NL, PL, RO, ES, CH and IT only data for three out of the four years included in the calculation was available. HU shared data only for 2021 and is therefore not featured in the damage trend map. LT provided data for three years, however, due to difficulties to read the coordinates provided the cases for 2021 were excluded. Similarly, many 2018 and 2019 cases in EL had to be excluded because locations provided in Greek could not be matched to NUTS regions. To calculate the incident densities, the data was weighted accordingly.

[22] R Core Team, 2023. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Vienna, Austria. URL: https://www.R-project.org/.

decrease of reported incidents from one year to the next, but give a more detailed insight into the trends of wolf damage cases over time. Additionally, for the years 2018-2020, Singer et al. ran statistical tests to see whether the trends of the different species were correlated (Pearson correlation test) and to check if trends were stronger in recently colonized areas (Mann-Whitney U test).

Data was mapped to the NUTS 3 level. Depredation levels (number of incidents rather than number of victims) were compared statistically with a number of variables including land use types, large carnivore numbers, and seasonality. Trends were also analysed over the four-year period.

4.2 Findings: Overview of wolf damages per country per year

Country	Total livestock depredated				LCIE figures on depredation (2021 where available)	Number of wolves LCIE (2021 if not stated otherwise)	Livestock depredated per wolf (2021 if not stated otherwise)
	2018	2019	2020	2021			
Austria	132	75	270	453	906	56	8.1
Belgium	16	66	126	189	217	9 (2022)	21.0**
Bulgaria	NA	NA	NA	NA	NA	2712	NA
Croatia	1920	2181	2872	3357	2761 (2016)	163 (2020)	20.6
Czechia	492	689	762	NA	841 (2020)	100 (2020/21)	7.4
Denmark	NA	NA	NA	78	78	14	5.6
Estonia	121	798		516	508	240	2.2
Finland	691	962	1163	1850	1835	290 (2022)	4.0**
France	11416	11280	10114	8780	11292 (2020)	783	11.3
Germany	1674	2189	3177	2538	3153	1119 (158 packs, 27 pairs)*	2.3
Greece	6366	6367	5669	5662	4881	1020 (2014)	5.6**
Hungary	NA	NA	NA	63	NA	75 (avg.)	0.8
Italy	463	760	645	NA	10100 (2019)	3307	3.1**
Latvia	182	312	82	122	51	700 (2020)	0.2

Lithuania	NA	1200	1345	NA	1342	504	2.7
Luxembourg	NA	NA	NA	NA	0	0	0
Netherlands	168	134	388	NA	209	15 (2022)	13.9**
Norway	703	239	205	115	1115	51	2.3
Poland	1170	1699	187	NA	993 (2019)	1886 (2019)	1.2
Portugal	NA	NA	NA	NA	3059 (2017)	300 (avg. 2019-2020)	10.2**
Romania	933	277	506	NA	NA	2750 (avg. 2013-2018)	0.2**
Slovakia	319	478	643	881	792	600 (2020)	1.5
Slovenia	735	1368	824	451	189	138	3.3
Spain national	2753	3195	2859	NA	11210 (2020)	2280 (304 packs, avg. 2012-14)*	4.9**
Sweden	175	252	483	378	297	460 (2022)	0.8**
Switzerland	526	447	815	NA	853	153	5.6

Table 1: Number of animals killed per EU-country per year, Number of wolves and number of animals per head of wolf

**Total number of wolves is not available; hence it is calculated based on number of packs. For Germany, pack size of 7 wolves (average across all European countries) was assumed; for Spain, pack size of 7.5 wolves was used as stated in the LCIE report.*

*To calculate livestock depredated per wolf, the year 2021 was used where available (case based data firstly and LCIE data if not available). If no data for 2021 was available, the same year was taken for livestock and wolf numbers. For a few cases, there is no data for both for the same year, in which case, the data available is used (marked**).*

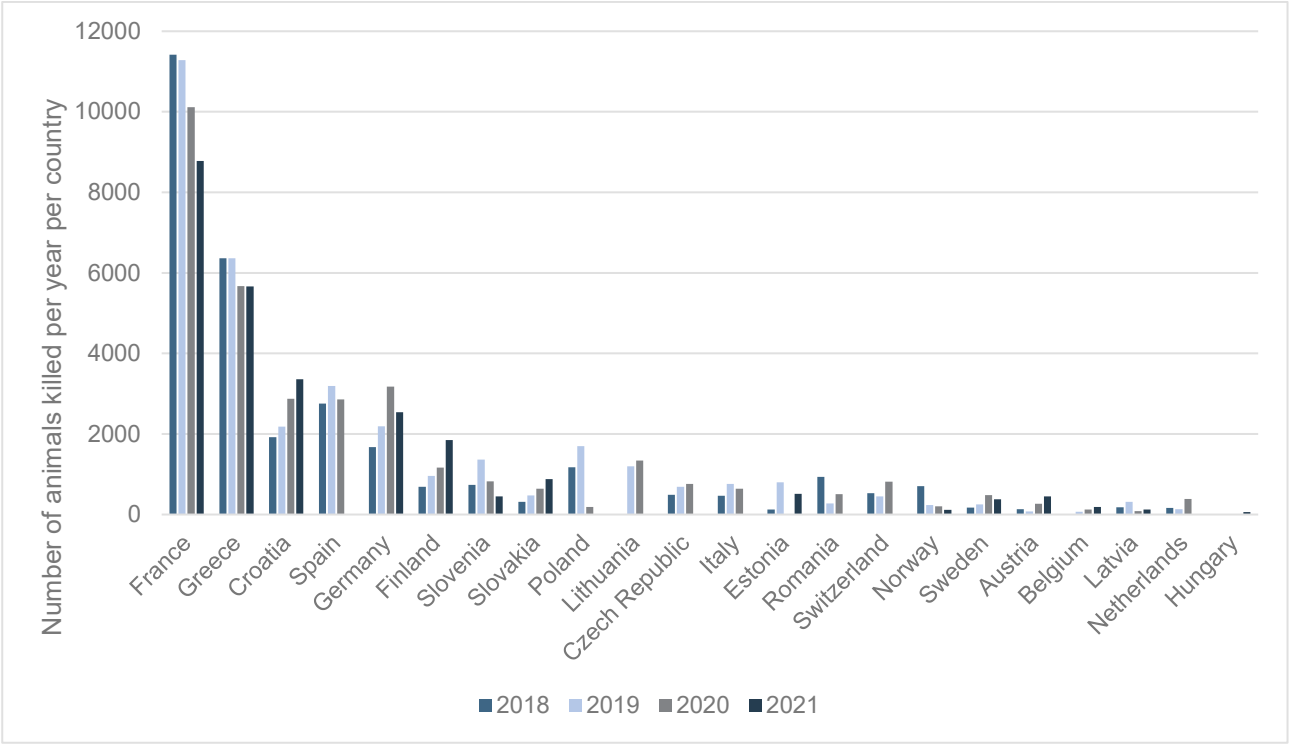

Figure 2: Number of animals killed per year per country

Figure 3: Wolves, Spain © Juan Carlos Blanco

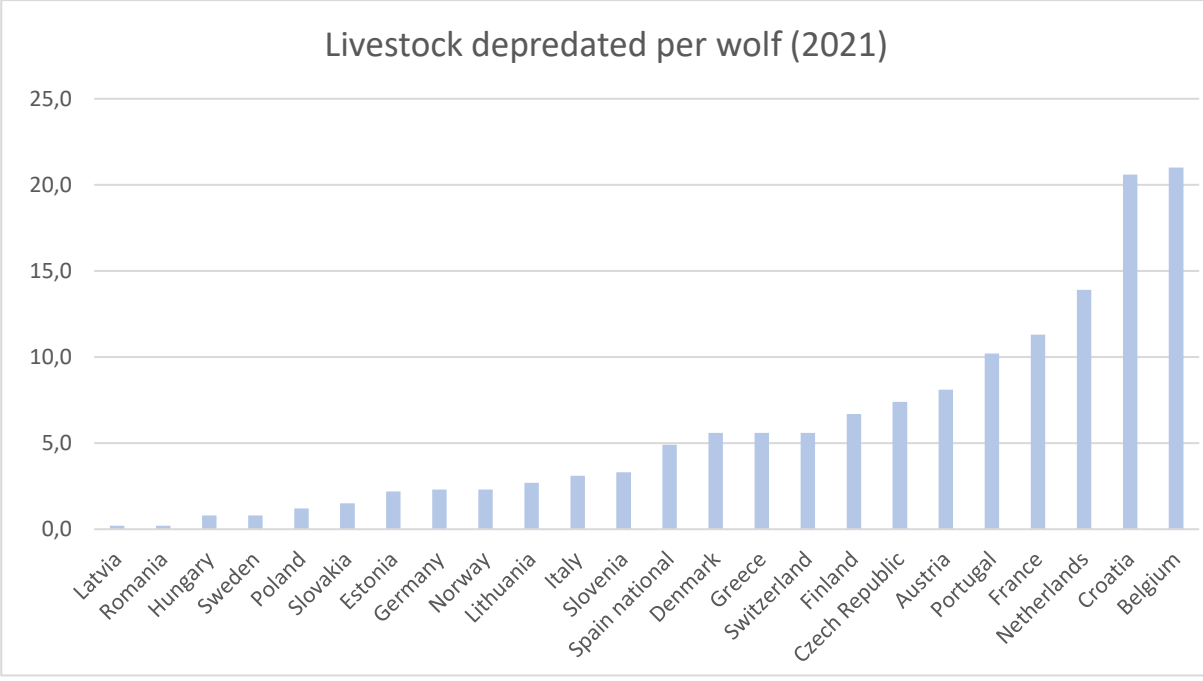

Figure 4: Number of livestock depredated per wolf individual (2021 where available)

The above figures give a broad picture of the extent of livestock depredation across the EU based on compensation payments. Livestock depredation per wolf individual shows that there is significant variation across Europe and that depredation is a significant issue on the "colonisation front". As described above this is as much an indicator of a range of difference in livestock systems, natural habitat, protection measures, compensation systems as wolf numbers. Additionally, it may be that in the countries where wolves have recently returned and are few, incidents are more accurately recorded. Taking these factors into consideration, it nonetheless appears that there is no direct link between large carnivore population figures and depredation.

Isolating the importance of the range of factors listed above is not possible with national level figures. Examining damages reported on a regional level within a single country has potential for better exploring what variables lead to higher or lower reported depredation. Figure 5 is a heat map showing the density of incidents gathered through the case-based system mapped to different geographical levels (national and NUTS 3) (see Annex 1 for number of incidents per country). The map on the right reveals interesting differences within member states. South-eastern France, northern Greece and the Spanish province of Asturias appear to be regional hotspots of reporting depredation incidents. Certain countries report very few cases, such as Belgium and Latvia. In Sweden, the density of cases was lowest of all EU countries analysed. Compared with the 2018-2020 maps presented in Singer et al (2023), adding an additional year of data does not significantly change these findings though some new colonisation areas (e.g. Northern France) can be observed. The average density of incidents decreases slightly in the North of Germany and Baltic states.

