BALKAN DETOX LIFE

STUDY ABOUT THE ILLEGAL USE OF POISON IN THE ENVIRONMENT OF THE BALKAN PENINSULA

VCF VULTURE CONSERVATION FOUNDATION

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BALKAN DETOX LIFE: STRENGTHENING NATIONAL CAPACITIES TO FIGHT WILDLIFE POISONING AND RAISE AWARENESS ABOUT THE PROBLEM ACROSS SEVEN BALKAN COUNTRIES

(LIFE19 GIE/NL/001016)

Prepared by: Vulture Conservation Foundation

Project Partners:

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Subject and purpose of the report

This document is prepared within the framework of the BalkanDetox LIFE project (LIFE19GIE/NL/001016) and relates to the deliverable "Study about the illegal use of poison in the environment of the Balkan Peninsula", defined under *Action A.2: Preparation of the current review of the problem of illegal wildlife poisoning in the Balkan Peninsula*. This study is designed to provide a clear and up-to-date overview into the current circumstances regarding the illegal use of poisonous substances and the detrimental effects this illegal practice has on vulture populations and other wildlife species in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, the Republic of North Macedonia, and Serbia. Additionally, it represents a baseline for monitoring the impact that actions implemented within this project and other similar conservation initiatives towards diminishing the threat of illegal wildlife poisoning will have in the region, as well monitoring of the change in perception about this practice among key stakeholder groups and socio-economic impact.

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Geographical scope

This study reflects on the illegal practice of using poisonous substances in the environment and wildlife mortality induced by it in the following countries of the Balkan Peninsula: Albania, Bosnia and Hercegovina, Bulgaria, Croatia, Greece, the Republic of North Macedonia and Serbia, as well as different challenges related to the prevention of wildlife poisoning that exist in these countries.

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About the project

The BalkanDetox LIFE project is a five-year endeavour with a €1.8 million budget, which aims to raise awareness and strengthen national capacities to fight the problem of wildlife poisoning across Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Greece, the Republic of North Macedonia and Serbia. It received funding from the EU's LIFE Programme *with a contribution of 1.004.792€ (54,82%) to the total project budget*, and it is co-financed by the Vulture Conservation Foundation, the MAVA Foundation and Euronatur, as well as by the Whitley Fund for Nature and Environmental Protection and Energy Efficiency Fund for specific actions. Project partners are the Vulture Conservation Foundation as the coordinating beneficiary, and the Albanian Ornithological Society, Association BIOM, Bird Protection and Study Society of Serbia, Fund for Wild Flora and Fauna, Hellenic Ornithological Society, Macedonian Ecological Society, Ornitološko društvo NAŠE Ptice and the Protection and Preservation of Natural Environment in Albania as associated beneficiaries. Furthermore, this project is based on Spanish best practice experience and counts with the support from the Junta de Andalucía and the Spanish Ministry for the Ecological Transition and the Demographic Challenge.
Learn more at www.balkandetoxlife.eu

Cover photo: Santiago Ruiz

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Acronyms and abbreviations

BAPP - Balkan Anti-Poisoning Project

BAVP - Balkan Vulture Action Plan

BCTF - Bird Crime Task Force

BPPS - Birds of Prey Protection Society

BSPB - Bulgarian Society for Protection of Birds

CAWI - Computer Assisted Web Interviewing

CSO - Civil Society Organization

EU - European Union

FWFF - Fund for Wild Flora and Fauna

HOS - Hellenic Ornithological Society

MES - Macedonian Ecological Society

PAPI - Paper and Pen Interviewing

PID - Poison Incident Database

SOP - Standard Operational Procedure

VCF - Vulture Conservation Foundation

Vulture MsAP - Vulture Multi-species Action Plan

INTRODUCTION

The environmental effects of the illegal use of poison in the environment have been devastating and it has now become one of the main threats to biodiversity. The use of poisonous substances in the environment is one of the most commonly used predator eradication methods worldwide. Poison is used to kill wildlife and undesirable domestic animals considered to be harmful to certain human activities, in particular livestock farming and other agricultural practices, as well as game management for hunting and pigeon keeping. It is also not uncommonly used as a way of settling various feuds and disputes between people. The illegal use of poison is considered one of the most important issues regarding illegal killing of birds due to the serious conservation impacts it has on scavenging species and is confirmed to be among the most important direct threats to the vulture populations in Europe (Vultures MsAP).

The most common use of poison for the purpose of eliminating undesirable animals is placement of poison baits in the environment. The use of poison baits usually involves lacing a food item (most commonly a piece of meat, or an entire animal carcass) with a toxic compound, usually phytosanitary products like insecticides, rodenticides, fungicides, herbicides or molluscicides, and placing them in the environment so that they are accessible to the target animals, and often to other non-target species, which may also be affected. Intentional poisoning is therefore a non-selective and destructive method of eradicating animals deemed harmful for human activities and can even pose a serious risk to human health.

The illegal use of poison baits remains the single most important threat that vultures are currently facing in the Balkans and has contributed to the regional extinction or severe depletion of all the species in the region. The vulture populations of the Balkan Peninsula had been brought to the brink of extinction by the end of the 20th and beginning of the 21st century mainly because of illegal wildlife poisoning in the environment (Pantović & Andevski 2018). Of the four species that were once commonly spread throughout the region, the Bearded Vulture and Cinereous Vulture are now reduced to single, isolated populations. The last population of Bearded Vultures in the region is found in Crete (Greece), numbering around 6-7 breeding pairs and the Cinereous Vultures in Dadia-Lefkimi-Soufli Forest National Park, NE Greece, 28-35 pairs (Xirouchakis 2019). The number of Egyptian Vultures has declined by more than 50 % in the last ten years and continues to decline. This species stronghold in the region is in Bulgaria, while it is still in small numbers present in North Macedonia, Greece and Albania, totaling to less than 50 breeding pairs in 2021 for the entire Balkan Peninsula (Valevski et al. 2015, LIFE16 NAT/BG/000874). The population of Griffon Vulture has also been significantly depleted and the species has disappeared from many countries of its former range (Albania, Bosnia & Herzegovina and Montenegro), whilst in continental Greece and Northern Macedonia isolated and small populations are still persisting, numbering 29-37 and 7 breeding pairs respectively in 2021 (Xirouchakis 2019). Strong populations are present in Serbia, numbering up to 230-233 breeding pairs, and up to 121 pairs in Croatia, while the populations in Bulgaria (up to 163) and Crete, with an estimated population of 280-350 breeding pairs (Xirouchakis 2019), are showing signs of increase in the last years.

This practice is illegal in Europe, including the Balkans, but it is still in use by local people as a quick and inexpensive method for resolving conflicts with predators and other wildlife. The main driver for such an intensive use of the poison is the conflict between livestock breeders, hunters, farmers and mammalian predators, mainly wolves, but also jackals, foxes and feral/stray dogs (Andevski 2013). Its widespread use has also been facilitated by the poor enforcement of the legislation, the black market of banned pesticides and the relative free availability of poisoning substances on the markets.

Wildlife poisoning is a serious conservation issue, which needs to be investigated in detail and actions need to be carefully planned and implemented to achieve desirable results. This study pro-

vides an overview of the situation with the illegal use of poison in the environment and its effects on wildlife in each of the target Balkan countries. Its objective is to collect and analyze the data from the Balkan region and identify regional aspects of the poisoning problem, but also recognize the particularities in each country and propose general actions. It directly builds on the "Balkan vulture poison study" (Review of the problem of poison use and vulture poisoning in the Balkan Peninsula), produced by the Vulture Conservation Foundation (VCF) in 2018.

This study fundamentally consists of two components. The first component entails compilation and analysis of data about poisoning and presumable poisoning events from the countries of the Balkan Peninsula dating from the year 2000 onwards and analysis of the scope, severity, root causes behind it and substances most used in the region. The study will highlight the collected data relevant to vulture poisoning incidents, as vultures, being mostly obligatory scavengers, continue to be victims of poison and poison baits intended for other animals in the environment, primarily mammalian predators, and are a group of species most deeply affected by this practice. Additionally, this study will reflect in more detail on the incidents involving mortality of other wildlife species, especially of those with an unfavorable conservation status. Increasing and improving available information on the scope of this illegal practice in the Balkans is essential for better understanding of its drivers, conveying the message to the public and other target audiences that it is a public hazard and that it has damaging effects to numerous wildlife, especially scavengers.

The second component of this action represents the conduction of a baseline evaluation of the perception and knowledge among relevant stakeholders about this illegal practice, their personal experience (number of cases investigated, number of cases processed and brought to trial, number of sentenced cases) in poisoning incidents in each of their respective countries, as well as a baseline for monitoring of the socio-economic impact of the project.

APPROACH AND METHODOLOGY

Information represented in this study about poisoning and presumable poisoning events that have occurred in the Balkan region during the study period was collected from relevant governmental institutions for environmental crime, as well as internal databases of the beneficiaries of the BalkanDetox LIFE project, who have been systematically recording all such incidents for many years. For this purpose, a questionnaire was prepared (Annex VII), requesting information regarding: historical data about poisoning incidents, number of poisoning incidents recorded during the last 20 years (their location, species affected, main driver behind them and substances used), number of presumable poisoning incidents where official necropsies been conducted on wild animals which were suspected to have died from poisoning or ingesting poison baits, number of presumable poisoning incidents where toxicological analysis been conducted, either on dead animals or on poison baits, number of poisoning incidents that have officially been prosecuted by the public prosecutor's office and have reached court trials, and number of poisoning incidents for which court rulings have been delivered.

