

December 2023



CASE STUDY

Livestock depredation and large carnivores in Europe: Greece - livestock damages, bear and wolf

EU PLATFORM ON COEXISTENCE BETWEEN PEOPLE & LARGE CARNIVORES

Minimizing
Conflict

Finding
Solutions

Produced by the EU Large Carnivore Platform Secretariat (adelphi consult GmbH and Callisto) as part of the services provided to DG Environment for Service Contract 07.0202/2020/835172/SER/ENV.D. The report does not necessarily reflect the official view of the European Commission.

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Greece

Bears in Greece are part of the Dinaric Pindos range/population, they have recovered from a low of 250 individuals in the early 1990's to a current population of around 750 individuals. At the same time, the range has increased (recolonization of former range) and certain regions have had to re-adapt to their presence. Bears cause a certain degree of damages to livestock (smaller than wolves) and to crops and there are also conflicts around human settlements, infrastructure (road development) and anthropogenic food resources (waste) management. Bears are strictly protected under national and EU legislation.

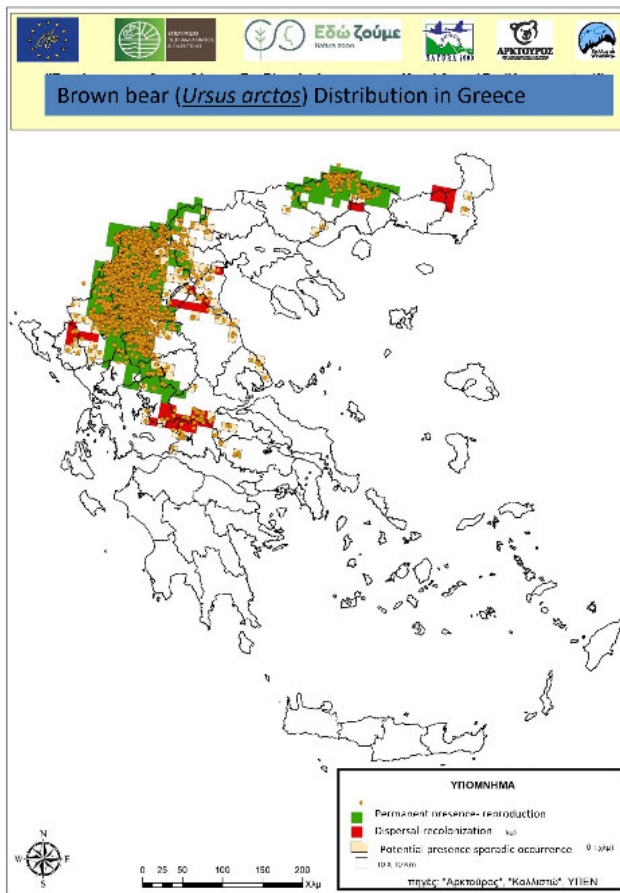


Figure 1. Bear distribution map in Greece (Bear Action Plan, 2021)¹

Wolves are part of the Dinaric Pindos and Eastern Balkan populations. While never extinct in Greece, the population reached a low in 1980s and has increased to around 189 packs (estimated 1020 individuals). Wolves are strictly protected (annex IV HD) South of the 39 parallel while North they are theoretically huntable (annex V HD) but are strictly protected nonetheless under Greek law.

The golden jackal (with high recolonizing dynamics) is also present.

¹ Mertzanis G., Psaroudas Sp., Karamanlidis A.A. 2021. National Action Plan for the brown bear (*Ursus arctos*). LIFE-IP 4 NATURA Project: Integrated actions for the conservation and management of Natura 2000 sites, species, habitats and ecosystems in Greece (LIFE16 IPE/GR/000002). Deliverable Action A.1. CALLISTO/ARCTUROS. Thessaloniki, 142 pp. & VII Annexes. Final version.