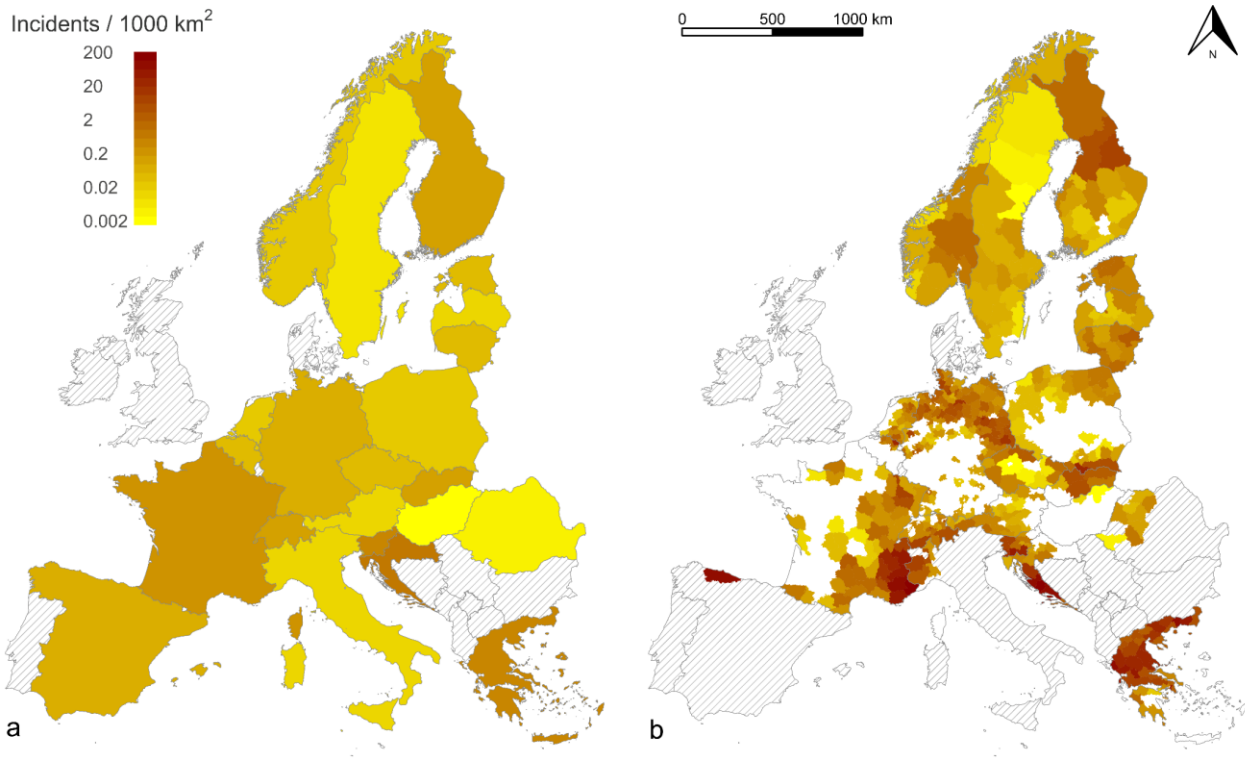

Figure 5: Average wolf-caused livestock incident density on the country level (a) and NUTS3 (b) level (2018-2021)

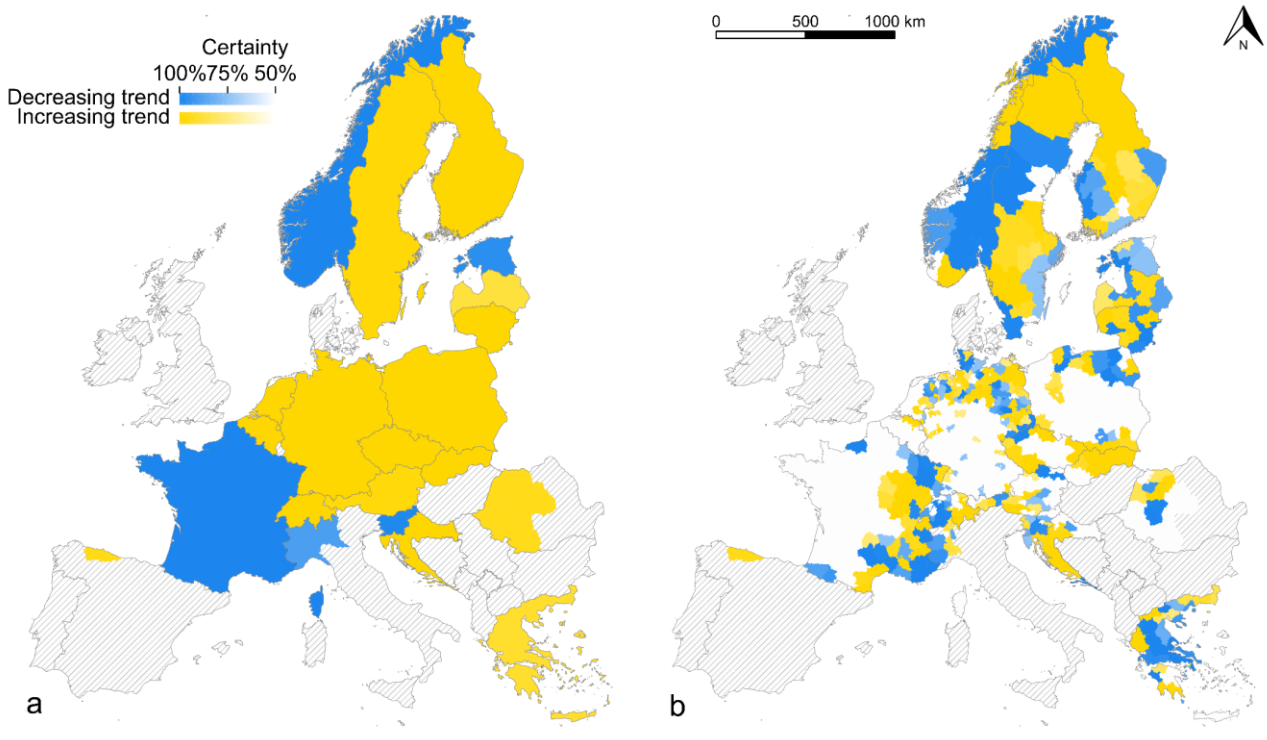

Figure 6: Wolf-caused livestock damage trends based on number of incidents at the country (a) and NUTS3 (b) level (2018-2021).

NB. While an increasing overall trend is shown in Greece, this is inaccurate, as certain data from 2018-2020 could not be geolocated. The actual trend is decreasing when unused incidents are counted.

Figure 6 shows the trends in reported damage over a four-year period. Examining trends rather than incident density indicates more clearly whether damages are increasing or decreasing in a particular location. For example, although incidents are high in France, the trend is decreasing.

At an EU level, these maps give an overall indication of areas where conflict may be arising or decreasing. Zooming in on the data to a regional level and re-examining it with an understanding of local conditions is also valuable. Combining regional-level data and examining it with input from stakeholders and with an understanding of the social, political and institution variables can allow a better understanding of the causes for conflict and of ways to address them.

Box 2. Depredation by other large carnivores

The data on bear depredation data across the EU is less complete than for the wolf. Some countries with significant bear populations such as Romania and Bulgaria do not have well-functioning reporting systems. The numbers here should not be taken as representing the EU total. Nonetheless, a comparison between the countries listed shows that in general, bear depredation of livestock is lower than wolf but that they will take a larger proportion of cattle where available.

These differences are related to the differences in hunting strategies between bear and wolf. Bears are omnivores and scavenge and eat fruits and crops as well as predating. Wolves in contrast, are carnivores, hunt effectively in packs and sometimes kill surplus to their immediate needs.

Lynx can occasionally depredate livestock if other prey is unavailable but are a common cause of damages only in Scandinavian countries. In the case data collected in 2021, there were 5 cases in Slovakia, 1 in Estonia but 397 in Norway.

Wolverine are geographically restricted to Fennoscandia and cause significant damages to reindeer but less to other livestock species though in Norway they do depredate sheep. In Finland, where most damages are recorded, large fluctuations in the number of wolverines have been documented, as well as a significant increase in wolverine-caused killings from approximately 550 in 2002 to 3492 in 2020 with a following decline to 1920 in 2021[23].

[23] Reindeer Herders' Association: https://paliskunnat.fi/reindeer-herders-association/reindeer-info/statistics/ (Last accessed: 09.05.2023)

Figure 7: Bear Bulgaria © Elena Tsingarska

	Bear depredation cases per animal species 2021							**Cf.**
Country	Cattle	Sheep	Goat	Horse	Deer	Other	Total Bear	Total Wolf
Croatia		1					1	3356
Estonia	1	21					22	516
Greece	280	103	60	8			451	5662
Norway		263	2				269	115
Slovakia	19	85	3		6	183	296	881
Total	300	473	65	8	6	183	1039	10,530

Table 2: Bear depredation for select member states

4.3 General findings

The statistical analysis carried out by Singer et al. (2023) as well as by Gervasi et al. (2021) suggest that reported depredation increases with the geographical spread of the wolf to new areas but that the relationship with the number of wolves is more complicated and depends instead on the availability of natural prey, landscape, the use of protection measures. Single wolves can cause significant damages whereas in areas where natural prey is plentiful, there is sometimes little depredation. Overall, the trend shows an initial increase when wolves return to a particular area, followed by a decrease in incidents.

Sheep were the livestock species most frequently targeted by wolves, making up over 50% of all incidents. We describe the findings in relation to livestock depredated in more detail in Section 4. In addition, Singer et al. (2023) analysed depredation figures against a range of other variables. Incidents were analysed over time, showing an expected seasonal variation. Across all livestock species, incidents peaked during summer and early autumn. Nearly 50% of incidents occurred between July and October. In the winter months, incident rates declined in northern compared to southern Europe due to livestock being housed indoors during this period in the North. Reindeer incidents in contrast, peaked in the autumn to winter months. Analysis of incidents against land use types found that in wolf-occupied territories, pasture and broad-leaf forest habitats had the greatest number of incidents reflecting the type of extensive landscapes most suitable as wolf habitat and most impacted by livestock depredation.

4.4 Assessment of the data collection system and its future potential

A case-based incident collection system has benefits and the potential with time to develop into a way of measuring likely human-wildlife conflict in Europe. Only through such means can incidents be measured to a degree that allows comparison over time. The analysis allows national and regional governments to identify depredation hotspots and gain a broad overview of whether protection measures are working or not. It provides them with additional information that can potentially be useful for their management approaches. For example, in Sweden, funding for damage protection is currently allocated broadly on the wolf population in a particular region. However, it is clear from this analysis that this allocation is not representative of damages and potentially unfair. Additionally, providing the data to the research team encourages national and regional administrators to consider what information they collect, how they analyse it, and eventually how they make it publicly available.

Nonetheless, such an approach is challenging. The quantity and quality of information provided in the latest year of data collection which was taken over by the EU Large Carnivore Platform Secretariat (2021) varied between the different countries. The information categories “compensation value”, “# wolves attacking”, and the provision of latitude/longitude coordinates were frequently missing. This led, especially in the case of location, to time-consuming efforts to reconstruct the information in a useable format for statistical analysis. Damage prevention measures and administrative regions were also missing in some cases.

Several countries did not use the provided format at all or only used some of its categories mixed with their own, adding a language barrier by recording data in their native language. In a few cases,

saving detailed data of depredated livestock (split up into different species) in the same excel cells made it difficult to determine total depredated livestock for each incident.

It should be noted that although the information collected was incomplete in many cases, the reporting on damage prevention measures significantly improved in 2021 compared to previous years.

Overall, this system has future potential. Further discussions should be held with the data administrators from the different countries, to encourage further systemisation of the reporting systems and publication on a national level of the data.

5. Livestock breeding and the impact of large carnivore depredation

In this section, we provide information on livestock breeding in Europe and some of the potential impacts of depredation by predators.

5.1 Data availability

Livestock numbers and mortality causes

Surprisingly, data on livestock numbers across Europe are also not easily attainable. Data for this report were mainly obtained from EuroStat[24]. Data were extracted on the scale of the EU's NUTS2 regions. However, data for certain countries and certain years were missing and it was not always obvious whether the whole population (including young) was referred to or (more usually) the breeding population (excluding young).

No EU level information is collected on the causes of livestock mortality. Member States must collect data on the cause of livestock deaths (other than slaughter for human consumption) following the requirements of fallen stock reporting under the animal by-products regulations[25] but there is no requirement to report these figures on the EU level. Data have been obtained in some illustrative examples on the member state level.