The questionnaires about wildlife poisoning incidents were distributed by the BalkanDetox LIFE project beneficiaries among relevant governmental institutions, primarily to enforcement agencies, environmental inspectorates, and public prosecutors by means of formal requests for information, as this data represents information of public importance and therefore must be made available. Additionally, project beneficiaries have endeavored to obtain all publicly available data (official records and reports from relevant national institutions, published papers and project reports, internal databases of CSOs) relevant to wildlife poisoning incidents. The analysis of the collected data enables us to define the most significant gaps in the chain of custody and enforcement mechanisms in each Balkan country. This will represent a baseline for

implementing and monitoring the effectiveness of anti-poison actions in the Balkan region. It is important to highlight that not all countries have the information available in a structured form, so some of the replies received from the questionnaires were more complete and more informative compared to others.

Information obtained for the baseline analysis of the socio-economic drivers and perception of the illegal practice of wildlife poisoning focuses on the knowledge among relevant stakeholders from the Balkan countries about the motives behind wildlife poisoning, most common types of wildlife poisoning, most frequently used methods and poisoning substances, areas where wildlife poisoning regularly occurs (hotspots), period of year when this practice is mostly utilized, as well as their personal experience with poisoning events in each of their respective countries. This information derives from quantitative research conducted using a mixed methodology that combines desk research, and quantitative surveys of two main target audiences: target group of hunters, farmers, livestock breeders and target group of governmental services and institutions officials, law enforcement officials and veterinary services in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, North Macedonia, and Serbia.

Quantitative research towards measuring the awareness level of target groups (hunters, farmers, livestock breeders, rangers, veterinarians and policemen) about vultures, methods of poisoning and individuals or groups responsible for poisoning in their country, and measuring the current attitudes and practices of these target groups connected with illegal wildlife poisoning was conducted by face-to-face PAPI (Paper and Pen Interviewing) and CAWI (Computer Assisted Web Interviewing) techniques. Surveys for assessing the perception of wildlife poisoning in local communities were conducted in 2 areas defined as poisoning hotspots, according to the available data, in each country except Bulgaria. Research towards employees in relevant governmental institutions were conducted via online interviews in all Balkan countries. Employees were identified based on the information about their relevant job positions available at the webpages of their respective institutions.

Questionnaires for both surveys were designed to be completed within 10 minutes. Desk research refers to the use of existing statistical data as well as other indicators from official available sources (Central Bureau of Statistics, Ministries for Environmental Protection, Veterinary Institutes, etc.) and to all other relevant available sources, such as studies and project reports for establishing a baseline for socio-economic impact analysis. This research was carried out by MASMI agency for Albania, Bosnia and Herzegovina, Bulgaria, Greece, North Macedonia and Serbia, while research in Croatia was carried out by DotPlot agency.

The aims of the research in local communities are: 1. Measuring awareness of target groups (hunters, farmers, livestock breeders) about endangered species (vultures), methods of poisoning and individuals or groups responsible for poisoning in their respective countries; 2. Measuring the current attitudes and practices of target groups connected with illegal poisoning of endangered species, such as vultures.

For relevant governmental authorities in this first phase, the aims of the research are: 1. Measuring awareness about vultures, methods of poisoning and individuals or groups responsible for poisoning on the territories of their respective countries; 2. Measuring of the current perceptions and attitudes of target groups related to aggravating circumstances and obstacles as well as capacities of the state institutions to prevent, investigate and sanction wildlife poisoning cases; 3. Measuring of the current perceptions of target groups related to legislations, procedures, documentation, and processing of wildlife poisoning cases.

Statistical significance helps us to determine whether the results obtained reflect real differences between target groups and survey categories and whether the obtained differences can be generalized to the entire sample population or should be treated as a consequence of chance. The usual significance levels of 0.95 were used in this study. This means that the finding (difference between groups) has a 95% chance of being true, and thus can be accepted as a reflection of realistically existing differences between groups.

The baseline report of the socio-economic study was produced by MASMI agency and it strives to provide an overview of the relevant institutional and legislative context and (currently) available socio-economic indicators in order to carry out monitoring in preparation for the socio-economic evaluation of the project impact that will be carried out in 2025. The aim of the socio-economic monitoring is to help identify and assess the impacts of the project and how they will change the attitudes of the relevant stakeholders towards the use of poison baits. For the purpose of the socio-economic monitoring and impact evaluation of the project the following indicators were proposed. A baseline overview will be provided for all the countries individually.

- Number of regulations and their content related to wildlife and pests poisoning, number of regulations in preparation and their content and compliance with EU regulations for countries outside of EU
- Fields of knowledge baseline level and new fields of knowledge introduction into the sector
- Target groups knowledge baseline level and level after the media campaign: hunters, farmers, livestock breeders' knowledge and government services and institutions officials, law enforcement officials and veterinary services employees' knowledge and expertise
- Number of stakeholders and key actors involved
- Feedback from stakeholders and key actors (follow up phase 2025)
- Understandable and straightforward information generated during the project aimed at target groups awareness (follow up phase 2025)
- Types of activities aimed at information and awareness raising of the general public (workshops and other local events, project website and social media, etc.) (follow up phase 2025)
- Estimated economic impacts of illegal poisoning of wild animals through continuation, replication or transfer of the project activities (follow up phase 2025)

In order to achieve the main goals of this baseline report, a mixed methodology will be applied. We will combine desk research using relevant legal documentation, as well as the results of previous research on this topic, with the quantitative results of the survey that will be conducted with the two relevant target groups of stakeholders – hunters, farmers and livestock breeders, and governmental services and institutions officials.

The situation with wildlife poisoning in general, of each Balkan country is presented in a different chapter in alphabetic order.

OVERVIEW OF THE SITUATION WITH WILDLIFE POISONING IN THE BALKAN COUNTRIES

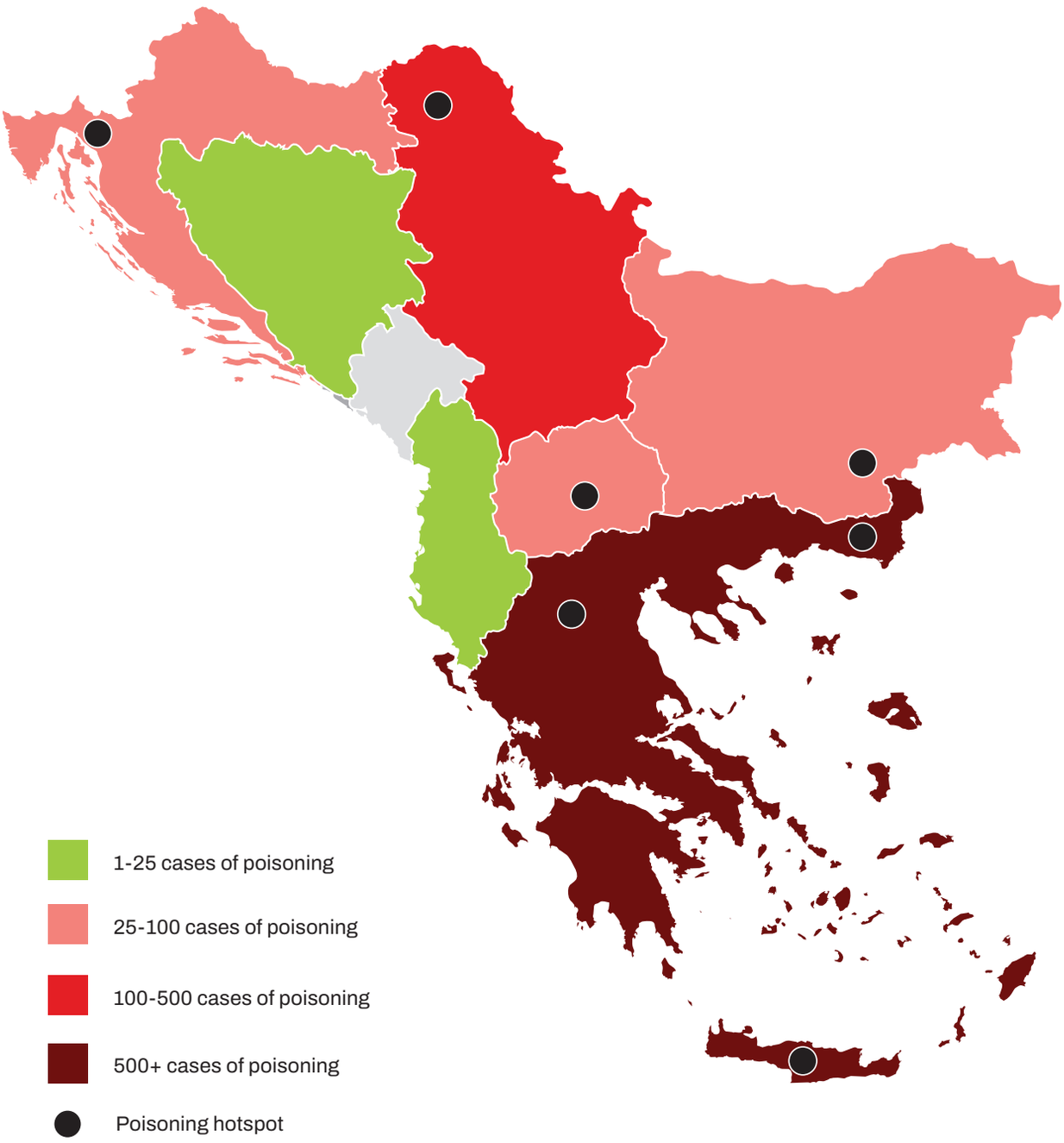
Wildlife poisoning is an illegal practice that commonly occurs in the Balkan Peninsula even nowadays. The damaging effects that this practice has on many species, especially avian scavengers, are well documented throughout the region. Vultures, being almost exclusively obligatory scavengers, continue to be victims of poison and poison baits intended for other animals, primarily mammalian predators. Over the course of the last 50 years this practice has led to severe population declines of all vulture species and has brought the Bearded Vulture, Cinereous Vulture and Egyptian Vultures to the brink of regional extinction. The illegal use of poison baits is a deeply rooted and still quite common practice for resolving conflicts with wildlife, especially in rural areas, and continues to represent the most severe threatening factor for the remaining vulture populations in the region and the biggest obstacle for their recovery towards their former distribution range.