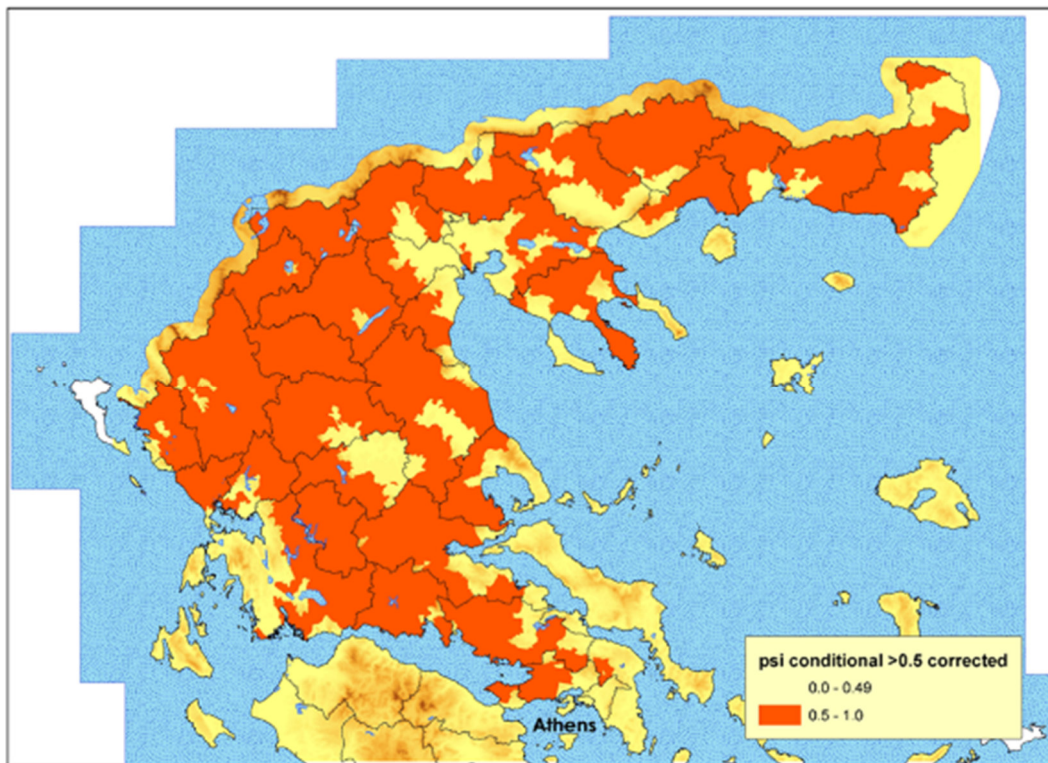


Figure 2 Wolf distribution map in Greece, (Iliopoulos 2018) ²

There are 80,000 livestock raisers in Greece who produce 8.5m sheep, 5m goats and 730,000 cattle. 50% of the agricultural land is pasture it is thus an important part of the agricultural economy and there is conflict around the depredation of livestock and beehives.

Flock size is on average approximately 300 animals, with regional and local differences related to landscape characteristics (i.e. transhumant vs stationary, forest vs more open pasture). In case of large livestock units (i.e. 1000 sheep) animals are usually split into several smaller herds. Sheep are raised both for milk and meat production. Traditional shepherding involves near constant human surveillance, practiced by the majority of farmers hired shepherds and with night-time enclosure / gathering in wolf or bear areas. (Iliopoulos and Petridou 2012³).

Over the last decade, extensive livestock farming has been decreasing. While extensive grazing is predominant in many areas, there has been a gradual decrease of transhumance and shepherding over time.

Bovine transhumance is characterized by the seasonal movement of livestock between winter and summer pastures. The system is well-known for Mediterranean countries, including Greece, where its role is multifunctional, because of its complex interactions with the environments and local societies. Unlike the dairy farming sector in Greece, whose salient features are the emergence of

² Iliopoulos Y. (2018) : Conservation status of the wolf (*Canis lupus*) in Greece – conflict issues and management. Report to the Ministry of Environment (Callisto NGO), 78 pp.

³ Iliopoulos Y., Petridou M., 2012. Livestock depredation mitigation from large carnivores in the National Park of mt. Oiti, Central Greece. 4th Operational Program study technical report, 123 pp.

large-sized farms which are heavily dependent on fixed capital endowments and the provision of feed stuff, the transhumant system is much more flexible, by taking advantage of excessive family labour and reducing feeding costs through grazing. The total number of transhumant farms in Greece has diminished during the last decades this farming system remains an essential activity in less favoured areas of the country (Ragkos et al. 2013⁴).

Institutional structure

Wildlife management is the competency of the Ministry of Environment and Energy, Directorate of Planning and Forest Policy, Department of Wildlife and game management, livestock protection the Greek Ministry of Rural Development and Food. Large carnivore management therefore falls between the two. A bear management plan was developed in 2021 under the integrated LIFE project: LIFE16 IPE GR 002 but in November 2023 still had not been officially launched (published in the official gazette).

A wolf management plan does not currently exist and is not planned.

Total livestock damages

In 2021, 321 livestock and 687 beehives were lost to bears and 5894 livestock were lost to wolves.