5.2 Overview of livestock most depredated

	Annual average animals depredated by wolves (2018-2021)[26]					
Country	Cattle	Sheep	Goat	Horse/ Donkey	Deer	Dog
Austria	3	221	10	1	2	
Belgium	2	78	10	1	7	
Bulgaria	NA	NA	NA	NA		
Croatia	343	1616	519	50		51
Czechia**	40	596	11	2		
Denmark	2	65	11	2		

[24] EUROSTAT http://ec.europa.eu/eurostat Last Accessed: 26.5.23
[25] Regulation (EC) No 1069/2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and its implementing regulation (142/2011) lay down rules on how animal byproducts including fallen stock must be treated.
[26] Figures taken from case-based data collection except in the cases of CH, DK, ES national, IT, PT where LCIE data is used. LCIE data is from a single year, most often 2021

Estonia***	15	438	5	1		14
Finland*	7	192				44
France	125	9718	492	12		32
Germany	77	1665	30	9	162	1
Greece	1218	2828	1938	33		
Hungary*		45	18			
Italy	1400	7200	1200	300		
Latvia	2	169	1		1	2
Lithuania	125	1051	57	4		13
Netherlands**	1	229				
Norway		292				4
Poland**	123	789	23	10	57	10
Portugal	593	1769	295	395		
Romania**	14	532	26			
Slovakia	45	483	11		40	
Slovenia	49	750	14	24		2
Spain national*	752	812	355	996		
Sweden	18	260	1	1		20
Switzerland	3	552	41			

Table 3: Number of animals killed by wolves in each EU country, from 2018-2021

**only data for 2021 available; **data from 2018-2020 available; ***no data for 2020 available; number of horses also includes donkeys; DK, ES, and CH data from 2020, IT from 2019, PT from 2017*

Figure 9: Sheep herd, Massif Central France © Katrina Marsden

Figure 8: Goat herd, Germany © Moritz Klose

Figure 10: Cattle herd, French Alps © Katrina Marsden

Figure 11: Horses, Austrian Alps © Katrina Marsden

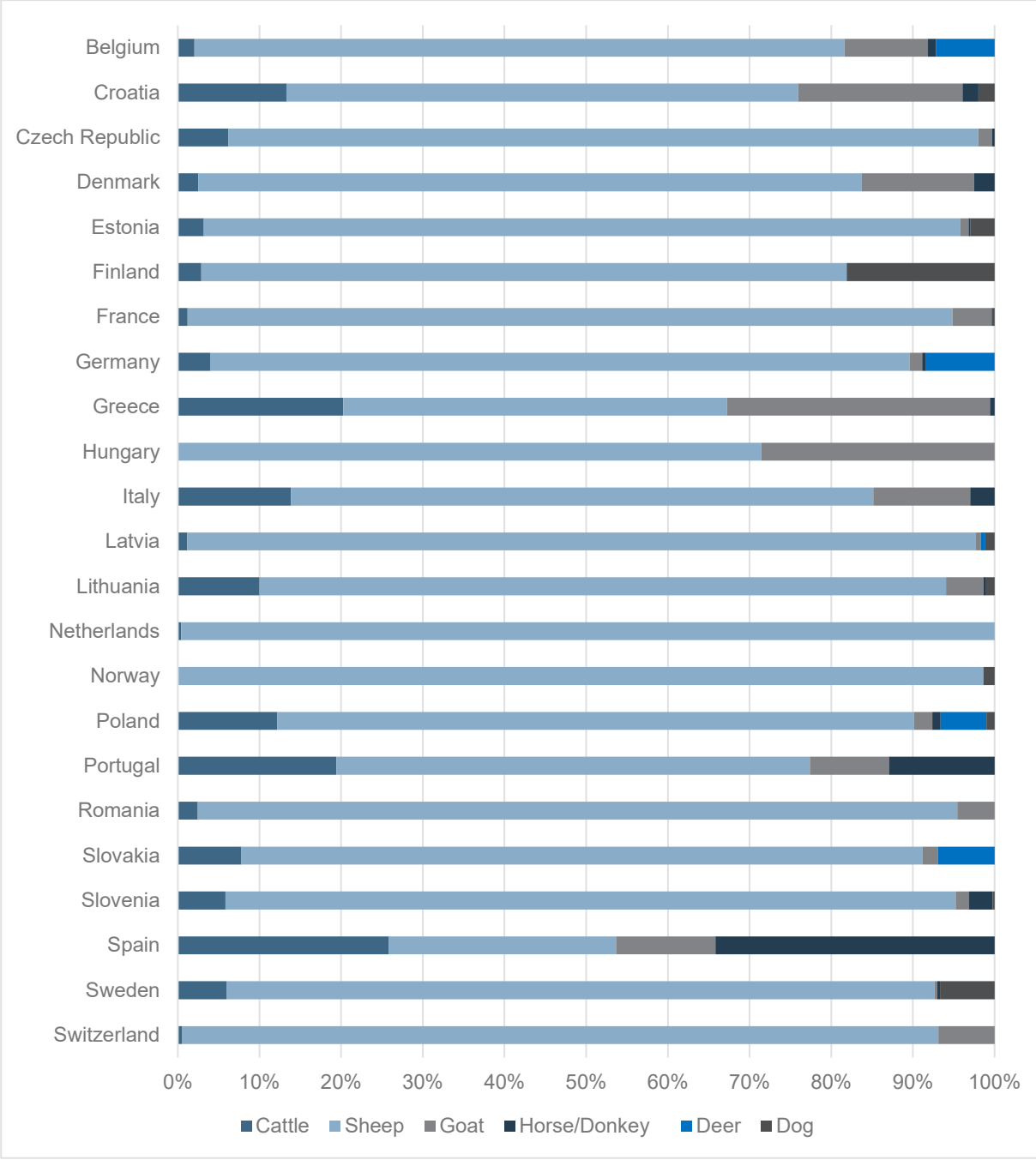

Figure 12: Percentage of average number of animal species depredated per country (2018-2021)

The livestock breeders most impacted by reported depredation by large carnivores are sheep breeders managing extensive stock grazing in pastures. In certain countries, however, attacks on cows and horses take place. In Greece, cattle depredation is relatively important. In Spain, it makes up more cases than sheep. In Finland, Sweden and Norway semi-domestic reindeer depredation is significant. However, for the reasons connected to the data collection systems explored in box 4 below, figures are not included here.

Examining the figures for reported depredation gives some indication of conflict. However, in some cases, conflict can be serious, despite relatively low depredation figures. For example, in Sweden, the killing of hunting dogs by wolves is a particularly emotive issue, though the numbers actually reported are not especially high. Croatia reports the overall largest number of depredated dogs.

5.3 Evolution of livestock numbers in Europe

In this section, we give a brief description of the three main livestock types affected by large carnivores.

Sheep

The total EU sheep population is roughly 59 million (Eurostat 2022) [27], kept for milk and meat production. Sheep numbers are decreasing in the EU, from 2001 to 2021 there has been a 20% drop (from 75 million sheep to 60 million). This has mainly been driven by consumer preference and market pressures. It pre-dates the return of large carnivores in those countries where they were absent[28]. The trend is similar across Europe, though some Eastern European and Baltic countries saw a rise in numbers in the early 2000s. In Romania, this increase continues.

Sheep can be raised through extensive production for wool and meat, intensive dairy production and traditional pastoralism. In the EU, extensive and semi-extensive systems dominate, with some variations, for example in whether sheep are brought indoors for lambing or for winter. Sheep breeding is concentrated in certain member states, with the main sheep breeding countries being Spain (25.1%), Romania (16.8%), Greece (12.1%), France (11.7%) and Italy (11.2%). Approximately 32 million sheep are slaughtered each year in the EU (Eurostat 2023)[29]. There is significant movement of sheep within the EU, partly explained by price differentials between member states and regions as well as the fact that regional production does not equal regional consumption[30]. The EU exports are around 10% of its total production. Live sheep are traded mostly to the Middle East and North Africa.

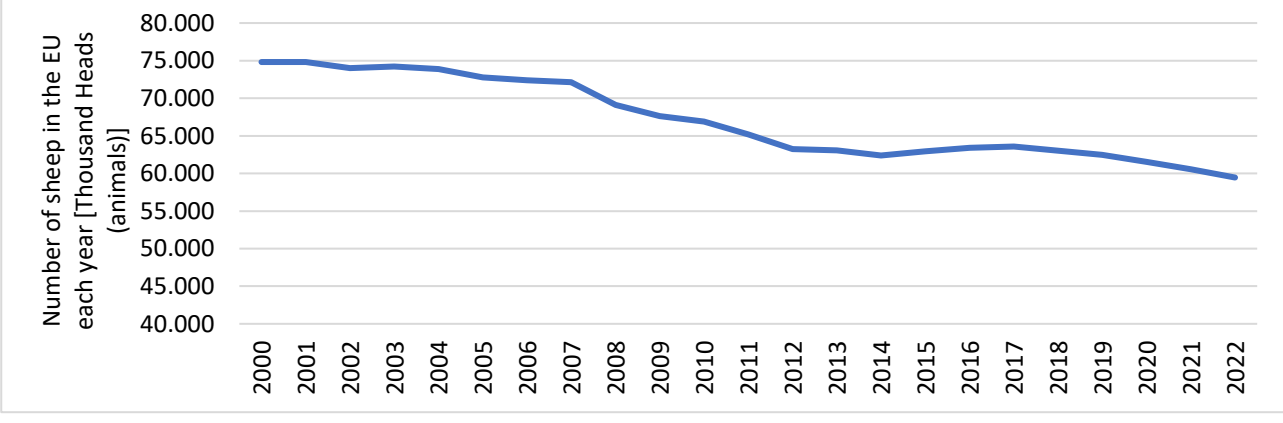

Figure 13: Sheep population changes in the entire EU from 2000-2022. Note that the y-axis does not start at zero

[27] Eurostat (2022). Key figures on the European food chain. https://ec.europa.eu/eurostat/documents/15216629/15559935/KS-FK-22-001-EN-N.pdf/1cb9d295-6868-70e3-0319-4725040cfdb8?version=3.0&t=1670599965263.

[28] Linnell & Cretois (2018). Research for AGRI Committee – The revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.

[29] Eurostat (2023). Slaughtering in slaughterhouses – annual data. Figures for Bulgaria and Slovakia are not available so this is lower than the true total. Last accessed 26.5.23. (https://ec.europa.eu/eurostat/databrowser/view/APRO_MT_PANN__custom_6068440/default/table?lang=en)

[30] European Commission (2022). Commission staff working document Fitness Check of the Animal Welfare Legislation. Document SWD(2022) 329 final. (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0328) Last accessed: 26.5.23

Cattle

The EU provides numbers on the total population of bovine animals which includes annual population data on buffaloes, cows, and dairy cows, as well as heifers and calves of each sex and of different ages. In 2022, the total number of bovine animals in the EU was approximately 75 million. The population has steadily decreased by 11% since 2001 (from 84 to 75 million animals). More than two thirds of all bovine animals (53 of 75 million) in the EU in 2022 are kept in France (23%), Germany (14%), Ireland, Spain, and Poland (each 9%)[31].

The total EU dairy cattle population in 2022 is roughly 20 million[32]. This number is slowly decreasing. In the last 14 years, the population of dairy cows in the EU declined from 22 to 20 million. Of these 20 million, almost half is bred in Germany (19%), France (16%), and Poland (10%).

The EU does not systematically assess whether cattle is kept indoors or outdoors, rendering it impossible to examine the proportion of cattle potentially affected by depredation from EU level statistics.