Over the course of two decades, from 1998-2018, a total of 227 poisoning and presumable poisoning incidents were recorded, causing the death of 385 Griffon Vultures, 36 Egyptian Vultures, 12 Cinereous Vultures and one Bearded Vulture in the region (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, North Macedonia and Serbia). In most of these incidents more than one individual bird has been found poisoned. According to the data for that period it was estimated that up to 115 vultures are potentially being poisoned annually throughout the Balkans (Pantović & Andevski 2018).

Table 1. Summary of available data about wildlife poisoning used in this study

Country	Total # poisoning incidents (# poisoning incidents since 2018)	Total # vultures killed (# vultures killed since 2018)	Main driver	Mostly used substance
Albania	17 (15)	0 (0)	Conflicts with predators	Methomyl (11,8%)
Bosnia and Herzegovina	6 (4)	GV: 1 (1)	Misuse of pesticides in agriculture	unknown
Bulgaria	88 (13)	GV: 60-90 (14-30) EV: 19 (2) CV: 1 (0)	Conflicts with predators	Carbamates (41%)
Croatia	40 (21)	GV:62-66 (6)	Conflicts with predators	Carbofuran (47%)
Greece	579 (74)	GV: 215 (42) EV: 24 (1) CV: 16 (6) BV: 1 (0)	Conflicts with predators	Methomyl (3,5%)
North Macedonia	29 (2)	GV: 102-125 (0) EV: 4 (0)	Conflicts with predators	Methomyl (7%)
Serbia	291 (45)	GV: 16 (0)	Conflicts with predators	Carbofuran (13%)

GV-Griffon vulture; EV-Egyptian vulture; CV-Cinereous vulture; BV-Bearded vulture



Map 1. Registered poisoning incidents per country, with marked poisoning hotspots

This chapter of the study focuses on the current circumstances with the use of poison in the environment for each target country of the Balkan Peninsula and reflects on the use of this practice in the past. It provides a detailed overview of all available data relevant to wildlife poisoning events, including known drivers for poison use, toxic compounds mostly used (identified through conduction of toxicological analysis), and of the current legal framework in place in each country

ALBANIA

Introduction

Until 2010, wildlife poisoning in Albania was regarded as a minor threatening factor for many wildlife species, confined to remote mountainous areas of the country, and attributed mainly to conflicts that livestock breeders have with mammalian predators. This was related to lack of knowledge on the extent and prevalence of the poison baits use in the country. There are almost no official records related to wildlife poisoning incidents among the relevant governmental institutions, which contributes to the overall picture that this conservation issue did not officially exist in the country until 2019, when the use of poison baits against wild animals was clearly stated in the law "On the protection of wild fauna" as an administrative violation.

On the other hand, Albania has experienced extinction of all its vulture species, apart from the remaining, dwindling population of around 5 breeding pairs of Egyptian Vultures. Disappearance of entire national populations of vulture species during the 20th century, as it was documented in many other neighboring countries, is associated with the use of poison baits in the natural environment, which is why we can reasonably suspect that similar circumstances existed or still exist in Albania.

Historical perspective

Although there are very few official records available related to wildlife poisoning, there is evidence that poison baits laced with *Strychnine* were regularly used in rural mountainous areas for elimination of wild predators (mainly wolves) during the 20th century as a part of governmentally sponsored actions for population control, like the rest of the countries in the region. While *Strychnine* was used mostly in mountainous areas, *Cyanide* was again used in an organized way in the coastal area, mostly in hunting reserves to control damage in game species from small carnivores like foxes, jackals, weasels, martens, etc. Nevertheless, poisoning with cyanide was not widespread.

Current situation in the country

First comprehensive investigation of the practice of wildlife poisoning in Albania was conducted through the implementation of the Balkan Anti-Poisoning Project (BAPP), which was implemented from 2018-2021. Within this period, a lot of efforts were invested in determining the current scope of this practice on a national level, drivers behind it, substances most commonly used and areas in the country where it most often occurs, as well as being vigilant and recording all poisoning and presumably poisoning incidents.

The biggest obstacle relevant for this conservation issue is the fact that it was not precisely defined in the national legislation of the country until 2019, despite Albania having ratified the Bern Convention in the 90s. Unlike the other Balkan countries, where the deliberate poisoning phenomenon is well-incorporated and clearly defined as a prohibited action in the legislation over the years, the intentional wildlife poisoning in Albania has not been regarded as a prohibited activity in the national legal framework until July 2019. Since wildlife poisoning was not mentioned within existing national legislation as an illegal activity, no official records, documentation, or relevant database existed prior to this period, neither within governmental organizations nor nature conservation CSOs. Therefore, respon-

sibilities of governmental institutions relevant to wildlife poisoning and other environmental crime (except illegal hunting-hunting prohibited on all species until July 2021) are still unclear on all levels of enforcement and there are no procedures or protocols related to reporting of poisoning incidents. Consequently, awareness of the severity of this conservation issue and the danger that it poses both to wildlife and human health is still low. It is important to note also that there is a notable lack of knowledge, capacities, and resources within governmental institutions, related to conduction of toxicological analyses of animals suspected to have died of poisoning.

Since 2018, information about 17 separate poisoning incidents, that occurred from 2007-2020, in Albania was compiled by the leading national nature conservation CSOs. According to the available data compiled for the purpose of this study, wildlife poisoning in Albania can mainly be attributed to:

- Intentional use of poison baits for the purpose of extirpating mammalian predators, (mainly foxes and wolves) and reducing the damages that these animals may inflict upon livestock and other agricultural practices.
- Unintentional poisoning, where improper use of phytosanitary products, especially for control of rodent populations, often leads to secondary poisoning.

In 59% of the cases poison baits were set with an aim to eliminate foxes, wolves, jackals and bears which can cause damages on people's livelihoods in rural areas (Figure 1.). In 23% of presumable poisoning incidents the actual motive behind this practice remains unknown, while the rest is attributed to misuse of pesticides and other phytosanitary products

A total of 9 wild species of animals were recorded poisoned and presumably poisoned. Poisoning was confirmed in 29,4% of the recorded incidents (Annex I), and the most commonly used substances were pesticides: Carbamates (*Methomyl* in 2 cases) and Organophosphates (2 cases). The use of *Strychnine* was also registered in one poisoning incidents from 2007, where 6 wolves were poisoned. Information about the use of another phytosanitary product, "Selino" (2, 4 – Dinitrophenol) for wildlife poisoning was obtained during interviews with livestock breeders towards obtaining more information about wildlife poisoning practices in Albania during the implementation of the BAPP project, but further evidence is needed to confirm these claims.

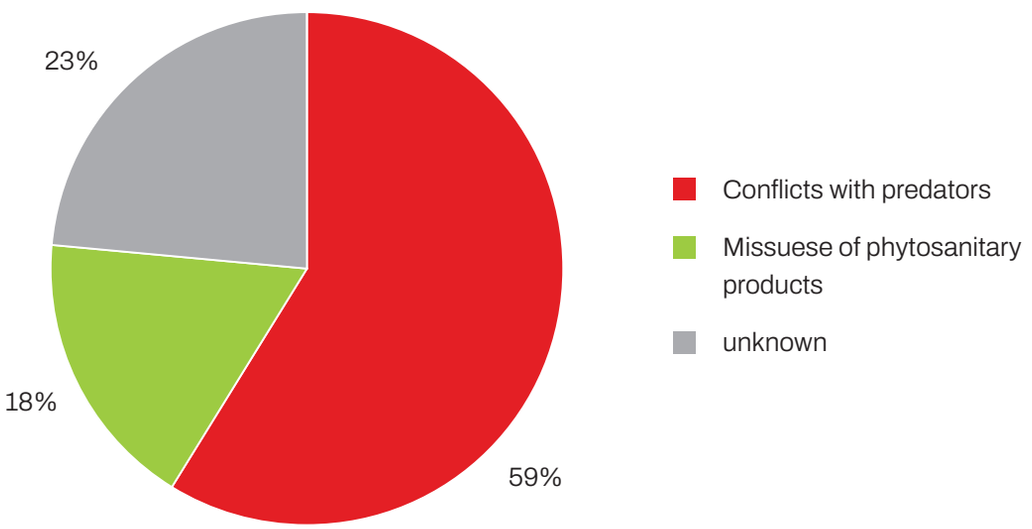
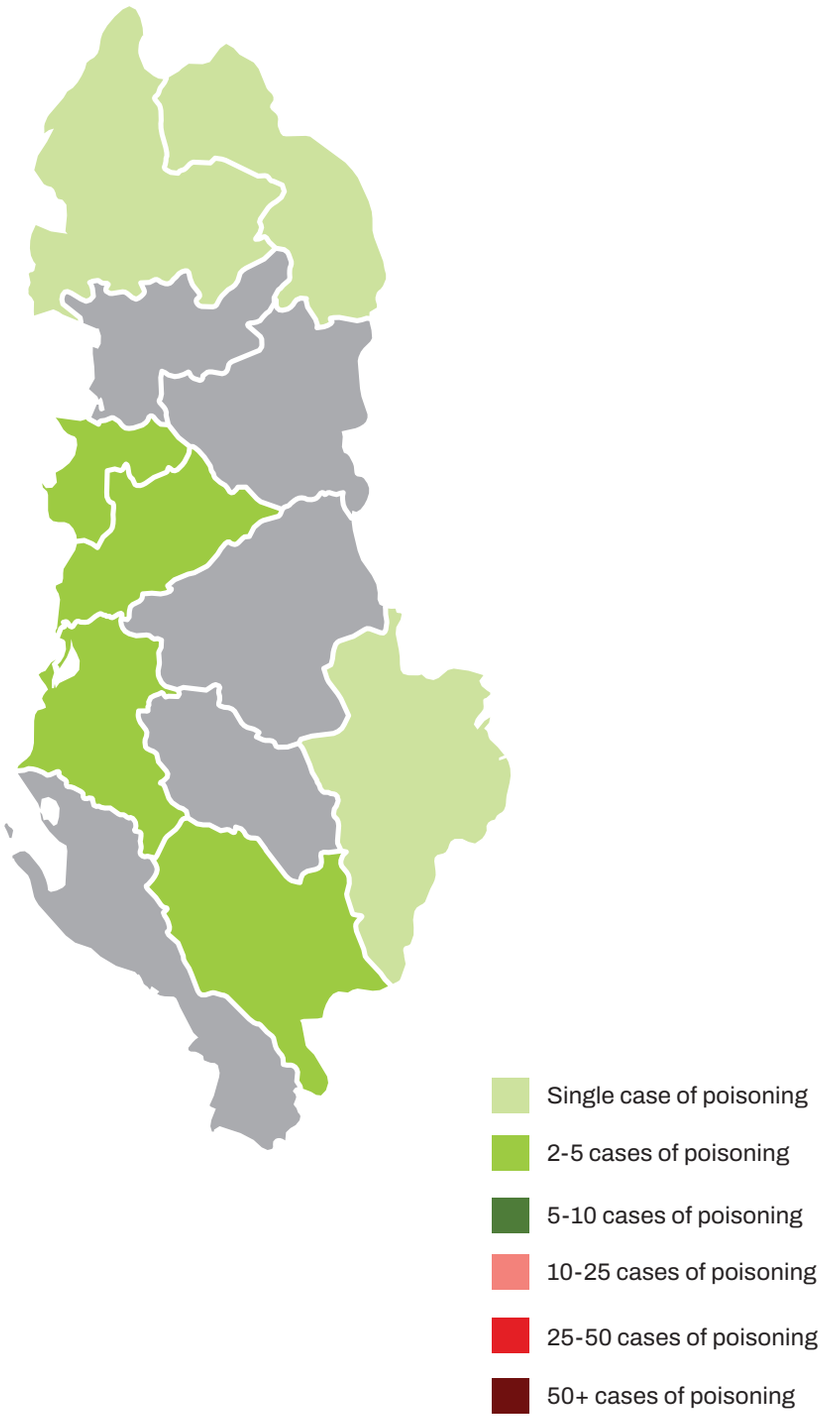