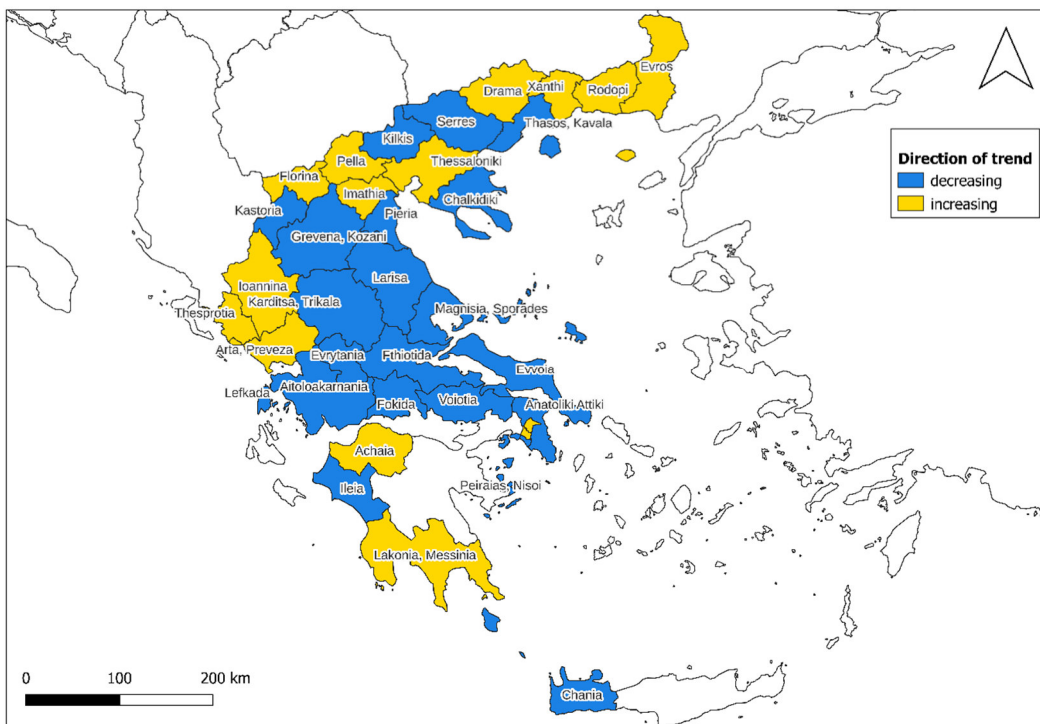


Figure 3. Trends in damages across Greece, see EU LC Platform (2023) for more information⁵

Overall national trend: decreasing damages

4 Ath.Ragkos, I.Mitsopoulos, A.Siasiou, V.Skapetas, St.Kizitsi. V. Bampidis, V.Lagka, Z.Abas (2013); Current Trends in the Transhumant Cattle Sector in Greece Animal Science and Biotechnologies, 2013, 46 (1)

https://www.researchgate.net/publication/296995019_Current_trends_in_the_transhumant_cattle_sector_in_Greece .

⁵ EU Platform on Coexistence Between People and Large Carnivores (2023) Livestock depredation and large carnivores in Europe: Overview for the EU Platform: https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive/large-carnivores/eu-large-carnivore-platform/national-large-carnivore-management_en

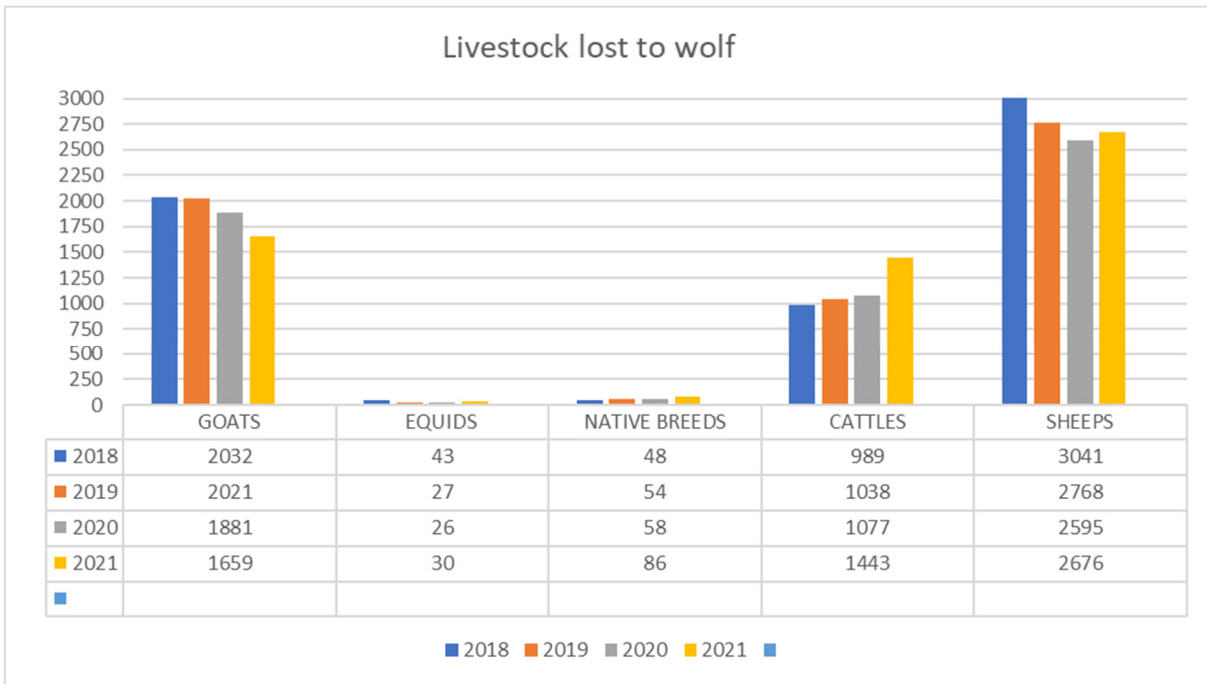


Figure 4. Wolf damages over time (data extracted from ELGA)