Box 3. Cattle depredation

In Spain, damage to cattle is so high because in many areas of the Cantabrian Mountains, sheep and goats, which were the predominant type of livestock until about 30 years ago, have been replaced by extensive beef cattle which spend several months of the year in the field. These cattle are less vulnerable to predation by wolves and bears than sheep and goats and require less attention so farmers can combine cattle production with other activities such as tourism, which has become increasingly important in these areas. In addition, since the year 2000, wolves have recolonized some areas of central-western Spain such as Ávila province, where there are huge densities of extensive beef cattle and low densities of wild ungulates. In Ávila province alone, wolves kill more than 1,600 calves each year.

Extensive cattle are difficult to protect with preventive methods. These cattle spend at least six months scattered in the field, so they cannot be protected with fences and it is not always easy to protect them with guarding dogs. The proliferation of extensive cattle in the Cantabrian Mountains and Ávila province is the main reason why damage to cattle has boomed in Spain[33].

In the **French Alps**, attacks on calves have started increasing since sheep flocks are now often well-protected. The signs of wolf-attacks are different and until fairly recently, not all incidents were recognised for this reason. The measures for cattle protection are less well known and not yet financed on a scale similar to sheep but a range of projects and exchanges have been set up building on experiences in Portugal and Italy. Livestock guarding dogs have been put in place for some herds and protective fencing is being experimented with for calves during their first month. Trials have also been carried out with the Hérens cattle breed. Integrating this

[31] Eurostat (2023). Bovine population – annual data. (https://ec.europa.eu/eurostat/databrowser/view/APRO_MT_LSCATL/default/table?lang=en&category=agr.apro.apro_anip.apro_mt.apro_mt_ls) Last accessed: 26.5.23
[32] Eurostat (2023). Number of dairy cows (https://ec.europa.eu/eurostat/databrowser/view/TAG00014/default/table?lang=en&category=agr.apro.apro_anip.apro_mt.apro_mt_ls) Last accessed: 26.5.23
[33] Pers. comm. Juan Carlos Blanco

breed, which is gentle but protective, can help a herd learn how to protect themselves. Hérens also help to calm a herd following an attack.

GPS collars and trackers (linked to the main GPS) can be used on individuals in a herd of cattle or sheep flock. The breeder receives an alert if the herd or flock wanders out of their area or if they start to move in a way that indicates the presence of a predator. This system also has the advantage that, in a mountain environment, the flock can be traced more easily.

Reindeer herding

Reindeer husbandry is conducted in Norway, Sweden and Finland, with large areas of the north of these countries included in the reindeer herding area (40%, 55% and 33% respectively). In Norway and Sweden, husbandry is strongly linked to the Sami culture and only Sami can own reindeer. In Finland, while reindeer herding can be practiced by other EU citizens, it is also linked strongly to Sami culture and the majority of herders are descended from the indigenous people of the area (Lapp village / Sami origin). In general, herds are smaller than in Norway or Sweden with a greater number of herders. Reindeer are in a different category from other livestock in that they are a wild, protected species that has been semi-domesticated over centuries. They have a strong cultural importance in the reindeer herding areas[34].

From lows of under 100,000 animals at the start of the 20th century, the number of reindeer in Finland increased steadily, reaching a maximum of over 250,000 animals during the 1970s and 80s. Since then, this number has decreased to 188,190 semi-domestic reindeer in the 2018/19 season (Turunen et al., 2021)[35]. The overall permissible reindeer population is regulated by the Ministry of Agriculture and Forestry and is controlled through annual culls for meat.

[34] International Centre for Reindeer Husbandry (https://icr.arcticportal.org/finland?lang=en&showall=1) Last accessed: 26.5.23

[35] Turunen et al. (2021). How Reindeer Herders Cope with Harsh Winter Conditions in Northern Finland: Insights from an Interview Study. *Arctic*, 74(2). pp. 188–205. DOI: 10.14430/arctic72667

Figure 14: Reindeer herding, Finnish Lapland © Helena Rännäli

Box 4 reindeer depredation

In the Nordic countries, certain conditions prevail that make semi-domestic reindeer depredation a special case compared with the depredation of other livestock. Across Norway, Sweden and Finland up to 80,000 reindeer can compensated in a year, which makes up a much higher percentage of the entire herd (500,000 to 700,000) compared with other livestock species36.

Reindeer are depredated by all four large carnivore species (wolves, lynx, bears, and wolverines) and in many areas, alternative prey is not readily available. Reindeer themselves range extensively over large areas. This makes finding carcasses and accurately recording cause of death complicated. In Sweden, authorities have therefore put in place a means of paying based on large carnivore abundance rather than actual number of reindeer depredated37.

Livestock protection measures, as applied to domestic livestock, cannot easily be transferred to reindeer and measures such as supplementary feeding of large carnivores during sensitive periods have other potential disadvantages and are rarely put in place. Additionally, the EU CAP does not apply to reindeer herding which is not considered agriculture in the same way

[36] Pekkarinen et al. (2020) Predation costs and compensations in reindeer husbandry, Wildlife Biology, https://doi.org/10.2981/wlb.00684

[37] Perrson et al. (2009) Human caused mortality in the endangered Scandinavian wolverine population, Biological Conservation, https://doi.org/10.2981/wlb.00684

as entirely domestic livestock production systems. Thus, wildlife management authorities generally regulate large carnivore populations by using lethal control methods in the reindeer areas.

While depredation attracts a lot of attention, reindeer husbandry is also negatively affected by other drivers. Modern society infringes more and more on the grazing grounds of the reindeer, with mining, hydro power, wind power establishment, new infrastructure, industrial forestry, increasing tourism, climate change and increasing prices for equipment and fuel[38]. This pressure is likely to increase in future as demand for land for alternative energy sources increases. Climate change also has a significant impact in the north and can result in changes to grazing patterns and habits due to low snow cover. The combination of these issues means that depredation pressures by large carnivore are felt more keenly, not because of increasing predator populations but due to a loss of alternative grazing grounds.

5.4 Sheep depredation

As the most depredated species, sheep is taken as an example to examine the overlaps between sheep distribution, wolf range and populations and depredation. Table 4 shows the depredation of sheep per member state over the measured time period[39].

Country	2018	2019	2020	2021
Austria	128	150	366	435
Belgium	36	85	139	145
Bulgaria	NA	NA	NA	NA
Croatia	1279	1465	2010	2149
Czechia	360	470	677	NA
Denmark	NA	NA	NA	NA
Estonia	382	752	NA	490
Finland*	NA	NA	NA	239
France	10729	10480	9456	8232
Germany	1368	1825	3053	1484
Greece	4118	4069	3387	2598
Hungary	NA	NA	NA	45

[38] Kløcker et al. (2016), Kumulativa effekter av exploateringar på renskötseln – vad behöver göras inom tillståndsprocesser. – Rapport 6722, Naturvårdsverket.

[39] https://agriculture.ec.europa.eu/farming/animal-products/lamb-mutton-and-goatmeat_en#:~:text=Committees-,Overview,areas%20such%20as%20mountain%20regions

Italy	NA	NA	NA	NA
Lithuania	58	990	1112	305
Latvia	184	325	112	106
Netherlands	168	184	482	NA
Norway	666	236	190	107
Poland	974	1558	261	NA
Portugal	NA	NA	NA	NA
Romania	906	244	481	NA
Slovakia	285	525	848	653
Slovenia	665	1039	36	340
Spain	745	914	781	NA
Switzerland	NA	NA	NA	NA

*Table 4: Sheep depredated per member state * No numbers were given regarding animals killed per case. Therefore, only the number of cases reported was included.*

Whenever the countries chose to report sheep and cattle or sheep and goats as one joint category, we used reported sheep numbers in the EU as the ratio to identify the share of sheep

Figure 15: Sheep herd, Germany © Moritz Klose

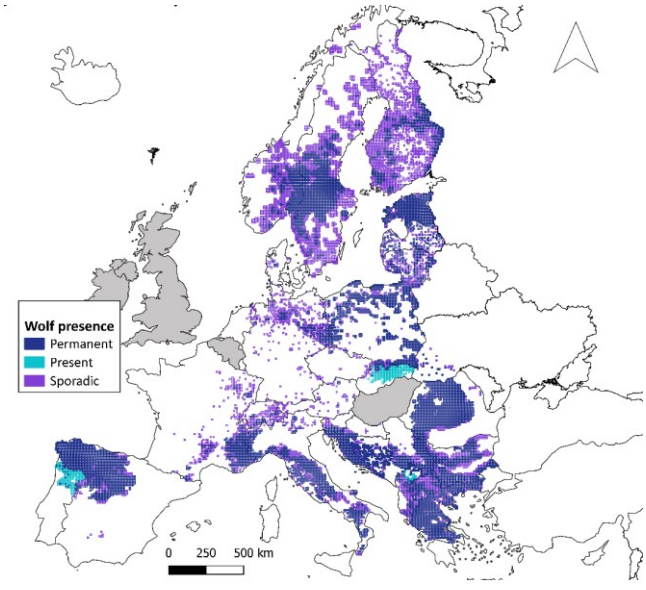

Figure 17: Wolf presence across EU member states LCIE (2016)

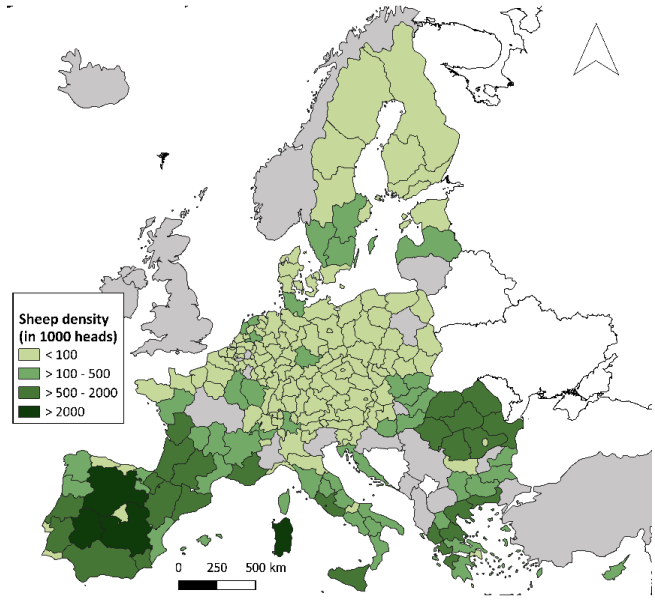

Figure 16: Sheep density to NUTS 2 level, Eurostat (2020)