Figure 1. Motives behind wildlife poisoning in Albania

According to the available data, most common victims of wildlife poisoning in Albania are mammalian predators such as Red Fox (7 individuals in 7 separate incidents) and Eurasian Wolf (9 individuals in at least 2 separate incidents). Other victims include Eurasian Brown bear (4 individuals during 2019), Golden Jackal (1 individual in one poisoning incident), Beech Marten (1 individual in one poisoning incident), Rough-legged Buzzard (1 individual in one poisoning incident), Eurasian Magpie (3 individuals in one poisoning incident), House Sparrow (2 individuals in one poisoning incident). Additionally, 2 Eurasian Sparrowhawks were found presumably poisoned due to conflicts with pigeon fanciers and the damages they might inflict upon racing pigeons. This specific driver of illegal poisoning is recorded for the first time in Albania, although it has been well documented in other countries of the region, notably Serbia and Croatia. It is important to mention that one presumably mass poisoning incident dating from 2013 was obtained from the relevant authorities which indicates that 114 individuals from at least 3 different bird species probably died from poisoning.

There are indications from hunters that conflicts between wild predators (mainly wolves and jackals) and livestock breeders are becoming more frequent since the national hunting ban has been enforced in 2014. And, since there are no alternative official methods of population management enforced by relevant governmental institutions, it is believed that the populations of predators, as well as damages they inflict upon livestock, are increasing, which is why local livestock breeders often resort to poisoning as an easy and affordable method. In addition to this, there are no compensatory measures in place for damages inflicted by wildlife, which further deepens the conflict. However, additional data is needed to support these indications and efforts should be made to further investigate them, as they potentially represent the most significant threat that vultures might face in Albania.

Significant progress has been made in Albania in the struggle against illegal wildlife poisoning, chiefly towards amending the national legislation relevant to wildlife crime, as well as investigating the scope of illegal wildlife poisoning in the country. In synergy with the BAPP project supported by VCF and MAVA Foundation, “Illegal Killing and Taking of Birds” supported by EuroNatur and MAVA Foundation and the “Egyptian Vulture New Life project” (LIFE16 NAT/BG/000874) supported by Bulgarian Society for Protection of Birds (BSPB) and the EU, the Albanian Ornithological Society (AOS) lobbied in 2018 for the amendment of the Law No. 10 006, dated 23.10.2008 “On the Protection of Wild Fauna”. In July 2019, the Albanian Parliament adopted these amendments, explicitly stating that poisoning and particularly the use of poison baits is by law a prohibited action, and that the use of agricultural chemicals, veterinary drugs and services is a potential threat to wild fauna in case they are used contrary to the current legislation covering agricultural chemicals, veterinary drugs and services. Furthermore, these amendments were incorporated also into the penal code. These amendments of the national legislation represent a pre-requisite for any further conservation work related to combating wildlife poisoning. Following this, nature conservation CSOs and the Ministry of Tourism and Environment have currently developed an Anti-Poisoning Road Map which will orientate anti-poisoning policies in Albania. The adaptation of the legal national framework and the enhancement of the strategical framework is for sure a steppingstone in the right direction, but still significant efforts need to be made towards detection of poisoning incidents, awareness raising of both general public and relevant governmental institutions, from decision makers to enforcement bodies, and also towards capacity building. Training relevant to detection, reporting, sampling, and further processing of poisoning cases needs to be provided for police officers, environmental and veterinary inspectors and operational protocols developed so that they have the necessary tools to implement the newly amended legislation. Also, detailed training needs to be provided towards conduction of toxicological analysis, which is of crucial significance for further legal proceedings of poisoning incidents.



Map 2. Distribution of poisoning events by regions in Albania during 2000-2020.

Legal framework

Existing national legislation relevant to wildlife poisoning in Albania:

- **Law No. 46/2019, dated 08.07.2019 "On some changes and additions to law no. 10 006, dated 23.10.2008 "On the protection of wild fauna":** According to Article 10: "On the protection of wild fauna from substances, hazardous waste, and services" the use and administration of hazardous substances and waste, agricultural and veterinary chemicals, and services is done in accordance with the provisions of the legal framework in force, relating to chemical substances and preparations, hazardous waste management, plant protection service, as well as taking into account specific issues related to the prevention of poisoning of migratory birds, in accordance with the obligations defined in the agreements to which our country is a party.

  According to Article 19: "Prohibited Actions" of the same law, the use of poison baits for the extermination of wild fauna is punished with a fine in the amount of 100 000 ALL to 200 000 ALL.

- **Penal Code:** According to Article 202: "Harming of protected species of flora and fauna" of the Penal Code, killing, destruction, possession, acquisition or trade of specimens of protected species of wild flora and fauna or their parts or by-products, in breach of the requirements of specific national legislation or relevant permit, unless such a case has occurred over a negligible amount of these specimens from the biological point of view of the group belonging to the protected species, and has no significant impact on the conservation status of the species, constitutes criminal contravention and is punishable by a fine or imprisonment of two to seven years.

Relevant international treaties and conventions that Albania is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified by Albania in 1999, it prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in Albania

The research included 100 respondents to the survey questionnaires. The majority of livestock/ cattle and agricultural production farmers, rangers, veterinarians and policemen in hotspot areas in Albania are not informed about the presence and breeding of key species of vultures in their country. 56% of respondents from the local communities believe that Albania can be a breeding ground for the Egyptian Vulture, the Griffon and Cinereous Vulture follow (42% and 31%, respectively); when it comes to other species of vultures that were mentioned, the number of respondents who state that they are familiar with their presence is considerably lower.

Target groups in local communities in Albania mostly have limited information on the key threats to the vulture populations. While wildlife poisoning is identified as the biggest threat by less than 15% of respondents, the majority (35%) find reasons for the endangerment of vulture species in some other causes and 17% of respondents claim that they are not informed. Farmers, rangers, veterinarians, and policemen in our target communities in Albania also assess their knowledge of the issue of wild-

life poisoning as below average (39%). The respondents' knowledge related to the causes of vulture poisoning is limited and unclear, as the majority identify poison baits intended for other animals (29%) and consumption of poisoned animals (18%) as the key causes of vulture poisoning, which implies accidental poisoning, at the same time close to 50% of respondents believe that wildlife poisoning mostly occurs intentionally, with illegal poisons from the black market (36%) or by abuse of legal poisoning substances such as pesticides, insecticides, etc. (12%).

Responsibility for vulture poisoning lies primarily with livestock breeders, farmers and people who intentionally poison animals out of aggressive and destructive impulses; hunters follow. The key motivations for poisoning animals are related to *protection from pests*, *protection of pastures and livestock from wild animals*, but also *protection from stray dogs and cats* and *conflicts among people about land use*. The majority of the respondents who witnessed/heard of poisoning cases in the past 10 years believe that the incidents were the result of deliberate poisoning of any type of animal *within the settlements and inhabited areas* implying the need for better protection of property, cattle, and pets within human settlements. Although a smaller number of poisonings were attributed to intentionally poisoned wild animals outside of settlements because "they bothered someone", this is still an issue to address in the communication with residents of local communities in Albania.