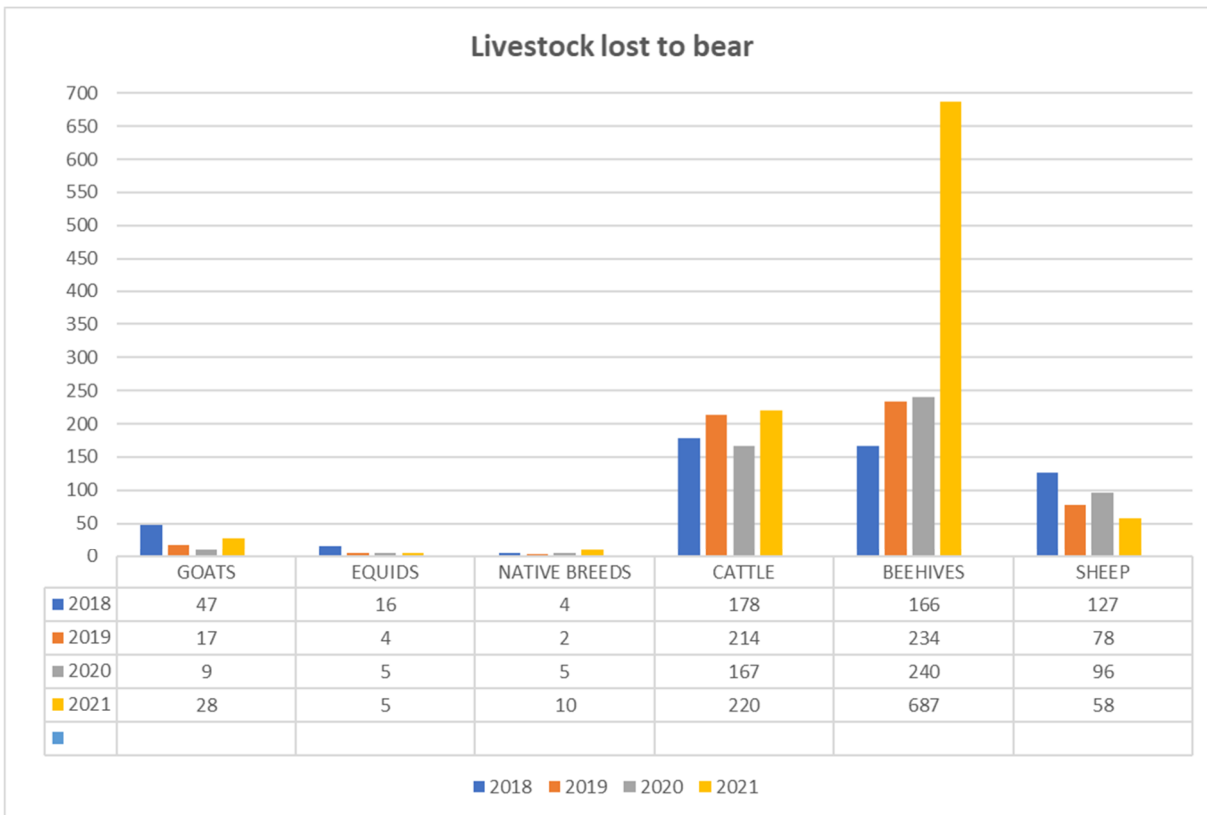


Figure 5. Bear damages over time

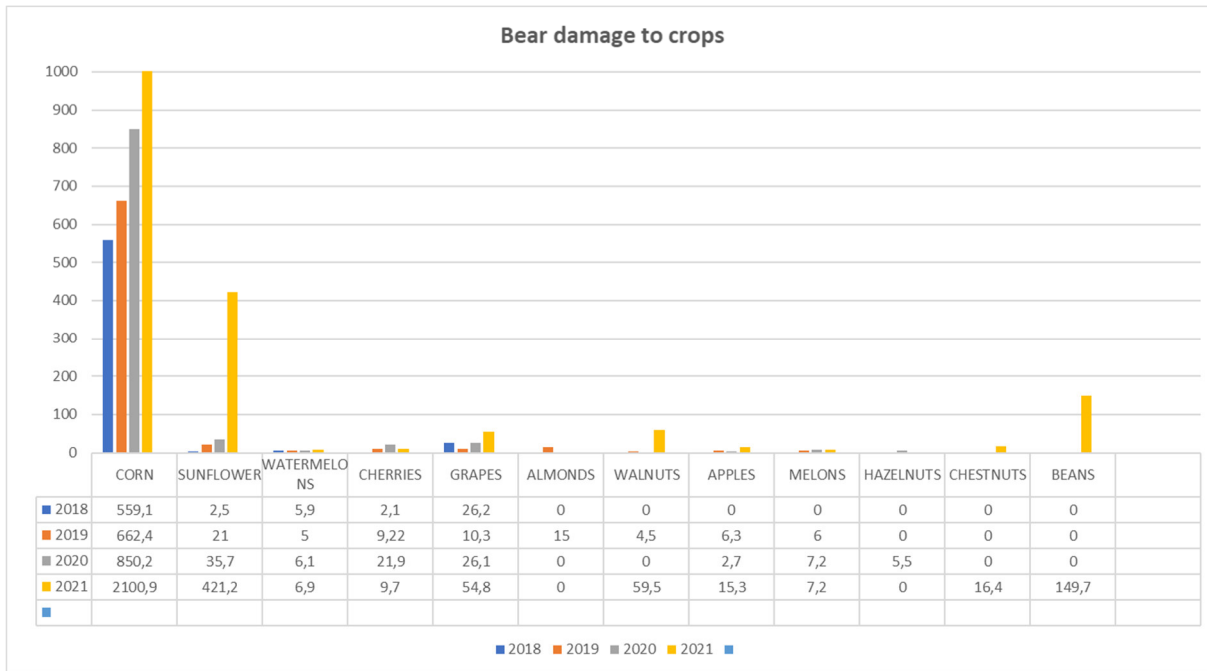


Figure 6. Bear damages to crops over time

Management response

Greece identified a range of measures in their priority action framework (PAF), also recognised in their draft bear management plan. These include the following:

- Supporting breeders to implement prevention measures to reduce attacks and damages caused by large carnivores to reduce the anthropogenic mortality of these species due to retaliation
- Implementation of pilot measures to manage the conflict between wolves and hunters.
- Upgrading data recording and processing by ELGA staff
- Development of an application for mobile devices for farmers and stockbreeders for their more effective compensation by ELGA
- Organization and operation of "National Platform of Coexistence with Large Carnivores"
- Organization and institutionalization of "Bear Emergency Teams" to deal with and manage incidents of human-bear interaction in rural, and operation of regional "Emergency Response Teams" to deal with and manage human interaction incidents with wolves in suburban areas
- Creation and operation of a Breeding Centre and National Register of Greek Breeds of Livestock Guarding Dogs

Many of these measures are include in the draft bear management plan, however few are as yet implemented.