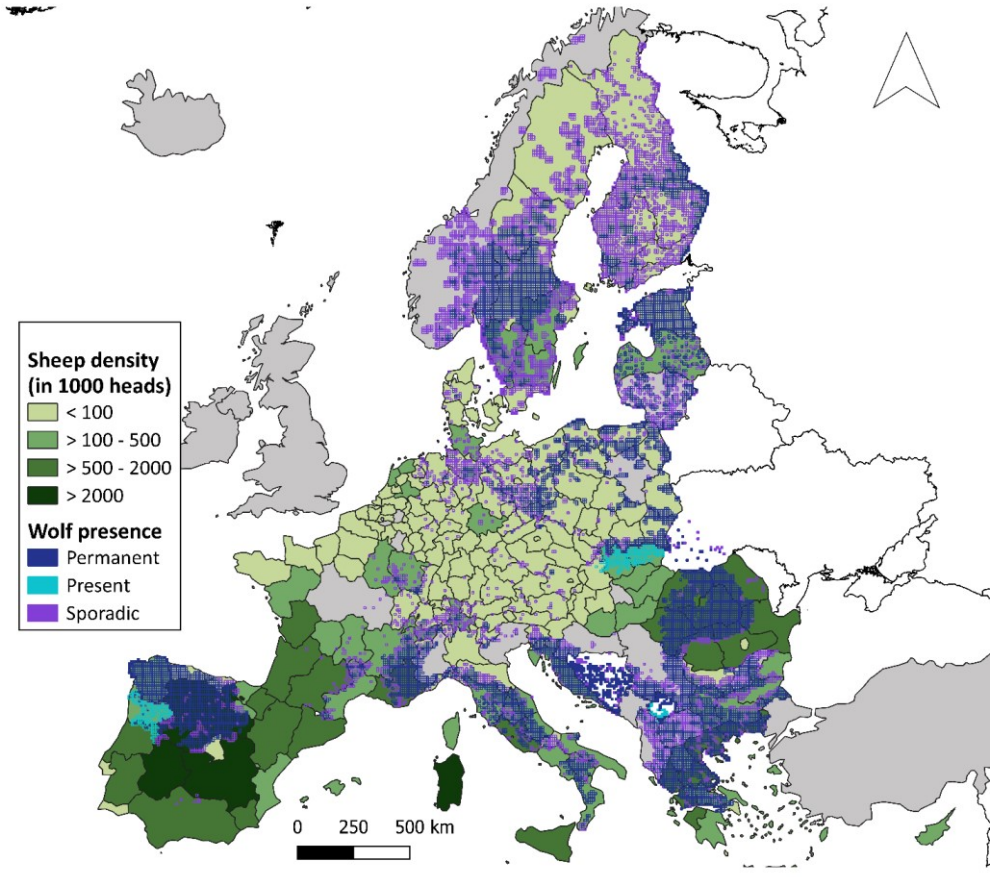

Figure 18: Sheep density and wolf presence in the EU

Figure 18 shows the overlap of sheep production and large carnivore presence. As already noted by Linnell and Cretois (2018), there is significant variation in overlap between different countries. In Romania, Bulgaria, Estonia, Greece Latvia, Lithuania, Slovakia and Slovenia there is significant overlap between the highest sheep densities and large carnivore populations. These are countries which have a longer history of living with large carnivores and have potentially adapted practices. In other countries such as France and Germany, a smaller portion of herds are exposed to large carnivores but conflict is still important. Such large-scale comparisons have limited value as so much depends on the type of farming system rather than the overall population of sheep. Nonetheless, zooming in from the EU scale based on such maps can help examine where risk is high currently or where future conflicts are likely, as well as where there is less conflict despite existing risks.

5.5 Sheep welfare and depredation

According to our findings, 17,329 sheep were depredated in 2020[40]. While not insignificant, this represents 0.07% of the total number of sheep slaughtered for human consumption each year in the EU and 0.04% of the total sheep population.

Recent overviews of sheep welfare have not highlighted depredation as a significant worrying trend for overall sheep welfare. The recent Fitness Check of the EU Animal Welfare legislation[41] isolated

[40] Based on reported data with caveats explored above. Doesn't cover all EU
[41] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0328

the transport of live sheep as the issue of most concern for sheep welfare. The Transport Regulation objective to reduce long journeys has not been fully met and this was one area of highest concern to address.

Sheep have however traditionally received less attention than other livestock due to an assumption that welfare in more extensive systems generally used to raise sheep is better (there is no welfare legislation addressing sheep specifically). A number of recent reviews highlight the challenges faced in extensive raising of stock. A major issue identified is financial pressures on farm labour and the trend over recent times has been towards a higher sheep:stockperson ratio[42]. This and the extensive environment mean that sheep are harder to monitor or observe. In TechCare, an ongoing Horizon project[43], a participative approach was used to identify the most important issues for sheep and goats in extensive and intensive systems. Sheep systems were classified and 80 welfare threats and their impacts identified through an extensive literature review. A series of 11 workshops were held with livestock breeders and they prioritised the welfare issues. For extensive systems, health and nutritional issues (parasites, malnutrition, lameness) were ranked as of greatest importance. Predation together with dog-worrying came 11th in the list of 18 issues with an equal ranking to environmental stress and ranked just before loss on the range[44]. It can therefore be said to be an issue which is relevant to extensive livestock breeders but clearly is not a top priority concern for the majority.

A global review (Temple and Manteca 2020)[45] highlighted the diversity of animal welfare issues which can face extensive systems even within one region due to diversity of terrains and practices. Factors such as chronic hunger and thirst are threats, as well as heat, handling, diseases and injuries. The risk posed by predation is described as minimal compared to other threats where depredation makes up a relatively small proportion of non-human consumption deaths in livestock. In the USA, in States where depredation is regarded as a significant issue 0.5% of cattle are depredated while 7.6% are subject to other forms of (non-human consumption) mortality[46].

In the EU countries where statistics on fallen stock are available, national statistics from several countries indicated that depredation impacts a small proportion of the total sheep population. Figures are however highly variable, likely reflecting both the reliability of reporting systems as well as depredation pressure.

Country / Region	Total sheep numbers	Fallen stock (sheep)	Depredation by large carnivores	% of fallen stock (from total population)	% population depredated
Germany	179,887 (2021)	15,624 (2018)	842 (2021)	8.7	0.47

[42] Morris in: Ferguson, Lee, Fisher (2017). Advances in Sheep Welfare. *Woodhead Publishing Series in Food Science, Technology and Nutrition*. Woodhead Publishing. ISBN: 9780081007181.
[43] Dwyer: What are the most important welfare issues for sheep and goats in Europe? (https://techcare-project.eu/what-are-the-most-important-welfare-issues-for-sheep-and-goats-in-europe/) Last accessed: 26.5.23
[44] Techcare Deliverable D2.2 (2021) Report on the Prioritised List of the Main Welfare issues affecting Sheep and Goats of the greatest concern to European stakeholders. Unpublished.
[45] Temple & Manteca (2020). Animal Welfare in Extensive Production Systems Is Still an Area of Concern. *Frontiers in Sustainable Food Systems* (4). DOI: 10.3389/fsufs.2020.545902.
[46] Laundré (2016). "Predation," in Animal Welfare in Extensive Production Systems, eds. J. J. Villalba and X. Manteca (Sheffield: 5M Publishing Ltd.).

Lower Saxony					
Greece	7,557,900 (2021)	13,400 (2020)	2589(2021)	0.2	0.03
Austria	400,660 (2021)	31,000 (2017)	435 (2021)	7.7	0.11

Table 5: Comparison of total sheep numbers, fallen stock and large carnivore depredation

While we can conclude that, on an EU level, depredation is a relatively minor issue for sheep welfare, the impact in certain regions should not be underestimated. Certain breeders and sheep flocks are more exposed than others meaning that the threat is not evenly distributed. Studies have shown that the stress caused by repeated attacks in some areas may impact on the health and productivity[47] of livestock as well as potentially affecting the areas they graze (avoidance of exposed areas)[48]. On an individual farm level, the impact may be serious both in monetary terms and in distress caused to animals and their keepers.

5.6 Impact of predation on livestock keepers

Large carnivore attacks on flocks also cause psychological distress to livestock breeders and shepherds. Flykt et al. (2022)[49], analysing the situation in Sweden, note that farmers, large carnivores and livestock can all be included in an “ecology of fear” or “landscape of stress” where behaviours are modified according to fear experienced and provoked for all participants.

Zahl-Tanem et al (2020)[50] describe distress as being related principally to three causes: 1. attachment to stock; 2. the feeling of lack of control and lack of faith in authorities; and 3. the need to make undesired changes to farming practice including introducing dogs, changing grazing patterns, accompanying flock or hiring shepherds, building new infrastructure. This puts new, often undesired pressures and focus on a breeder’s work (including more paper work to claim protection and compensation measures), leaving less time for other tasks and family life. Distress appears to be less related to fear of financial loses (at least in the countries studied where compensation systems work relatively well).

Contributing to their distress, in addition to the above factors, breeders feel that there is little recognition of their efforts to adapt to the wolf or sympathy for their plight, that they are paid for damages and therefore shouldn’t complain. The fact that Livestock Guarding Dogs, in particular can lead to conflicts with neighbours and tourists also adds to the stress experienced. (Nicolas and

[47] Dwyer, C., & Bornett, H. (2004). Chronic stress in sheep: Assessment tools and their use in different management conditions. Animal Welfare, 13(3), 293-304. doi:10.1017/S0962728600028402
[48] Meuret et al. (2017). Élevage et loups en France : historique, bilan et pistes de solution. *INRAE Productions Animales*, 30(5), 465–478. DOI :10.20870 /productions-animales.2017.30.5.2277
[49] Flykt et al. (2022). “Landscape of Stress” for Sheep Owners in the Swedish Wolf Region. *Frontiers in Ecology and Evolution* (10). DOI: 10.3389/fevo.2022.783035
[50] Zahl-Tanem et al. (2020). The impact of wolves on psychological distress among farmers in Norway. *Journal of Rural Studies*. 78(6). DOI: 10.1016/j.jrurstud.2020.05.010

Doré, 2022)[51]. All three of the above studies suggest that stress caused by wolf presence is variable, ranging from "acute" when experiencing the violence of a first attack to "ambient" based on knowledge of wolf presence in the area. Nicolas and Doré (2022) suggest that after around five years, there is some acceptance of the situation in a particular area. On the other hand, in new areas, learning from previous experiences (both administrators and breeders) seems to have little impact and those on today's wolf "colonisation fronts" experience the same shock as well as similar initial lack of support as those in Mercantour when the wolf first returned to France in the 1990s.

While not yet studied in depth, the reports above indicate that financial support is only part of the solution to reducing conflict around livestock depredation. Most breeders do adapt to the situation over time, but recognition and acknowledgement of this additional burden is important.

Box 5 Vercors, France case study

In the Regional Natural Park of Vercors, France, a diverse stakeholder group established through an EU funded pilot project built on many years of work established by the regional park authority, brought stakeholders together to discuss the park's "wolf plan". The wolf returned a relatively long time ago in Vercors and breeders have often adapted their practices, with the use of livestock guarding dogs (LGDs) being widespread. The conflict observed at this regional platform was therefore less centred around the presence of the wolf and more on the reaction of others using the space (walkers, trail-runners, cyclists as well as local people) to the presence of protection measures, especially LGD. With the help of a trained facilitator, the group members (breeders, shepherds, pastoral associations, nature associations, local elected officials, administrators, sports and tourism representatives) worked together to produce the text of a "common narrative" on how to share a territory and respect those working the land. The narrative is promoted and supported by a video[52] and leaflets, and work has also been carried out to reach out to the press to place the narrative and reduce polarised reporting on conflict around the wolf's presence. The whole text is available online on the Park's website[53] and translated sections are quoted below.

"Originally, wolves were an integral part of the natural environment, and although their disappearance was orchestrated by humans, today they find their full place in ecosystems.

…But the return of the wolf also has problematic concrete effects... such as the attacks perpetrated on the flocks to the great detriment of the breeders. The presence of wolfpacks causes significant damage to this economic activity... Learning to coexist therefore represents a real challenge for the whole of society.

… The permanent presence of packs and predation makes pastoral activity more complicated and more demanding. Thus, several protective measures that have become necessary again, including the use of Livestock Guarding Dogs such as patous, as this is the most effective tool for preventing attacks.

[51] Nicolas & Doré (2022). Face aux Loups : étude socio-anthropologique des effets de la présence des loups sur la santé des éleveurs et berger. *Inrae pour la Caisse Centrale de la Mutualité Agricole*. 40 pp. https://hal.inrae.fr/hal-03681624
[52] Parc naturel régional Vercors (2023). Histoire d'un récit commun, vivre ensemble et partager le Vercors: https://youtu.be/Eo_1jvMpFTQ Last accessed 26.5.23
[53] Parc naturel régional Vercors : https://parc-du-vercors.fr/loup_territoire Last accessed 26.5.23

Throughout the year, day and night, shepherds and breeders face predation. In addition to the management of their herd and the grass resource, they must also observe their livestock guarding dogs continuously, make them respect them, anticipate behaviour by knowing in advance the character of the animal, maintain a relationship of trust, adapt the positioning of the herd to best take into account other users... All these new missions are all the more challenging and difficult to carry out when the dogs are surprised by this or that unexpected leisure practice, exacerbated by the presence of pet dogs.