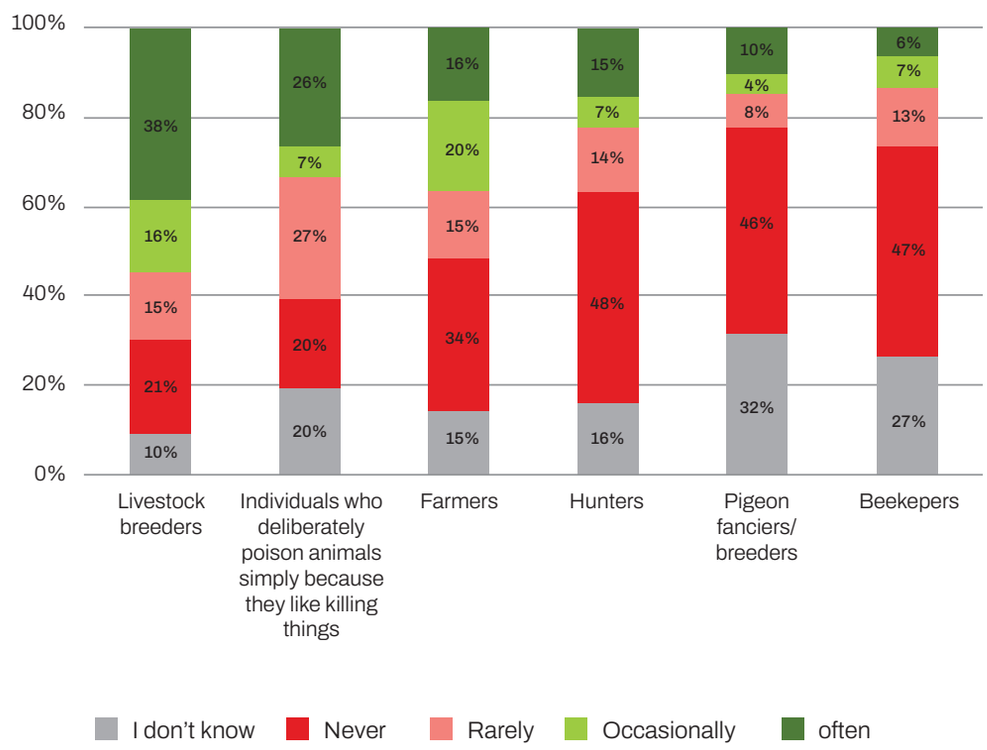


Figure 2. Perceived responsible groups for wildlife poisoning in Albania

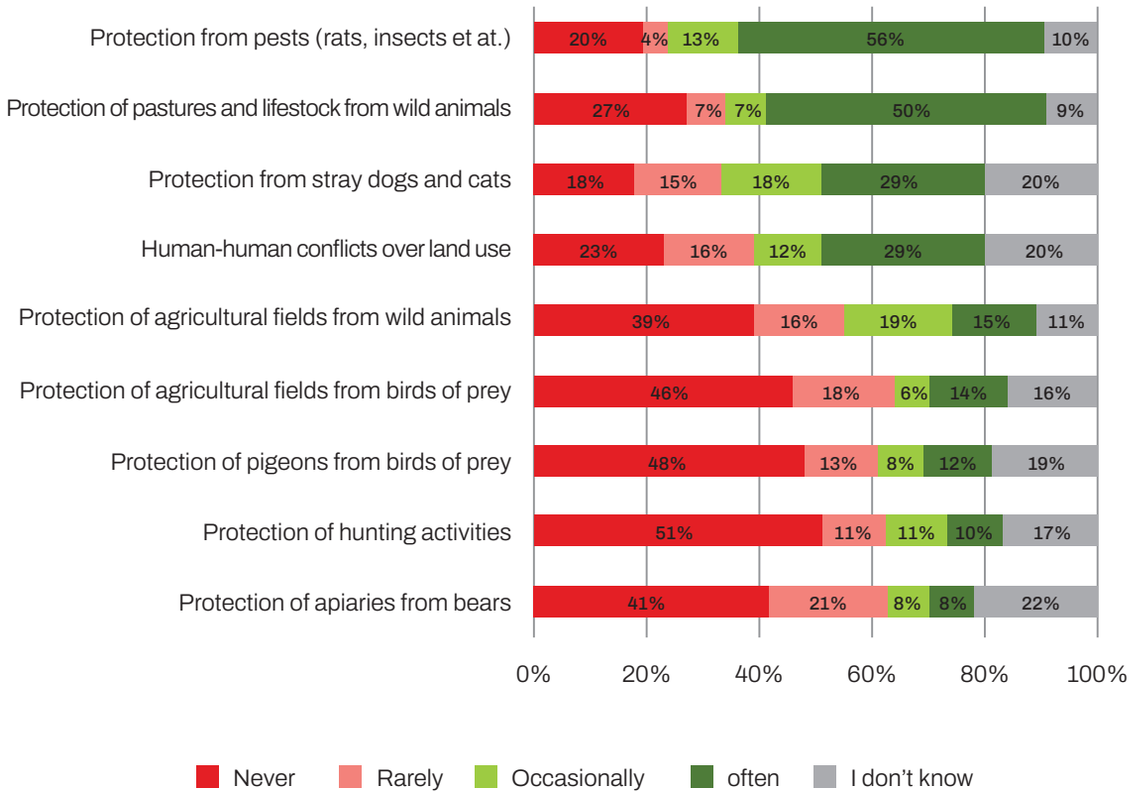


Figure 3. Perceived motives behind wildlife poisoning in Albania

On the other hand, responsibility for reporting poisoning incidents to the authorities is attributed to hunters and veterinarians, as well as the general population. Still, more than 70% of target groups believe that people who report someone for poisoning wild animals risk altercations and conflicts in their community, which is one of the important barriers for preventing and sanctioning these incidents (40% of respondents are concerned about the possible risks and claim readiness to report the incidents only if they personally wouldn't have negative consequences, while 1 in 5 stated that they would not report the poisoning). Apart from communicating the importance of the cooperation with the authorities in detection and prevention of these cases, research results show the need for communicating which are the proper institutions to report the poisoning to, especially as the authorities need this type of cooperation to detect the remote locations' poisoning cases, that are not easy to detect. Research results also show the importance of a public discussion about personal vs shared responsibility ("there are enough other people worrying about that"), and the importance of dealing with wildlife poisoning beyond the immediate effects that it has on individuals.

When it comes to the measures for prevention and combating wildlife poisoning, 80%-90% of respondents perceive that that the state/government should financially compensate the damage to livestock breeders and farmers caused by wild animals, and that additional resources should be invested in informing the general population about the problem of wildlife poisoning. Other relevant measures include addressing pasture ownership issues, installing electric fences, controlling the export and import of legal toxic substances, creating more feeding grounds for vultures, but also stricter imposing of fines for animal poisoning.

Wildlife poisoning investigations are also identified as important police work by close to two thirds of the respondents. 16% of the target group on the other hand considers these investigations as mostly or completely unimportant.

A promising finding of the research shows that most of the residents in local communities in Albania recognize the importance of the vulture population for both humans and the environment (around 70%). Also, about 70% of the target groups residents realize that the Earth has limited space and resources, that it is challenging to maintain the natural balance, and that plants and animals have the same rights as humans.

However, the results of the research also imply the need for further communication of the dangers of wildlife poisoning, as around one third of the respondents consider controlled institutionally conducted poisoning of wild animals as a proper means to control pests, and also that poisoning of vultures is justified in certain situations. The most polarizing attitude is related to the dominance of man over nature – while 4 out of 10 respondents believe that people are the ones who have primacy, a similar number disagrees with the idea of human rule over nature.

Ordinary citizens in general are identified as the target group for the awareness campaign about the threats of wildlife poisoning; livestock breeders, farmers, hunters and game wardens, follow.

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Albania

Online Interviews of the targeted groups of government services and institutions officials, law enforcement officials and veterinary service employees in Albania were carried out. The sample included 22 respondents in total out of 49 employees in targeted institutions.

Officials employed in relevant institutions in Albania are well informed that the Egyptian Vulture, the only vulture species breeding in Albania is present on the territory of their country. However, there is a certain lack of knowledge when it comes to the conservation status of other species of vultures, as less than half of the respondents think that the Griffon Vulture still breeds in Albania and a small number of respondents consider that Cinereous Vulture and Turkey Vulture are also present in Albania.

Wildlife poisoning is perceived as the key threat to the vulture populations in Albania (by more than half of the officials employed in relevant institutions). Wildlife poisoning is considered to be both accidental and intentional, by using illegal poisons from the black market or legal poisoning substances such as pesticides or insecticides. On the other hand, poisoning of the vultures is mostly perceived as unintentional either from poison baits intended for other animals or from secondary poisoning by consuming poisoned animals.

The key target groups responsible for wildlife poisoning are identified as livestock breeders and farmers. These groups resort to wildlife poisoning to protect the pastures, agricultural land and livestock from wild animals and as protection from pests.

More than half of the government employees believe that Gjirokastër is the region of Albania where wild animals are most frequently poisoned, while considerable number of officials (around one third) claim to be uninformed about the region(s) where wild animals are most often poisoned.

The key aggravating circumstances and obstacles for prevention and sanctioning of wildlife poisoning are *inadequate law enforcement* (although laws and regulations themselves are not assessed as unsatisfactory), *low penalties for wildlife poisoning* and *inadequate and unclear protocols for police action and limited police capacities*.

In terms of legislations and legal processing of poisoning incidents, officials additionally point to the rare imposing of fines (especially under the Hunting Act), and to the lack of public prosecutors' education for managing incidents related to the poisoning of wild animals. Regarding sanctions for various unlawful actions detrimental to animals and the environment, the majority of officials agree that all forms of mass and non-discriminative killing of animals (trapping, poisoning, explosives, etc.) should be severely punished

and that fines for every type of poaching or illegal shooting should be increased. They also recognize the necessity for treating the possession of poison baits as a separate offense, regardless of whether it has been proven that an animal was killed and believe that the rangers should have the authority to arrest perpetrators, if they are caught in the act. On the other hand, there is no unanimous opinion whether the fines for animal poisoning should only be financial, or they should envisage imprisonment.