Compensation

ELGA, the Greek Agricultural Insurance Organisation, which is a public benefit organisation, supervised by the Greek Ministry of Rural Development and Food, is responsible for compensation of damages on agriculture by all kinds of natural causes (weather, wild animals, diseases, etc.).

Its financial sources come mainly from the obligatory insurance premia of all Greek farmers.

Depredation by large carnivores (wolf and bear) and stray dogs (usually living in packs) are among the insured risks according to ELGA's regulation. Claim procedure:

- The farmer contacts ELGA's local office (in 48h) and a veterinarian inspector from ELGA performs an in-situ assessment –damage verification – damage level estimation.
- The inspector draws up an assessment report, based on which the livestock farmer will be compensated or not for the claimed damage.

Inspectors may be permanent employees of ELGA or temporary employees over the busy summer period. They receive training on recognising damages and fill out a report template on site. The decision on whether damages will be allocated is made by permanent employees of ELGA and is separated from the inspection.

In terms of prerequisites for compensation, ELGA demands proper safekeeping of the livestock, crops or beehives in cases where repeated previous damages have been recorded.

Damages caused by protected species, such as bears or wolves, are paid better (90%-100% of actual cost), while other damages are treated differently (paid at 75%-80% of their actual cost).

In general, the compensation system works well and most livestock breeders will claim for damages. Livestock breeders complain however, that the compensation given does not cover the true costs or when corpses are not found. Decisions on compensation costs are however made by the farmer members of ELGA. However, there is some conflict between different types of farming systems and potentially power imbalances between different types of members.



Figure 7. Examination of remains left by large carnivores © M.Petridou/CALLISTO

Since ELGA compensates all agricultural losses, it also collects data on “other causes” of livestock mortality. In 2019, 315 livestock were lost to bear and 5908 to wolf. This compares with disease: 14,618; weather conditions 9,753; accidental injuries: 331 losses; geological phenomena: 266.

Protection

Support for implementation of preventive measures has been sporadic over the last years. Protection measures were tested and implemented for the first time in Greece, at a pilot level, in the frame of LIFE projects, from the mid 90s. Bear damages issues have been examined through 12 LIFE projects from 1994 up to 2021 (the latest one foreseen to be completed by 2026) and wolf damages issue through two LIFE projects and six regional EU funded smaller scale projects under the national Operational Programme for Environment, in many cases carried out by National Park management bodies.

In recent years, support moved to be funded through the CAP. However, actual implementation has been very poor, largely because of a lack of awareness raising and corresponding lack of uptake of measures. In the 2007-13 RDP, a measure to purchase fencing was included under agri-environment but only 1.42% of the planned budget was used 113,411€ out of 8m€ planned. A second measure to support the purchase and maintenance of livestock guarding dogs was not used at all.

Between 2014-2020, grants were included in the RDP for the purchase and installation of electric fences. The measure was not used at all since there was little uptake in the first years and then funding was diverted during the COVID pandemic to support olive oil producers.

Under the current CAP Strategic Plan, the following measures are included:

Investment (73-74):

Non-productive investments for the sustainable management and protection of large mammals (Bear, Wolf, Jackal and Deer)

Improve the conservation status of species and habitat types. Address the problems created by interactions and conflicts between wildlife and human activities.

Eligible costs: the purchase and installation of an electric fence, including photovoltaic system, cable (wire) fence for fencing, wire tensioner, to maintain straight pulse transmission wire, door set, insulator to support the wire (in wood or iron), monitor, battery, wooden, plastic or metal stakes, supply of livestock guarding dogs.

Requirements:

Agricultural land:

- cultivated with corn, sunflower, vines, tree crops (such as pears, apples, cherries, trunks, plums, hazelnuts, nuts, chestnuts), vegetables, cereals and lucerne,
- livestock facilities.

Costs:

Total scheme allocation: Indicative financial allocation (Total public expenditure in EUR):
2,946,692.00

Agri-environmental-climate (70):

Protection of wildlife within protected areas

Provides aid for producers to undertake additional agri-environmental commitments to protect wildlife and enhance biodiversity.

Requirements on producers:

- 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

Costs:

A payment, depending on the type of crop (€ per ha, per year) is allocated: e.g. winter cereals 55; maize 224; table grapes 816; wine grapes 435; grass/ legumes 128

Likely success:

The Greek government has not yet opened the measures to applicants but recently announced a public consultation on the implementation of measures.

Experts express concerns about the effectiveness of the unharvested crops measure which currently does not include any spatial planning. Farmers may leave a single plot of land on their whole farmed area unharvested rather than spreading it between plots. This limits the dispersion of uncultivated land and could therefore cause harm to wildlife attracted across other farmland to the unharvested parcels.