Everyone must fully understand and respect the uses of these spaces, where leisure activities are combined with these economic activities. Thus, going around the herds so as not to disturb them, respecting the shepherd's hut, making sure to close gates, not making fires or leaving litter... are fundamental skills to acquire and pass on to the youngest to benefit more sustainably from this exceptional nature.

Enjoying the Vercors massif therefore means carrying values within yourself: respect, politeness, benevolence, interest and attention to local farmers and breeders."

6. Availabilty of damage prevention measures

In this section, we describe how livestock protection measures are currently supported by EU funds in different member states.

Figure 19: Electric netting © Moritz Klose

Figure 20: Livestock guarding dog and herding dog, French Alps © Jérôme Patrouiller

Figure 21: Shepherding, Germany © Moritz Klose

6.1 Data availabilty

Funding for livestock protection is already available across most EU countries either through EU projects (LIFE, Interreg), CAP funds or national funds. However, awareness and uptake are very variable. Figures on intentions regarding the funding of prevention measures through EU funds are readily available for many countries.

A first overview of Member State intentions for the financing of prevention measures was included in their Prioritised Action Framework (PAF)[54]. Since large carnivore species are, with some exceptions, strictly protected under Annex IV of the Habitats Directive, member states are obliged to describe how they will appropriately finance conservation measures including those aimed at reducing conflict and improving coexistence. In section *E.3.2. Prevention, mitigation or compensation of damage caused by protected species* member states list the annual spending plans for improving coexistence, they also describe (in some but not all cases) the sources of this financing (EU, national or regional funds).

For those member states which finance protection measures through the Common Agricultural Policy (CAP) (see below), they must describe the measures included in their CAP Strategic Plans (CSPs). Many CSPs also include intended spend on a specific intervention. However, in some cases a range of investments, such as fencing for different purposes or different types of agri-environment measures, are grouped together under one budget line so it is not always possible to isolate the spend for damage prevention measures.

[54] Prioritised action frameworks (PAFs) are strategic multiannual planning tools, aimed at providing a comprehensive overview of the measures that are needed to implement the EU-wide Natura 2000 network and its associated green infrastructure, specifying the financing needs for these measures and linking them to the corresponding EU funding programmes.

Figures on actual spend on prevention measures are even more difficult to come by since the ex-post evaluations of the CAP provide financial information only at the measure level (rather than sub-measure). Additionally, the timing of the ex-post evaluations mean that they receive little public scrutiny (the ex-post synthesis of the 2007-14 Rural Development Programmes (RDPs) was published in 2020, member states are due to submit the ex-posts for the 2014-2022 RDPs at the end of 2026[55]).

Damage statistics are also of little help. While State Aid rules require member states to check that prevention measures are in place before they compensate livestock keepers for losses caused by large carnivores, there is no systematic recording of the type of protection measures in place across Europe or how these measures were funded. What counts as a protection measure (or indeed what is effective as a protection measure) also varies significantly from country to country or even region to region.

Finally, although prevention measures in specific locations have been well-tested through LIFE projects and much has been learned through traditional practices and experimentation, there are few formal experiments with randomisation and control groups in the field demonstrating the impact of livestock protection measures[56]. Given the regional differences and large number of variables to be considered, serious and costly longitudinal studies would be needed to draw out scientifically sound results. Among other political and technical considerations, ethical implications (e.g. establishing control and treatments groups, knowingly exposing livestock and wolves to aversive experiences) render experimentation challenging. Yet, the lack of rigorous evaluation of (promoted) protection measures feeds scepticism about their effectiveness. This knowledge gap, which has been pointed out by farmers, NGOs, governments and scientists, is one worth addressing[57]. In the meantime, locally relevant mitigation system can be built up from the knowledge and best practices already available and well documented[58].

[55] Member states have an additional 2 years at the end of the programming period to finish implementing the Rural Development Programmes (i.e. they can run until 2025). This is a reason that reporting cannot be earlier.

[56] E.g. Eklund et al. (2017). Limited evidence on the effectiveness of interventions to reduce livestock predation by large carnivores. *Scientific Reports* 7(1), pp. 1–9. DOI: 10.1038/s41598-017-02323-w **and** van Eeden et al. (2018). Carnivore conservation needs evidence-based livestock protection. *PLoS Biology*. 16(9), pp. 1–8. DOI: 10.1371/journal.pbio.2005577; Treves et al. (2016) Predator control should not be a shot in the dark. Frontiers in Ecology and the Environment, https://doi.org/10.1002/fee.1312; de Roincé et al. (2016) Évaluation de l'efficacité des mesures de protection des troupeaux contre le loup NESE n° 42, Novembre 2017, pp. 39-58 https://www.terroiko.fr/sites/default/files/pdf/2_tap_loup_NESE.pdf

[57] Ibid.

[58] e.g. Bruns et al. (2020) The effectiveness of livestock protection measures against wolves (Canis lupus) and implications for their co-existence with humans, Global ecology and Conservation, https://doi.org/10.1016/j.gecco.2019.e00868; Wilkinson et al. (2020) An ecological framework for contextualizing carnivore–livestock conflict, Conservation Biology, https://doi.org/10.1111/cobi.13469; LIFE ELC Standard Operating Procedures: Standard Operating Procedures (SOPs) for Improved Management of Large Carnivores in Europe: https://www.eurolargecarnivores.eu/de/sops; ENCOSH.org; Meuse Nature Environment: Moyens de dissuasion* / dossier technique: https://www.loup-elevage-plaine.fr/moyens-de-dissuasion-exp%C3%A9rimentations-1; AGRIDEA: https://www.agridea.ch/de/themen/laendliche-entwicklung/herdenschutz/; DVL Herdenschutz in der Weidetierhaltung: https://www.herdenschutz.dvl.org/

6.2 EU rules and funding of compensation and protection measures

Compensation for stock depredated by large carnivores is not financed by the EU but can be paid through state aid[59] (national or regional financing) providing that prevention measures are in place (where prevention measures are possible) after a first attack has taken place. Under the *Guidelines for State aid in the agricultural and forestry sectors and in rural areas*[60] updated in 2022, compensation of 100% of costs can be paid for direct damages (animals killed or crops lost) by protected species and 80% for indirect damages (veterinary costs, labour, loss of productivity).

Prevention measures (mainly fencing, livestock guarding dogs and shepherding) can be funded by national funds to 100% of eligible costs following the above State Aid rules and under de-minimus requirements, which places a maximum limit on payments of 30,000€. Higher levels of funding can be allocated using EU funds. The LIFE programme has been widely used to test prevention measures, especially in new locations or linked with other coexistence measures through project-based approach[61]. The European Regional Development Fund (ERDF) can also be used, for example through Interreg projects.

Box 6 Examples of LIFE and Interreg funding

LIFEstock Protect, Austria, Germany, and Italy

The LIFEstockProtect project runs from September 2020 to August 2025. Several partners in each region support coordination, management and execution of the project. It has a budget of 4,988,308€ of which 75% is provided through EU LIFE programme funding. The project's main goal is the promotion of livestock protection measures suitable for alpine conditions and the associated communication and education. Target species are wolves and birds of prey. The herd protection measure of highest relevance to the project are livestock guarding dogs (LGD). The related activities include training of LGDs, training of livestock breeders to use LGDs, facilitation of knowledge transfer between farmers and livestock protection consultants, and the establishment of shepherding courses as well as volunteer schemes for support. To plan and carry out key activities, livestock protection competence centres are being established. The project will further investigate the efficiency and requirements of fences and fence material to be an effective livestock protection system.

Carnivora Dinarica, Slovenia and Croatia

[59] Following the requirements of Commission Regulation 2022/2472 declaring certain categories of aid in the agricultural and forestry sectors and in rural areas compatible with the internal market in application of Articles 107 and 108 of the Treaty on the Functioning of the European Union. https://eur-lex.europa.eu/eli/reg/2022/2472/oj

[60] European Commission (2022). Communication from the Commission – Guidelines for State aid in the agricultural and forestry sectors and in rural areas. Document C(2022) 9120 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022XC1221(01)

[61] LIFE EUROLARGECARNIVORES: Overview of LIFE projects on large carnivores and their conflict-prevention measures https://drive.google.com/file/d/1-TzMit8sydOf2-doMEqIeVQjevwvKJVo/view

European Commission - Environment Directorate-General: LIFE and human coexistence with large carnivores https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/life_and_human_coexistence_with_large_carnivores.pdf

European Commission, Istituto di Ecologia Applicata, IUCN/SSC Large Carnivore Initiative for Europe: Large Carnivore Conservation and Management in Europe: The contribution of EC co-funded LIFE projects: https://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/task_2_life_and_lc.pdf

The Carnivora Dinarica (Cross-border cooperation and ecosystem services in the long-term preservation of large carnivores populations in the Northern Dinarides), led by the University of Ljubljana and co-coordinated by two further Slovenian partners and five Croatian 7 partners, ran from September 2018 to February 2021. It was financed to 2,347,340€ through the INTERREG V-A Slovenia – Croatia programme. The overarching aim of the project was to improve the conservation status of the large carnivores lynx, wolf, and bear, as their long-term presence in the Northern Dinaric region is crucial for local biodiversity and ecosystem stability. This included improving the coexistence of large carnivores and humans through the provision of prevention measures and education. Prevention measures developed and supported by the project were electric fences, livestock guarding dogs, clear signalization for road signs, a rescue centre for abandoned lynx cubs, and access to education for local stakeholders and children, through material, workshops, and activities. The project found the following approaches to be the most efficient in protecting property and livestock from large carnivores: protection with electricity such as fences, livestock guarding dogs, and shepherd pasturing[62,63].

For wider roll-out, CAP funds are more appropriate. The CAP, especially the European Agricultural Fund for Rural Development (EAFRD) which co-finances, with the Member State, the Rural Development Programmes, has been used to fund the full range of protection measures from purchasing livestock guarding dogs to paying shepherds' salaries (see below and Marsden and Hovardas 2020[64]). Under the CAP 2023-2027, the direct payment ecoschemes (funded through the European Agricultural Guarantee Fund (EAGF) provide another means to fund broader measures such as overarching support to pastoral systems. However, there are currently no examples of ecoschemes being used for measures directly related to damage prevention, despite several countries having finance measures related to animal welfare or shepherding that could potentially be targeted to reduce the risk of livestock depredation.

Box 7 Ecoscheme use in Slovakia

In a number of countries, the ecoschemes are used to support extensive farming. Lithuania, Slovenia and Spain, for example, have schemes to maintain extensive grazing, recognising the environmental benefits it provides.

Slovakia is the only country which makes a direct mention of depredation by large carnivores in an ecoscheme. An animal welfare scheme for pastural farming is proposed which recognises the value of pastural farming and the threats to traditional systems which are listed as including intensification and depredation by large carnivores. The measure recognises the challenges in keeping animals outdoors according to the required animal welfare standards and in order to incentivise continuation of outdoor grazing proposes a payment with the following requirements.

[62] Project Carnivora Dinarica (https://www.dinapivka.si/en/project/project-carnivora-dinarica/) Last accessed: 23.5.23
[63] Carnivora DInarica (https://www.wwfadria.org/what_we_do/all_initiatives/carnivora_dinarica2/) Last accessed: 25.5.23
[64] Marsden and Hovardas (2020) EU Rural Development Policy and the management of conflictual species: The case of large carnivores https://doi.org/10.1016/j.biocon.2020.108464

During the pasture season:

- ensure grazing for a minimum of 120 days for sheep and goats from 12 months of age;
- ensure grazing of at least 120 days for dairy cows;
- ensure grazing for a minimum of 150 days for heifers from the age of 12 months;
- the basic need for feed must be covered with grazing;
- a register of grazing details must be kept; and
- terms of the commitment with all animals must be implemented.