In general, there is very little knowledge about the existence of National action plan for combating wildlife poisoning, a protocol defining procedures and jurisdictions for investigating wildlife poisoning and a database for poisoning incidents of birds amongst officials from relevant institutions. They also point out the inadequate cooperation between governmental institutions and civil society organizations regarding data collection about poisoning events, which is in line with the perception that the lack of coordination among relevant institutions and organizations is a bigger problem than a lack of resources.

Regarding the role of the Police in investigating wildlife poisoning incidents, respondents recognize the complexity of the investigations, assessing at the same time the capacities of the police as inadequate, both in terms of equipment and in terms of education and training of police forces. The majority of governmental employees surveyed identify the necessity for introduction of more people in the field for timely detection of poisoning incidents, introduction of specialized police units for environmental crime, including wildlife poisoning, and introduction of specialized canine units for detecting poisonous substances used for wildlife poisoning. Modern technologies and methods, as well as the cooperation with representatives of civil society in the investigation process are also identified as necessary. In addition, about two-thirds of respondents believe that additional effort is needed to change the attitude of the police towards a more serious understanding of the need for investigating wildlife poisoning incidents.

An additional obstacle in the work of the Police is the lack of reporting of poisoning incidents to the police forces, which should be the responsibility of veterinarians and hunters in the first place, but also general population (every person). Still, close to two thirds of respondents perceive that reporting of such incidents can pose certain risks in the respective local communities for those who inform on the poisoning. An important barrier is also believed to be lack of information who to report animal poisoning incidents to.

Speaking of measures for preventing wildlife poisoning, almost all governmental employees believe that further raising of awareness among citizens in general and key stakeholders (livestock breeders, farmers, hunters, institutions), imposing a stricter control of the sales of legal poisoning substances and providing compensation to livestock breeders and farmers for the damages caused by wild animals are the key preventive measures that can help reduce wildlife poisoning.

Additional supplementary feeding sites for vultures and better protection of wild ungulate populations are the measures which are also perceived as important and beneficial.

Research results indicate a developed environmental consciousness among officials in Albania. They understand that plants and animals have an equal right to exist as humans and that the natural balance is very delicate and easily disturbed. Also, optimism for future actions is present in beliefs of the half of the respondents who dispute that humans are destined to rule over the rest of the nature, although one third agree with the domination of people over nature.

Conclusions

Wildlife poisoning in Albania is an evident environmental issue. The efforts invested into the research of this practice since 2018 provide preliminary insight into its scope and nature. We now know that people mostly resort to poisoning to resolve conflicts with wildlife, most often predators such as foxes, wolves and bears in order to reduce the damages that these animals may inflict upon livestock and other agricultural practices. For the better investigated poisoning events

we can see that poison baits are mostly prepared using Methomyl and Organophosphates. A new potential driver of poison use registered in Albania is the deliberate use of poison due to conflicts with pigeon fanciers and the damages they might inflict upon racing pigeons. This specific driver of illegal poisoning is recorded for the first time in Albania, although it has been well documented in other countries of the region, notably Serbia and Croatia. It is important to mention that information about one presumably mass poisoning incident obtained from the relevant authorities indicate that misuse of pesticides used in agriculture could also be an important source for wildlife poisoning in the country. It is necessary to monitor and record all potential poisoning events in the country in order to more adequately determine the actual scope of this practice in the whole country and precisely define the areas where it most often occurs.

Conservation work regarding wildlife poisoning in Albania resulted in creating conditions for legal sanctions against this practice. The recent changes in the national legislation now make it possible for poisoning to be treated as an illegal activity, punishable by law, which represents the basic foundation for combating this damaging practice. Since the change in national legislation is very recent, the jurisdictions and responsibilities of national law enforcement agencies need to be precisely defined. Additionally, a significant amount of specific training for combating wildlife poisoning, and environmental crime in general, is needed for enforcement agents from the relevant institutions in order to be able to adequately address potential poisoning events.

Poisoning in general is not perceived as a very significant threat for vultures or other wildlife by the general population inhabiting rural areas in Albania, and the majority of people are not well informed about this conservation issue. On the other hand, they perceive that livestock breeders and hunters are groups which might often resort to the use of poison baits as they most commonly have conflicts with wildlife. These groups are perceived as the main culprits behind wildlife poisoning also by relevant governmental authorities, which generally exhibit a significantly higher ecological awareness when it comes to poisoning and wildlife crime in general. Therefore, future anti-poison efforts in Albania should also integrate a significant educational and awareness raising component aimed at changing the perception about this practice and labeling it as a socially unacceptable behavior.

BOSNIA AND HERZEGOVINA

Introduction

The negative effect that the use of poison baits has on wildlife is well documented in Bosnia and Herzegovina. The first data about the effects of this practice on birds, especially on vultures, was noted in Othmar Reiser's works published in the end of 19th and first years of 20th century, when it was pointed out that it is necessary to regulate the use of poisons in the environment to prevent the killing of Bearded and Griffon Vultures. Vulture populations in the country suffered the severest blow in the mid-20th century, when the use of poisonous substances for exterminating large carnivores, mainly wolves, was a legally sanctioned practice. This uncontrolled and unprecedented poisoning practice led to extinction of the Cinereous (1910), Bearded (1987) and Egyptian Vulture (1995) from Bosnia and Herzegovina. The last major poisoning event was observed at the beginning of the 1991 when the last breeding colony of Griffon Vultures in the country was poisoned in a single poisoning event. In the last 20 years the problem of poisoning is still present, although almost no records of massive poisoning incidents of wildlife have been officially reported to the relevant institutions. There are no systematic records or relevant database related to wildlife poisoning incidents in the country among the relevant governmental institutions. Since 2018. and the launch of the BAPP project in Bosnia and Herzegovina, information about potential poisoning incidents has been systematically recorded by Ornitološko društvo "Naše ptice", which enables us some insight into the current situation of the illegal poisoning in the country,

Historical perspective

There is very little available data related to wildlife poisoning in general, and even fewer data related to vulture poisoning from Bosnia and Herzegovina, although the use of poison baits for population control and extermination of various mammalian predators and other undesirable animals is a well-documented practice in the country. Therefore, avian scavengers could frequently encounter poisoned dead animals (either as bait or as victims of poisoning) in the environment. From the middle of the 19th to the middle of the 20th century *Strychnine* was extensively used for the control of wolf populations. The poisoning was not selective and was affecting many other different species as well. Another reason for using poison was the control of population of feral and stray dogs. Large, organized poisoning actions, with the use of strychnine and *Hydrogen cyanide* were carried out after the II World War.

It is estimated that around 220 vultures (mainly Griffon Vultures) were poisoned throughout Bosnia and Hercegovina during 1959 alone (Mardešić & Dugački *in* Marinković, 1999). The practice of illegal placing of poison baits in the environment for the same reasons continued throughout the 80s and 90s. During the period of 1980-1991, 97 Griffon Vultures were poisoned in eastern Hercegovina (Marinković *et al*. 2007). It was proven that in some incidents Furadan (Carbofuran) and hydrogen cyanide were used.

The last recorded incident of massive poisoning of vultures in Bosnia and Herzegovina was recorded on June 26th, 1991 in Blagaj, where the last breeding population of Griffon Vultures used to breed, on cliffs towering above the Buna River. Thirty Griffon Vultures were found poisoned after feeding on an animal carcass laced with Fura-

dan, which was placed in order to eliminate stray and feral dogs from the vicinity of a local settlement, according to official reports. This single poisoning incident wiped out the last breeding population in the country and the species hasn't recovered since. Currently there are no vulture species breeding in Bosnia and Herzegovina, only vagrant individuals of Griffon Vultures, and recently of reintroduced Cinereous Vultures from Bulgaria, have been recorded flying across the country during the last 20 years.