Experts believe that a National Large Carnivore Platform (as initially planned in the Greek PAF) is essential for the proper monitoring of the measures and necessary awareness raising.



Figure 8. Greek livestock guarding dogs M. Psaralexi/CALLISTO

Culling

No culling of wolves and bears is allowed in Greece even in annex V area for wolves. Bears have been strictly protected since 1969 according to national law.

Zoom-in: Florina Regional Unit, Western Macedonia, bear damages

The case study area: extends over ~600km² and presents strong contrasts in terms of the physiognomy of the natural and man-made landscape showing clear evidence of how it was shaped by human activities. The clearly differentiated mountainous relief with the 2 distinctly dominant mountain massifs: Vernon-Vitsi-Varnountas in the west and Voras in the east are linked by semi-mountainous and lowland areas where the most intense human activities of the primary sector develop. This characterises the area with very special features in terms of bear habitat condition, availability and suitability: the mountainous and densely forested zone provide very suitable habitat conditions for the bear with a characteristic floor/zoning and structure of the forest vegetation composed of beech (*Fagus sp.*), oak (*Quercus sp*) and in the eastern Scots pine (*Pinus silvestris*) forests, The lower zone is mainly characterised by arable lands (cultivations) with a very abrupt transition from forest lands to cultivated. A semi-fenced motorway segment cuts through area aggravating the barrier effect between the two core bear habitat sectors.

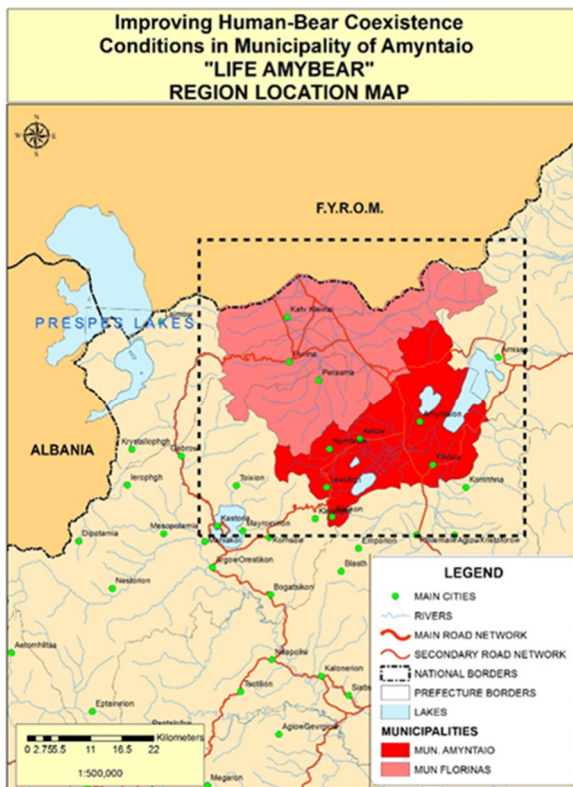


Figure 9. Case study area map

Livestock farming practiced in this semi-mountainous area is mainly of permanent nature (82% of famers), which means that most livestock units are permanent facilities that are used all year round. A relatively small percentage of farmers (15%) carry out local transhumance, some farmers move during the summer season locally - usually within the same Municipality district to temporary summer facilities at a higher altitude. Average flock size figures per type of livestock are as follows: mixed flocks with sheep and goats : 340; sheep: 240; goats: 344; cattle: 96.

Damages

The highest frequency of bear attacks (and number of losses) is observed on mixed flocks with sheep and goats. The results of the survey show that a relatively large percentage of attacks (25%) take place in stables though the attacks are not more destructive than in the pasture. Attacks are concentrated on certain producers with 25% suffering between 2-5 attacks per year and the rest minimally impacted.

Protection

Guarding and surveillance of the herd is a key parameter that largely determines losses from attacks by carnivores. The majority of farms in the area (85%) provide continuous surveillance during grazing either by the owner of the livestock unit or by an employee (shepherd). A small percentage (15%) have intermittent surveillance which means that the herd spends some hours alone in the pasture without human guarding.

During the winter season all the herds (100%) are gathered and driven for the night in a fenced area (building or temporary facilities). During summer season, the majority of herds spend the night inside some facility and only a small percentage (7%) spend the night outdoors, without any protection.

The use by local farmers of livestock guarding dogs (LGDs) is one of the most important and popular preventive measure to deal with attacks by carnivores on livestock.

Based on the above data and information and in order to minimize bear damage on livestock and beehives, The LIFE AMYBEAR project provided and evaluated two types of preventive measures to reduce bear and wolf damage to local farmers:

- 1) Electric fences to protect beehive units but also fixed livestock raising units
- 2) Livestock guarding dogs (LGDs) provided to livestock raisers.

38 electric fences were donated to beekeepers, farmers and livestock raisers of which 21 were monitored with IR cameras over a duration of 38 minutes to 390 (max) camera days in order to evaluate their effectiveness. In no cases were fences shown to be ineffective. In 8 cases deterrence of approaching bears was recorded.



Figure 10. Bears approaching electric fencing (camera traps)

52 livestock breeders were active in the case study area. A total of 43 pups (15 males and 28 females) from two to three months old, and eight (8) adult male dogs (1.5 to 5 years old) of the three national traditional LGD breeds, were provided by members of the network, were donated and/or exchanged amongst livestock raisers.