While depredation as a threat is included in the measure description, the requirements unfortunately do little to encourage reduction of this threat. There is no mention of the use of livestock protection measures. The ecoscheme may therefore encourage the maintenance of pastoral systems but is unlikely to reduce the potential of conflict related to large carnivore presence.

6.3 Overview of the use of CAP funds for livestock protection

The EU Platform Secretariat has followed the use of CAP funding for livestock protection from large carnivores over the last three funding periods. In previous periods, administrators provided information to the Secretariat through a questionnaire. Under the new CAP (2023-2027), the translated versions of the national CSPs were analysed by searching for key words related to livestock protection and depredation. The overview provided gives an indication of the importance of livestock protection measures for the member states. Nonetheless, there is enough flexibility in the broad interventions under the new CAP to allocated funding to livestock protection under a range of interventions, even if there is no specific mention made of large carnivores. It should also be noted that member states can make annual changes to their CSPs, and therefore that the situation may evolve over time.

Table 6 shows member states intentions to fund livestock protection measures at the date they submitted their final CSPs to the European Commission (end of 2022).

Country / region	2007-13 Measure code[2]	2014-20 Measure code[2]	2023-27 Intervention[2]	Large carnivore targeted[3]	Purchasing fencing[4]	Purchasing LGD	Maintaining fencing	Keeping LGD	Unharvested crops (B)	Shepherd salaries	Shepherd accommodation	Vulnerability analysis	Advice
Austria			70	W				y					
Belgium[1] (F)			73	W	y								y
Belgium[1] (W)			73	W	y								
Bulgaria	214	10.1	70	W, B, L				o x y					
Croatia		4.4	73	W, B	x y	x y							
Estonia			73	W, B	y								
Finland		4.4	70	W, B, L, Wn	x y		y						
France		7.6, 10.1	70, 73	W	x y	x y	x y	x y		x y	x y	x y	x y
Germany[1]	323, 216		70 (2 regions)	W	o y	o y							
Greece	216, 214	4.4	70, 73	W, B, J	x y	o y		o	y				
Italy[1]	121, 216 (3 regions)	4.1, 4.4, 10.1 (12 regions)	70 (4 regions, 73 (2 regions)	W, B	o x y	x y	y	y		y			
Latvia		4.1	55, 73	W, B(y)	x y								
Lithuania		4.1	73	W	x y	y							
Portugal		10.1	70, 73	W				x y					
Slovenia	214	10.1	70, 73	W, B	y	y	o x y	o x y		o x y			
Spain[1]	227 (1 region)	4.1, 4.4, 10.1 (7 regions)	70 (4 regions), 73 (4 regions)	W, B, L	o x y	o x y	y	y					
Sweden	216	4.1	-	W, B, L	o x								

Table 6: Use of the CAP to fund protection measures over the last three funding periods

[1] Countries with regionalised programmes.

[2] Codes are used to refer to the measures or interventions. In the 2023-27 regulation, these are equivalent to the articles of the regulation and measures have been integrated into a smaller number of interventions. The numbers referred to here are as follows: 214 = 10.1 = 71 = agri-environment (-climate) objectives; 121 = 4.1 = 73 Support for investment in agricultural holdings; 216 = 4.4 = 73 = support for non-productive investment linked to the achievement of agri-environment objectives (-climate); 323 = 7.6 = 73 = investments and studies linked to cultural and natural heritage; 227 = non-productive investment in forest areas; 55 = intervention in the apiculture sector (EAGF)

[3] W = wolf; B = brown bear, L = lynx; Wn = wolverine, J = jackel

[4] o = 2007-13 period, x = 2014-20 period, y= 2023-27 period; entries reflect the availability of each measure and not related to uptake.

Figure 22 shows Member States intended spend of CAP funds on the measures listed above. This is based on the figures included in the financial plans of their CAP SPs. Since rural development interventions are co-financed, this includes a component of national financing. Certain member states (Austria, Belgium and Estonia) identified measures but did not allocate an overall spend, others only allocated spend for one measure out of several or only for certain regions within the member state. Based only on those countries or regions clearly, explicitly, and specifically attributing a budget to interventions to reducing damages by large carnivores, the EU component of spend on protection measures has been calculated at around 200m€ over the 2023-2027 funding period. This is therefore minimum figure for *planned* expenditure. It makes up 0.07% of the planned spend of the CAP (270 billion).

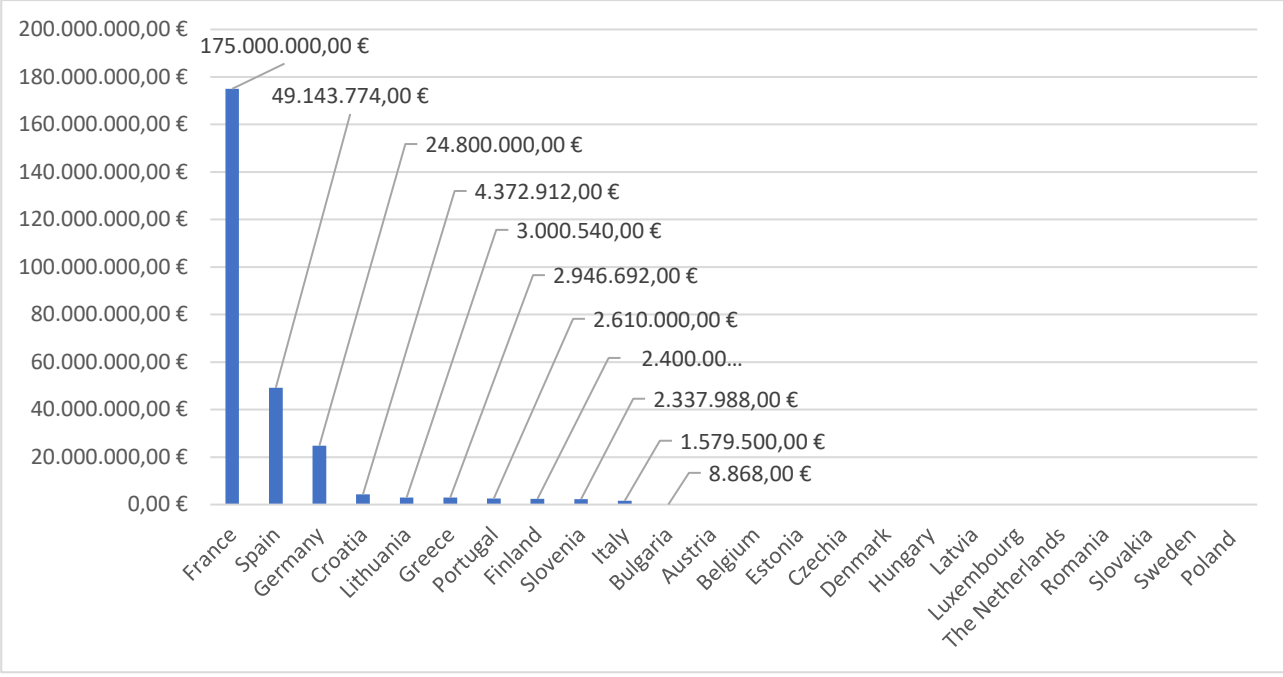

Figure 22: Intended spend of CAP funds on livestock protection measures

As is clear from Figure 12, there is no standardised approach to protection measures. There is significant variation in the planned spend and measures chosen between member states. This reflects to some extent experience with the use of protection measures and awareness of their availability. Availability of funding for livestock protection does not necessarily result in lower compensation costs. There is also significant variation on the focus placed on compensation compared with prevention. Figure 13 shows prevention funding as a % of compensation (over 100% means that prevention payments are higher than compensation and under that they are lower). Many member states do not provide consequent information on the funds allocated to compensation.

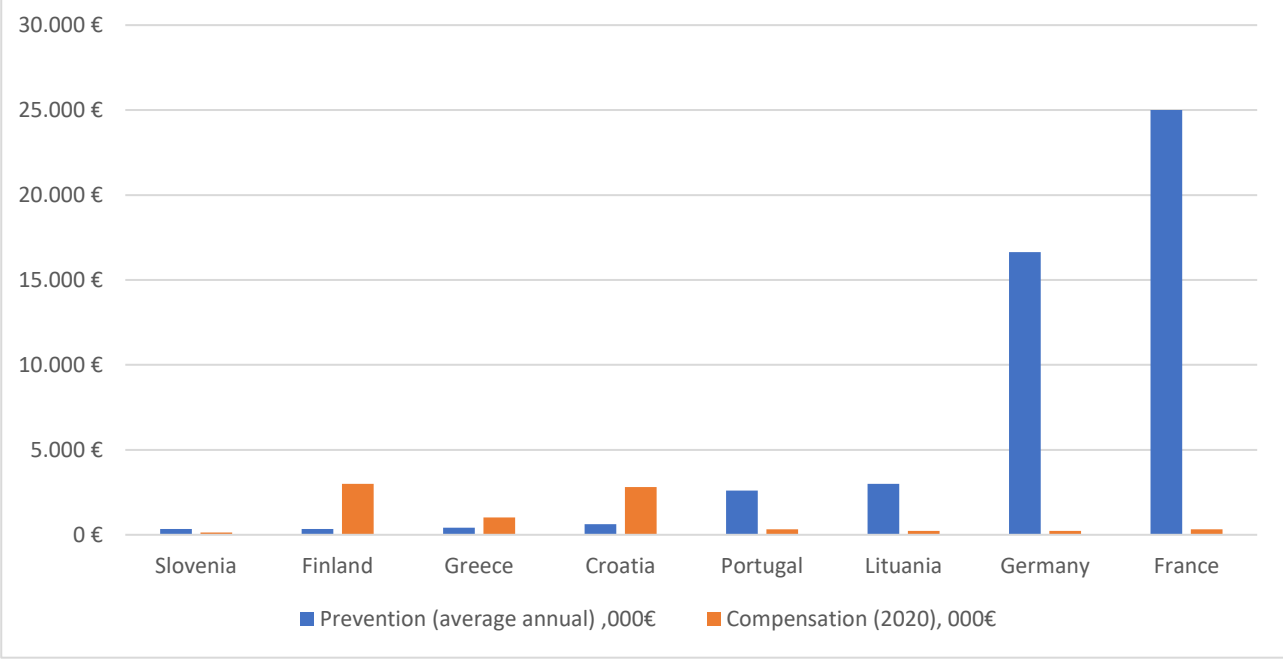

Figure 23: Comparison prevention and compensation funding in 8 member states

Box 8 Examples of protection financing

France

In France, protection measures are funded through the Common Agricultural Policy (CAP - rural development programme). The state started started funding protection in 2004 and a fully developed set of measures is now available including significant financing for shepherds' salaries. This is useful to livestock breeders not only for damage prevention purposes but also herd welfare and is a popular measure.

Protection measures must be contracted each year by the eligible persons. The cost of protection measures is borne at 80%-100% by the MAA and the EAFRD, the remaining 20-0% being borne by livestock owners (depending on measure and location). The French CAP Strategic Plan lays out the measures available and is translated into national law by the decree of 30 December 2022[65] which sets forth the terms and conditions for implementing flock protection.

Interventions: 73.16 investment connected to the protection of livestock against predation and 70.26 protection of flocks against predation (investment and agri-environment measures)

1. reinforced guarding/enhanced surveillance: Covers the costs of the additional work for the breeder themselves (daily lump sum of 30.75€) or for them to hire shepherds to guard the flock (based on expenditure with ceilings).
2. livestock guarding dogs:
    a. purchase, sterilisation and behaviour testing (flat rates paid for purchase (375€) and sterilisation (250€) and actual costs for behavioural testing within a limit)
    b. maintenance (flat rate of 815€ per dog paid with a limit based on the size of the herd)
3. material investment (electrified parks) (based on expenditure with ceilings);
4. analysis of the vulnerability of a farm to the risk of predation of herds (based on expenditure with a ceiling of 5,000€);
5. technical support (based on expenditure with an annual ceiling of 2,000€, and unit ceilings of 600€ for a training and 150€ for collective training).