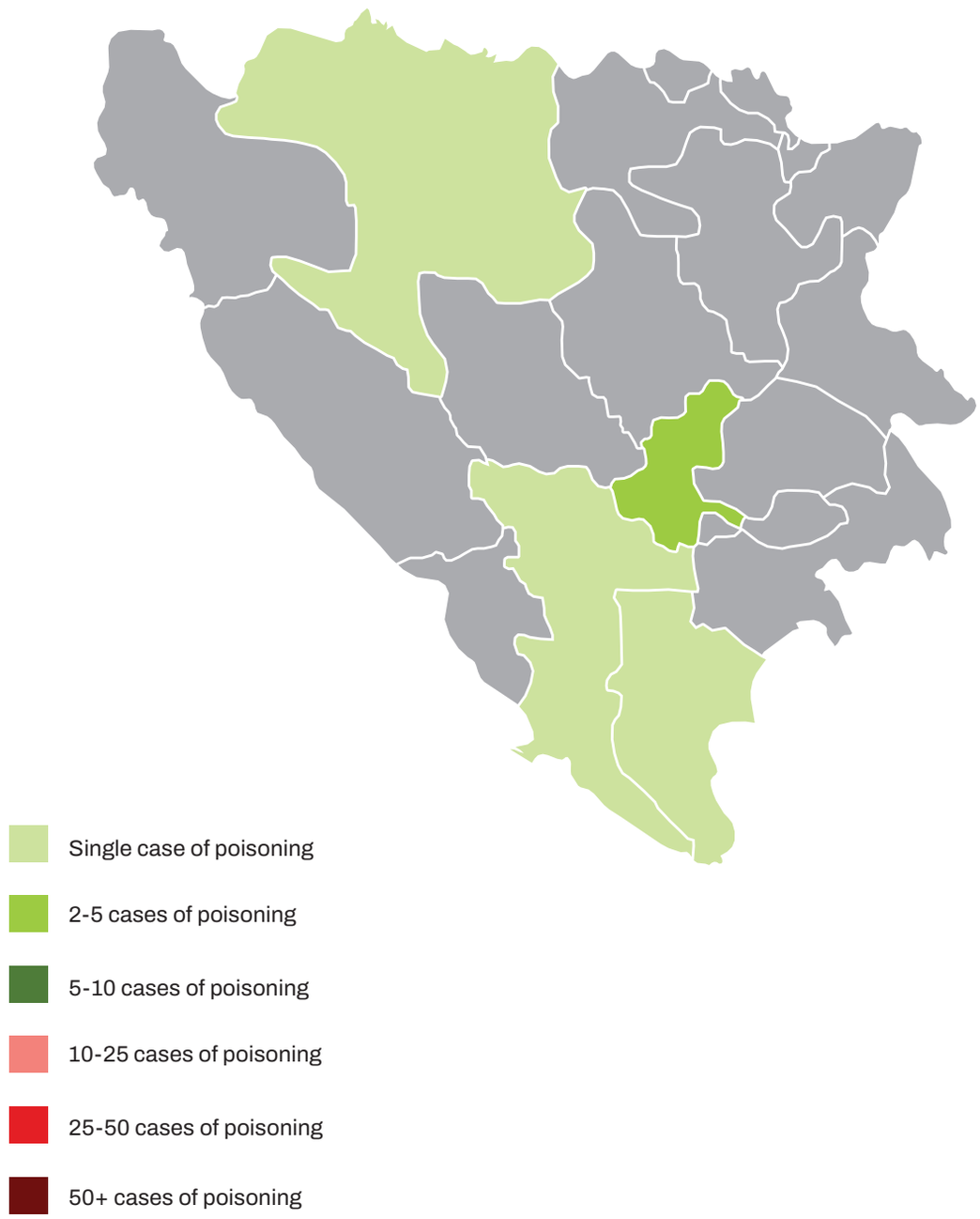
Current situation in the country

First comprehensive investigation of the practice of wildlife poisoning in Bosnia and Herzegovina was conducted through the implementation of the BAPP project, which was implemented from 2018-2021. Within this period, efforts were mainly invested in determining the current scope of this practice on a national level, drivers behind it, substances most commonly used and areas in the country where it most often occurs (or where conflicts with wildlife, especially predators, have been recorded the most).

There is very little information regarding wildlife poisoning available in general, both from the relevant governmental authorities and media, and even less about poisoning incidents relevant to vulture mortality, the drivers behind it and the substances most frequently used. Based on the available data a total of 6 presumable poisoning wildlife incidents have been recorded in Bosnia and Herzegovina from 2000-2020, mainly due to misuse of pesticides in agriculture. The last massive poisoning incident was recorded in 2004 near Sarajevo, where 20 Common Buzzards were found dead on an agricultural field. The misuse of rodenticides for control of rodent populations was believed to be the cause behind this incident, like the one recorded in 2017, where 2 White Storks were found dead in Vrbaška.

Since 2018, 4 presumable wildlife poisoning incidents were recorded, with no information available about the motives behind them or poisoning substances used. In 2018 one Griffon Vulture was suspected to have died of poisoning in the recovery aviary in Blagaj. In 2020, 3 Western Marsh-harriers were found dead in Gacko most likely due to misuse of pesticides in agriculture. In the Canton of Sarajevo, the same year 1 Eurasian Brown bear and Peregrine Falcon were found dead, presumably poisoned. The necropsy conducted on the bear concluded that there were indicative signs of poisoning. However, since there are currently no referent toxicological laboratories in Bosnia and Herzegovina for conducting forensic toxicological analysis on wildlife it is not possible to conduct necessary analyses to validate if the cause of death was actually poisoning and what was the substance used. Additionally, the current legislation does not permit samples from wildlife, especially protected species to be transported for toxicological analysis in referent laboratories abroad, which further complicates the issue of officially confirming poisoning incidents in the country. Therefore, it is vital that future conservation efforts in Bosnia and Herzegovina relevant to wildlife poisoning focus on amending the current legislation in place and develop capacities within existing relevant national laboratories for conducting toxicological analysis on samples obtained from wild animals.

Since half of the recorded wildlife poisoning incidents in the last 20 years indicate that the animals most likely died from secondary poisoning, due to improper application of rodenticides in agricultural areas, it is important to note that this unintentional poisoning constitutes a significant factor in Bosnia and Herzegovina. Poisonous substances are mostly used by farmers, most of them insufficiently informed about proper usage and application. There are legal protocols that prescribe the proper manner and amount of use of these substances, however adequate enforcement of these protocols is completely lacking or is restricted to large, commercial farms. There is no control of the application of these substances by small farmers and farmsteads. Furthermore, it is important to note that the procurement of banned substances is very much present in the country and is often conducted through social networks (Facebook), various web sites, indicating that a black market for these substances exists.



Map 3. Distribution of poisoning events by regions in Bosnia and Herzegovina during 2000-2020.

However, intentional use of poison baits for elimination of feral, stray cats and dogs is still frequently reported, both in rural and urban areas, and potentially poses a significant threat for vultures foraging in Bosnia and Hercegovina. Since 2004 a total of 13 incidents were documented where stray dogs were targeted. During 2011 within the city of Tuzla over 100 dogs were found poisoned. In 2 incidents the poison used was confirmed to be a rodenticide, while on one occasion a molluscicide was used to prepare poison baits. On the other hand, more recent data about the use of poison baits for elimination of wild predators is lacking and needs to be further investigated to assess if it poses a potential threat for vultures and other scavengers.

It is important to highlight that development and legal adoption of operational protocols for processing cases of wildlife poisoning in Bosnia and Herzegovina, which would also describe the responsibilities of each relevant authority, would lead to more effective enforcement of anti-poison legislation, as well as increased efforts of responsible authorities in early detection of poisoning cases. These actions would greatly facilitate the prosecution of these cases and their culprits and are crucial for long-term improvement. Bosnia and Hercegovina has a very complex bureaucratic apparatus, with often conflicting legislation in place on different levels of governance (federal level, entity level, cantonal level). Additionally, each level of governance has its own government, ministries, environmental inspectorates, and enforcement agencies, with joint actions and cooperation rarely being carried out. These circumstances are making it difficult to precisely define jurisdictions among these relevant stakeholders.

Legal framework

Wildlife poisoning and the use of poisonous substances is clearly defined in the existing legislation in Bosnia and Herzegovina as an illegal activity.

Existing national legislation relevant to wildlife poisoning in Bosnia and Herzegovina:

Federation of Bosnia and Herzegovina – Federal level.

- **Law on nature protection:** Article 119. of the Law on nature protection prohibits the use of all methods for capturing and killing of wild animal species which can cause local extinctions or severe disturbance of populations of those species, which includes the use of poison baits.
- **Hunting law:** Article 29. of the Hunting law prohibits the intentional poisoning of game animals. Exceptionally, the Federal Minister, based on request from interested parties (inspectorate, hunting association etc.), may authorize the use of poison for elimination of certain species of game animals if they threaten human health, health of domestic animals or survival of protected species of game animals. This authorization must state the method, timeframe and persons responsible for placing poison baits. Article 84. determines the penalty of 1.000-1.500 KM for all citizen who violate Article 29. Furthermore, Article 52. of the same Law prohibits unethical methods of hunting, which among other means and methods includes the use of poison baits.

Republika Srpska – Entity level.

- **Law on nature protection:** Prohibits all activities which contribute to disturbance of the favorable condition of populations of wild species, destroying or damaging their habitat, litter, nesting or disturbing their life cycle, or favorable condition, among other things, by the use of poison baits.
- **Hunting law:** Article 16. of this law prohibits the use of poison baits as a method for hunting or control of populations of game animals.

District Brčko – Regional level.

- **Law on nature protection:** Prohibits all activities which contribute to disturbance of the favorable condition of populations of wild species, destroying or damaging their habitat, litter, nesting or disturbing their life cycle, or favorable condition, among other things, by the use of poison baits.
- **Hunting law:** Article 13. of this law prohibits the use of poison baits as a method for hunting or control of populations of game animals.

Relevant international treaties and conventions that Bosnia and Herzegovina is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): ("Official Gazette of Bosnia and Hercegovina No. 8/08 – 47 – annex). It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in Bosnia and Herzegovina

The target group for the research were hunters, farmers and livestock breeders within the local communities of Blagaj and Kupreško polje, areas which Griffon Vultures occupied in the past and which are important for livestock breeding and potential conflicts with predators. Due to difficulties caused by COVID-19 pandemic, the sample included 27 respondents in total from a target population of 282 people.

Target audiences in local communities in Bosnia and Herzegovina are in general inadequately informed about the presence of vulture species and whether they breed in Bosnia and Herzegovina, as well as about the issue of wildlife poisoning in this country.

Wildlife poisoning is perceived as one of the three key threats to the vulture population in Bosnia and Herzegovina, apart from poaching and the lack of food (around 60% each). Vultures are however not perceived as primary targets of poisoning, but mostly as accidental fatalities from poison baits intended for other animals, because vultures themselves consume poisoned animals or because of unintentional pesticide poisoning. Only close to a quarter of respondents believe poisoning of vultures is intended and executed by poison baits prepared specifically for vultures.

An encouraging finding of the research implies that the majority (78% or above) of the respondents from the local communities in Bosnia and Herzegovina recognize the importance of vulture populations for both humans and the ecosystem in its entirety, they do not justify poisoning of wild animals, while 70% disagrees that wildlife poisoning is only a problem when it poses a threat for humans. Also, about 70% of the respondents agree that the Earth has limited space and resources, that it is difficult to maintain the natural balance, and that plants and animals have the same rights as humans.

However, results of the research imply the need for further communication about the dangers of poisoning as slightly above 40% of respondents consider controlled institutionally conducted poisoning of wild animals as a proper mean to control the populations of pests and undesirable animals. A similar number of the respondents believe that people are the ones who have primacy over nature.