Monitoring of the measure effectiveness was based on specific indicators as follows:

- Number of livestock breeder members of the established network
- Husbandry practices
- Number of donated dogs and puppies and adult LGD's (genitors etc.)

- LGDs behavioral traits and especially their efficacy against intruding large carnivores (barking, hunting, attack, physical contact)
- Number of cases of interaction between LGD's and bears
- Number and/or degree of satisfaction of livestock breeders donated with LGD's



Figure 11. Case study area interviews with LGD owners © M.Petridou/CALLISTO

In situ visits of LGD owners were performed and systematic records were kept on losses of the donated LGDs. Out of the 51 LGDs donated during the implementation of the LIFE project, 30 LGDs survived (23 puppies and seven adult dogs). Losses were attributed to attacks by wild carnivores (wolves) in two cases, car collisions in three cases, diseases in six cases, poisoning in eight cases and unknown causes in two cases.

An evaluation form was prepared to assess the LGD behavior and the level of satisfaction of the LGD owner. Monitoring for the indicators “Number of cases of interference between LGD's and bears” and “Number and/or degree of satisfaction of livestock breeders donated with LGD's” as well as other indicators for LGD were the basic estimators. 68% of breeders responding rated their satisfaction as high or very high (out of a scale of five from very low to very high). 34% of LGD had been noted as having deterred bears (through barking to attack).

Zoom-in: Tzoumerka NP, wolf damages

The National Park of Tzoumerka, Acheloos valley, Agrafa, and Meteora (hereafter Tzoumerka NP), is the largest National Park of Greece, extending over 4000 km² and encompassing 12 Natura 2000 sites. It is a mountainous and sparsely populated area, with great landscape diversity due to its

large extent and extreme altitudinal range (100-2500 m). It is an area with exceptional ecological value, hosting several endemic and protected species. Livestock husbandry is a main economic activity.

The area hosts an important wolf population with wolf densities ranging from 2.2 to 2.9 wolves per 100 km². Wolf-livestock conflict is particularly intense in the National Park: average annual compensation paid for depredated livestock was €157,000 corresponding to 1,380 killed animals, accounting for approximately 17% of the total compensation spent nationwide for wolf attacks on livestock.

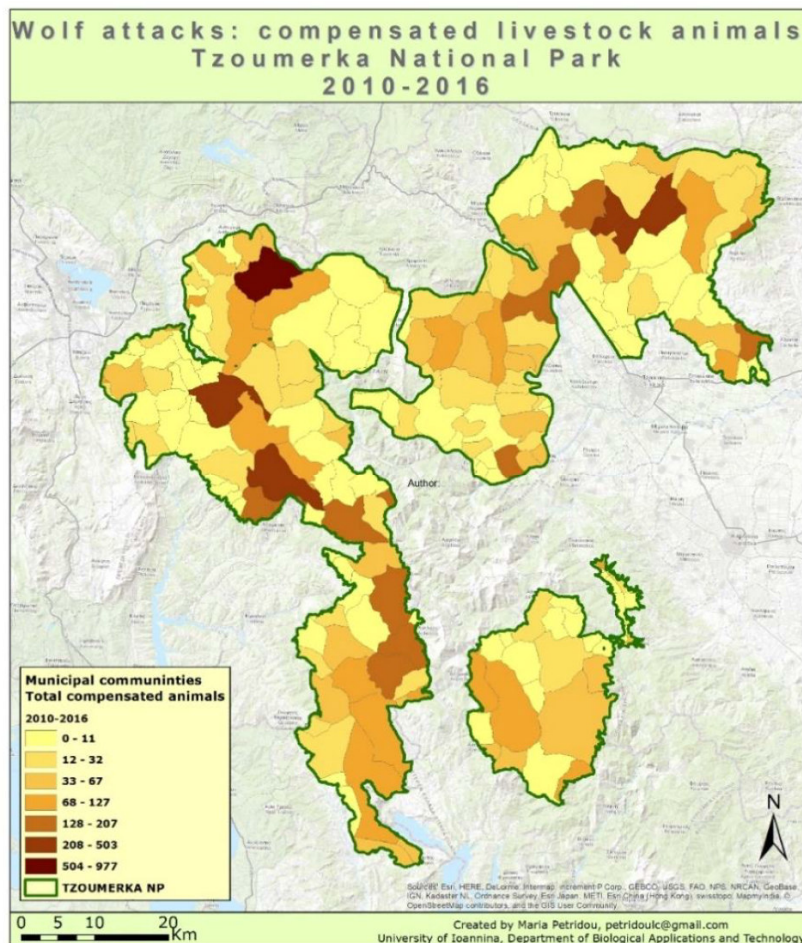


Figure 12. Wolf damages in the case study area

In a field study carried out by Petridou et al (2019)⁶, wolf damages on cattle, sheep and goats were examined and the likely impact of protection measures assessed. Data was gathered through 55 interviews with cattle, sheep and goat farmers from August to October 2018 (summer grazing period) using as semi-structured questionnaire. For the interviewed farmers, herd size was medium to large (sheep herds averaged 326 animals, goat herds 273, mixed herds 455 sheep and 27 goats, and cattle herds 112 adult cattle and 44 calves). Data on livestock losses and husbandry methods

⁶ Petridou M., Iliopoulos Y., Kati V. 2019. Wolf-livestock conflict in Tzoumerka National Park and comparisons with other protected areas of Greece. University of Ioannina and WWF Greece. Ioannina, Greece, pp. 51. https://www.researchgate.net/publication/332414177_Wolf-livestock_conflict_in_Tzoumerka_National_Park_and_comparisons_with_other_protected_areas_of_Greece?channel=doi&linkId=5cb43aa0a6fdcc1d4995a718&showFulltext=true

was collected. Data was analysed statistically to draw conclusions on the relative effectiveness of different protection measures.