Slovenia

Slovenia included livestock protection measures in their first Rural Development Programme and have expanded the range of these measures following experiences with multiple LIFE projects. Next to France, they have the most complete set of activities covering both the maintenance and purchase of fencing and guarding dogs, as well as top ups for shepherd salaries.

[65] https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000046847661

Agri-environmental-climate (70): *IRP18.03 — Agri-environment-climate payments — Biodiversity and landscape BK.12 Living with large carnivores* supports the following herd protection measures:

a. electric fences and electrical nets 118,64€/ha/yr

b. shepherding 269.20€/ha/yr

c. Livestock Guarding Dogs 85,60€/ha/yr

In addition to maintenance costs, initial investment (73) is covered. *IRP02 — Investments in productivity gains and technological development, including digitalisation of agricultural holdings* funds digital measures to protect grazing animals against attacks by large carnivores in extensively grazed (density 0,2 and 1.8 LU) bear and wolf areas.

IRP22 — Non-productive investments related to the implementation of nature protection sub-interventions includes non-productive investments in the protection of grazing animals against attacks by large carnivores with the same conditions as IPR02. The following can be funded:

- purchase and installation of a wire mesh fence or 4-6 wire fence or purchase of a high protective electrical network and the purchase of associated equipment (pasture apparatus) of a minimum height of 140 cm, measured from the ground;
- organisation of feeding and animal shelters;
- purchase of solar panels for powering grazing appliances; and
- purchase of Livestock Guarding Dogs.

In the next funding period, the above measures will be brought together in a package with attached advice.

Greece

Under the new programming period (2023-2027), Greece has introduced an innovative measure to leave some crops unharvested to support large carnivores (and birds).

Under the agri-environment intervention (70) *P3-70-1.1 — Protection of wildlife within protected areas*, producers are asked to leave 10% of a crop unharvested. The specific requirements on farmers are the following:

- Leave 10 % of the cultivated area unharvested.
- Spraying with chemical plant protection products and herbicides is prohibited in this area.
- Leave free access to wildlife
- Maintain existing paths and small irrigation channels
- Do not use baits

- Do not use chemical insecticides in the outer zone 12m wide of cereal parcels between 15 March and 10 June

Producers receive a payment ranging from 55€ (winter cereal) to 666€ per ha per yr (table grapes) depending on the crop left unharvested.

The total budget allocated (for carnivores and birds) is €8,473,612.

While the measure is interesting, there are serious concerns from experts that the lack of spatial planning requirements for the locations of unharvested crops mean that they will not be useful for large carnivores and could even be detrimental, drawing them to particular locations unsuitable for their presence.

Greece finances more typical measures under the investment intervention (73), P3-73-3.2 — *Non-productive investments for the sustainable management and protection of large mammals (Bear, Wolf, Jackal and Deer)*. Eligible costs of the intervention are (a) the purchase and installation of electric fences and (b) the supply of Livestock Guarding Dogs. The support is provided in the form of non-reimbursable aid on the basis of expenses paid by the beneficiary.

Greece included protection measures in previous funding periods. In the 2014-2020 periods, a measure was included in the programme to finance the installation of electric fences. However, the measure was never opened to applicants as the ministry's priorities shifted. In the 2007-13 period, electric fences and guarding dogs were included in the programme but there was no uptake of guarding dogs, which was the reason given for not including this measure in the following period.

The fact that a measure is included in State programmes therefore does not mean that it will ultimately be implemented.

Austria

Austria included a livestock protection measure in the 2023-2027 funding period for the first time. Under agri-environment intervention (70), *70-13 — Animal welfare — herding* should provide an area-based payment for shepherding for animal welfare reasons, and in particular, to better protect stock against large carnivores.

In addition to a basic payment, an optional supplement was included in the original CAP strategic plan as submitted to the European Commission. This requires herding dogs to stay on the pasture for the entire duration that the stock are present (minimum 60 days). A corresponding certificate recognised by the *Austrian Centre Bär, Wolf, Luchs* for the suitability of the dogs used is required to be present on the farm. Damage caused by herd protection dogs had to be covered by liability insurance.

Costs of up to 700€/per dog to a maximum of 5 dogs per alpine pasture are paid as a lump sum. The lump sum covers the increased labour costs as well as the running costs for feeding/supply, veterinary visits, as well as insurance costs per herd protection dog. Buying the guarding dog is not compensated to avoid overlaps with state funding programmes.

However, there are a number of problems with implementing this measure in practice and it has since disappeared from national descriptions of the scheme. One of these is that current animal welfare legislation does not allow dogs to be left unaccompanied.

While member states are, to an extent, obliged to provide support to breeders in reducing damages by a protected species, there is no obligation to use EU funds for this purpose and a number of member states choose to use national or regional funds. There are advantages and disadvantages to this approach. A main disadvantage is that regional and national financing fall under state aid rules and therefore there are set maximum levels of funding which can be distributed. An advantage is that there is potentially more flexibility in establishing a prevention fund. In general, however, this is often a policy decision about whether the responsibility lies with the agricultural administrators (CAP is more often used) or with the environmental authorities (national financing is used) and how much is available through these different sources.

Box 9 Examples of nationally financed protection schemes, Germany

In Germany, there has been a general move away from using EU CAP funding to finance prevention measures.

Responsibility for prevention and compensation, as well as the financial sources, are distributed among the sixteen federal states of Germany. The minimum requirements for installing prevention measures, conditions attached to them and conditions for receiving compensation therefore differ between the states. All German federal states provide financial support for prevention measures coming from state funds. The amount of money spent on prevention measures is much higher than the money spent on compensation for damages. In 2021, Germany paid 16,639,800€ for prevention measures, more than 30 times higher than for compensating losses or damages (498,433€).

Lower Saxony

The institution in charge of granting payment requests is the *Landwirtschaftskammer Niedersachsen* (Agriculture Chamber Lower Saxony) since 1 January, 2020. Preventive measures include upgrades and one-off new purchases of protective fences and accessories to achieve basic protection against wolves, as well as the purchase of livestock guarding dogs. For all existing prevention measures, up to 100% of the costs can be covered by the state of Lower Saxony (since 1 November, 2019). The upper limit of financial support to the beneficiary or agricultural farm in the agri- and forestry-sector of Lower Saxony is 30,000€ per year. The lower limit is 200€.

Baden-Württemberg

Within the state, each district administration (dt.: *Landratsamt*) is responsible for granting funding for protection measures. Generally, Baden-Württemberg only provides financial support within wolf-presence areas - mainly the Black Forest and the Odenwald (Oden Forest). Protection measures include electrical fences and fence supplies, installation and upgrades of

solid fences, materials to protect fences against undermining or climbing, and livestock guarding dogs. The upper limit of provided finances is 30,000€ per farm per year. The lower limit for expenses to be covered is 200€.[66] While most aspects of financing, such as acquiring equipment or dogs, are covered by regional financing, one measure is also included in the CAP SP: an area-based payment to compensate for the difficulties of grazing in a wolf area was included.

[66] Dokumentations- und Beratungsstelle des Bundes zum Thema Wolf (2022): Wolfsverursachte Schäden, Präventions- und Ausgleichszahlungen in Deutschland 2021. 41 S.

7. Recommendations

Based on EU level analysis backed up by more detailed case studies, this report gives an overview of the extent of reported depredation across the EU and some potential support mechanisms for livestock breeders. It also indicates areas where further research is needed. In conclusion, a number of recommendations can be made.

Data collection and comparability

Issue:

- Different compensation systems, different damage collection systems, different data analysis and transparency levels between member states make comparison of data on livestock depredation difficult or impossible
- Data is often not published by the member state

Recommendations:

- Continue improving the case-based approach of data collection on an EU level and its presentation in map format, supporting trends analysis on a regional / national level
- Make information on livestock damages and analysis of trends publicly available
- Consider in the context of the recently developed IUCN Human Wildlife Conflict and Coexistence guidance, how damage data combined with a range of social and economic indicators can contribute towards a conflict-coexistence indicator and pinpoint upcoming conflict areas
- Discuss the best ways of collecting data with data providers, minimising additional effort for all
- Organise exchange between member state authorities on inspection and compensation systems

Support of extensive livestock (High Nature Value farming) systems

Issue:

- There is low interest / awareness of the importance of extensive agricultural systems for maintaining habitats of biological and cultural importance
- HNV farmers and breeders and shepherds lack a political voice in many discussions about the future of agriculture
- Dealing with the depredation issue is used a scapegoat to avoid discussing the other wide range of difficulties facing the extensive livestock breeding sector
- Farmers and livestock breeders feel that their efforts are left unacknowledged and the services they provide through employing less intensive farming methods are unrewarded
- Additional manpower is needed to maintain extensive flocks in the context of depredation but also for wider welfare reasons

Recommendations:

- Engage in significant communication efforts to reach farmers and breeders and raise awareness about the technical tools and financial opportunities available from the EU and national funds which can address not only depredation but other livestock management issues
- Engage in significant communication efforts to raise awareness of the importance of these systems with the general public and other stakeholder groups
- Encourage further direct exchange with livestock breeders and other interests e.g. through the local to regional platform approach to help identify the range of pressures and potential aids and make links directly to the European level
- Find ways to better reward extensive livestock breeders for services such as ecosystem management or higher quality food production (labelling schemes etc)
- Establish a range of agri-environment and investment interventions which deal with both the short-term challenges of depredation and a range of other challenges for livestock breeders; maintaining or reintroducing shepherding should be a priority

Damage prevention systems

Issue:

- Member states have highly variable approaches to use of prevention measures and EU funds are not consistently used when they could be
- Interventions are sometimes designed with little consideration of their practical implementation or effectiveness
- Breeders are sometimes not made aware of the existence of support measures
- Stakeholders sometimes lack proof of the effectiveness and limits of the tools available and have little access to reliable advice

Recommendations:

- Encourage use of the EU funds available, especially CAP funding for at least fencing, guarding dogs and supporting shepherds' salaries and housing
- Require better and more timely reporting on use of CAP funds
- Require member states and regions to document and assess the deployment of damage prevention measures (at least those that are state / EU funded)
- Better involve stakeholders in the discussions around the tools available, their deployment and awareness raising around their existence
- Member states should require fuller reporting of protection measures in place (and their funding) when recording a damage incident
- In the longer term, invest in serious scientific research into the effectiveness of protection measures (longitudinal studies in a range of locations).

8. Annex 1. Number of relevant depredation incidents per country

The following list shows the number of incidents as used to create the maps in Figure 5 and Figure 6.

	Number of relevant incidents/year			
Country	**2018**	**2019**	**2020**	**2021**
Austria	34	20	61	94
Belgium	11	23	47	64
Bulgaria	NA	NA	NA	NA
Croatia	1111	1379	1739	2186
Czechia	88	198	265	NA
Denmark	NA	NA	NA	NA
Estonia	121	178	NA	109
Finland	553	756	832	1655
France	3499	3522	3205	2849
Germany	551	694	700	669
Greece	2283	2405	2182	2340
Hungary	NA	NA	NA	4
Italy	186	212	164	NA
Latvia	30	39	22	37
Lithuania	NA	408	492	NA

Luxembourg	NA	NA	NA	NA
Netherlands	44	25	95	NA
Norway	703	239	205	115
Poland	680	732	121	NA
Portugal	NA	NA	NA	NA
Romania	82	33	69	NA
Slovakia	95	111	175	372
Slovenia	201	357	253	192
Spain national	2152	2488	2244	NA
Sweden	31	87	135	69
Switzerland	238	188	312	NA

Table 7: Number of relevant depredation incidents per country and year (2018-2021)

Produced by the EU Large Carnivore Platform Secretariat (adelphi consult GmbH and Callisto) as part of the services provided to the European Commission and for the EU Platform Members