Damages

In the case study area, perceived Mean Percentage Annual Losses (MPAL) to depredation were calculated per farm (i.e. the % of stock lost to depredation) and per type of livestock. The following results were seen.

Table 1. Summary table of MPAL index for sampled farms (n=55) in Tzoumerka NP, i.e. mean percentage of livestock species killed per farm type and per year, for the period 2016-2018

		Sheep farms	Goat farms	Mixed sheep and goat	Cattle
		14	11	11	19
Sheep	Mean	2.11		0.92	
	SD	1.38		0.78	
	Range	0-4.5		0-2.17	
Goat	Mean		3.36	3.62	
	SD		2.79	7.39	
	Range		0-8.67	0-22.22	
Adult cattle	Mean				1.96
	SD				3.9
	Range				0-16.67
Calves < 1 year	Mean				6.37
	SD				15.2
	Range				0-66.67

The most vulnerable category was calves. Calf losses by wolves showed great variability and can reach very high values of up to 66.27%. The second most vulnerable species are goats irrespectively of the type of livestock farm (pure or mixed). It seems that in the case of mixed sheep/goat herds, wolves may select for goats, since the predation of sheep is substantially lower in mixed herds than in pure sheep ones. Wolf preference for goats is very likely related to the fact that goats tend to scatter extensively while grazing, feeding on more remote, dense and steep areas. In contrast, sheep graze in more open pasture areas, in dense and compact flocks.

Most farmers questioned were not satisfied with the compensation schemes provided by ELGA (78% of sheep farmers and 65% of cattle farmers were dissatisfied). This was related to the difficulties in finding stock killed by wolves and the compensation rates.

Protection

Breeders were questioned about four main protection / husbandry practices: shepherding, night enclosure, presence of young stock on the pasture and use of livestock guarding dogs.

Shepherding is still widely practiced in the area. 58% of sheep/goat herds graze with a shepherd being always present and 42% with a shepherd partly present. In contrast, only a small proportion of cattle herds (21%) graze with a shepherd being always present, 63% graze only partially attended by a shepherd during daytime grazing and 16% completely unattended.

Confinement of livestock herds during the night is part of the traditional husbandry. The place of confinement varies significantly from well-built permanent infrastructures to ad-hoc shelters built with pallets and plastic. The vast majority of sheep/goat herds (86%) overnight inside a fenced area every night. A small percentage of sheep/goat herds (14%) periodically overnights outside a fence. However, for cattle, only a small percentage of adult cattle (16%) spends each night inside a fence/enclosure, one third of them (32%) periodically. A higher percentage (53%) of calves were either housed at night or permanently housed for the whole grazing season. However, 47% were left overnight outside any sheltered area, while accompanied by their mothers.

Whether young livestock (<6 months) are present in the pasture can also have an impact as young animals are particularly vulnerable to wolf predation. The majority of cattle farmers (74%) allows young calves to freely graze in pastures. In contrast, most sheep/goat farmers keep lambs and kids constantly penned until this age (78%). Most sheep and goat births occur during the wintering period when livestock are kept inside permanent pens. Cows in contrast, may deliver outdoors year-round.

Use of livestock guarding dogs (LGDs) is one of the most common and traditional damage prevention measures. Indigenous dog Breeds include: the Greek sheepdog, the Greek white sheepdog and Molossos of Epirus. In the study area the use of LGDs was widespread. 100% of sheep-goat farmers and 84% of cattle farmers used LGDs. However, there was significant variability in the number of guarding dogs per 100 heads of cattle, sheep or goats. Farmer satisfaction with their LGDs (on a scale from 1-10) averaged 6.8 and was similar for sheep/goat and cattle farms. A significant issue in the area was LGD poisoning with 50% of owners having experienced poisoning due to conflicts with hunters or accidental consumption of poison left for wildlife.

Overall, the study found that weaker protection measures for cattle and calves has had the result that wolves have tended to focus more on calves and sheep depredation is relatively less common Petridou et al (2019)⁷. Recommendations further developed in Petridou et al (2023)⁸, include increased public support for protection measures and a focus on introducing more protection for cattle farms.

⁷ Petridou M., Iliopoulos Y., Kati V. 2019. Wolf-livestock conflict in Tzoumerka National Park and comparisons with other protected areas of Greece. University of Ioannina and WWF Greece. Ioannina, Greece, pp. 51. https://www.researchgate.net/publication/332414177_Wolf-livestock_conflict_in_Tzoumerka_National_Park_and_comparisons_with_other_protected_areas_of_Greece?channel=doi&linkId=5cb43aa0a6fdcc1d4995a718&showFulltext=true

⁸ Maria Petridou, John F. Benson, Olivier Gimenez, Yorgos Iliopoulos, Kati Vassiliki (2023) Do husbandry practices reduce depredation of free-ranging livestock? A case study with wolves in Greece, *Biological Conservation* 283:110097, DOI: 10.1016/j.biocon.2023.110097



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