While close to 2 out of 3 respondents from our target groups perceive that wildlife poisoning mostly occurs intentionally (mostly by illegal poisons from the black market and to a somewhat lower percentage by abuse of legal poisoning substances such as pesticides, insecticides, etc.), around one third of respondents believe that wildlife poisoning most commonly occurs accidentally, by misuse of legal poisoning substances out of negligence or ignorance.

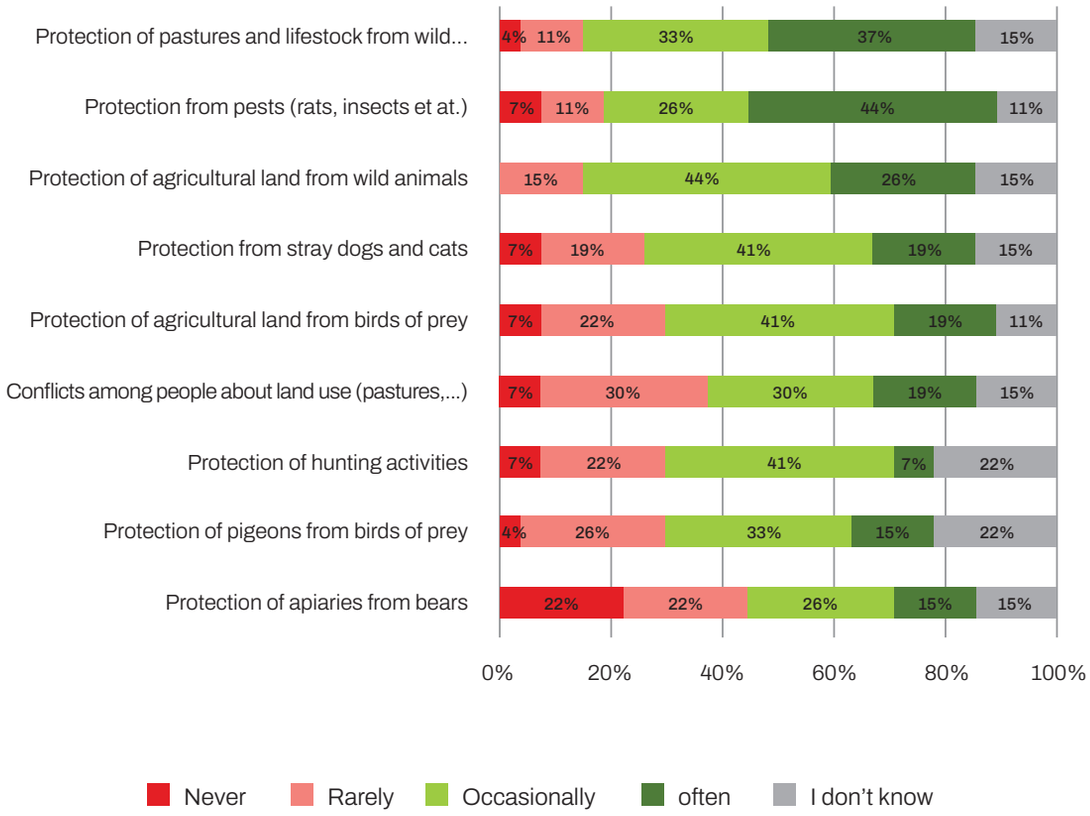


Figure 4. Perceived motives behind wildlife poisoning in Bosnia and Herzegovina

People from the local communities attribute the responsibility for wildlife poisoning mainly to hunters (around 75% of respondents), individuals who deliberately poison animals simply because they like killing things (63%) and livestock breeders and farmers (around 50%). In line with this, 70-80% respondents recognize hunters and veterinarians, but also the general public (*every person*) as the most responsible for reporting information/knowledge about wildlife poisoning to the police.

A key barrier for people to report wildlife poisoning cases are risks of negative consequences for those who report the poisoning incidents and conflicts with people from their communities. While one third of respondents would report the incident only if it wouldn't have negative consequences for them, 15% is undecided what they would do, while close to 1 in 10 stated that they would not report the poisoning. Another potential barrier for reporting animal poisoning incidents is the perception that citizens mostly do not know who to report these incidents to (Figure 5).

All this implies that further standardization of the reporting procedures of poisoning incidents, as well as informing of the citizens to whom to report to is needed to help them participate in the identification of poisoning events and in the prevention of further occurrences.

The most frequent motives behind poisoning of wild animals imply the need for better solutions for *protection from pests*, *protection of pastures, livestock and agricultural lands from wild animals, stray dogs and cats* and *protection of agricultural land from birds of prey* (Figure 4.).

In the past 10 years, around half of the respondent claim encountering mostly intentional case(s) of poisoning in their community. Apart from wildlife poisoning, witnesses claim poisoning of guard or shepherd dogs, pets or domestic animals as

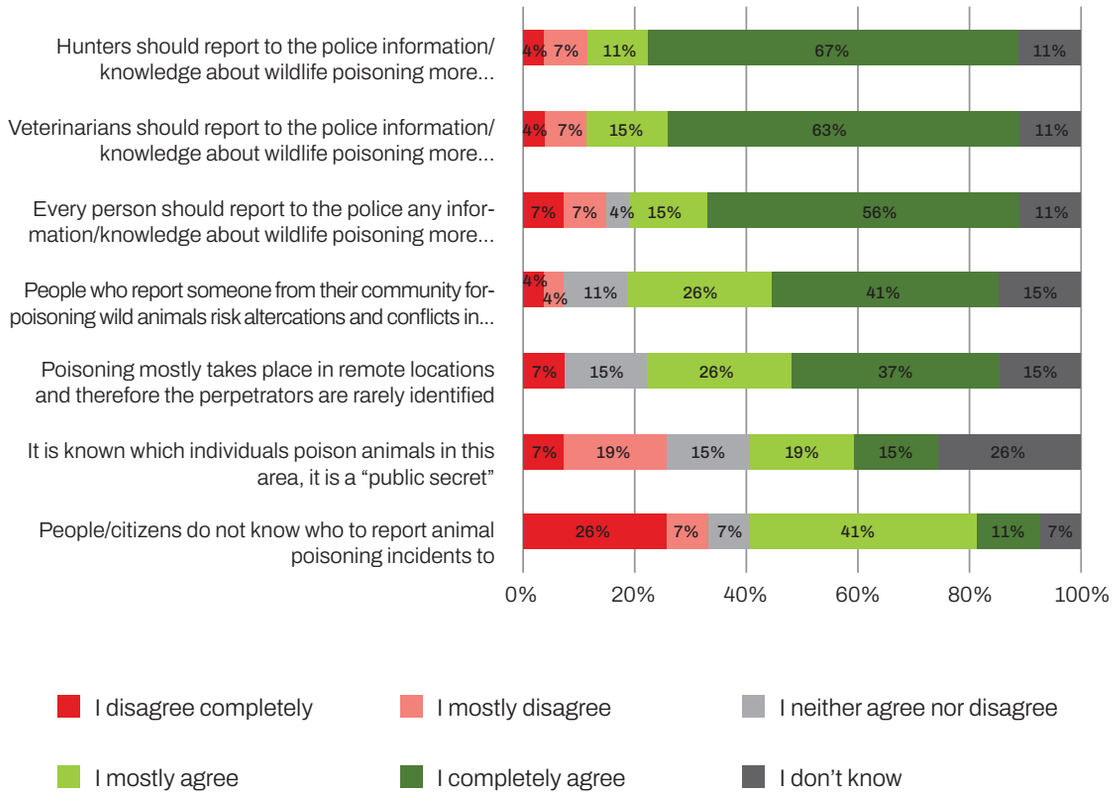


Figure 5. Personal attitudes towards reporting poisoning incidents to the relevant authorities in Bosnia and Herzegovina

accidental occurrences. Amongst the regions of Bosnia and Herzegovina, Krajina (33%) is perceived as the region where wild animals are most frequently poisoned, Hercegovina (15%) and Posavina (11%) follow.

When it comes to the measures for prevention and combating wildlife poisoning, 75% of the respondents believe that it is important to enforce a stronger control of import and trade of legal poisoning substances, to increase administrative fines for wildlife poisoning, to work more on informing the general public about the problem of wildlife poisoning, and that the state/government should financially compensate the damage to livestock breeders and farmers, caused by wild animals. Wildlife poisoning investigations are also identified as important police work by close to two thirds of respondents.

Citizens in general are identified as the target group for the awareness campaign about the threats of wildlife poisoning, hunters (30%), livestock breeders (26%) and farmers (22%) follow.

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Bosnia and Herzegovina

Due to difficulties caused by the COVID-19 pandemic, the sample included 9 respondents in total out of 29 employees in targeted institutions. Employees of relevant governmental institutions in Bosnia and Herzegovina show a certain lack of information and knowledge about the degree of endangerment of the vulture populations, and the fact that there are almost no vultures in the country apart from rare and isolated sightings of passing Griffon vultures.

The key perceived threats to the vultures in Bosnia and Herzegovina are extensive use of legal toxic

compounds (pesticides, insecticides, rodenticides) and wildlife poisoning. Vultures are however perceived as both primary targets and accidental fatalities, poisoned by baits intended for other animals, by consumption of poisoned animals or consumption of poison baits intended specifically for them. These findings imply the need for vigilance regarding wildlife poisoning in general.

Amongst the regions of Bosnia and Herzegovina, Herzegovina stands out as the region where wild animals are most frequently poisoned, especially in the spring and autumn periods of the year, although half of the institution employees perceive they are not informed about the regions affected by wildlife poisoning or the periods of the year posing the biggest risk for vulture population.

In addition to persons who deliberately poison animals out of aggressive or destructive instincts, livestock and agricultural production farmers have been identified as a specific group with interest in protection of pastures, livestock and land from pests and wild animals through the practice of poisoning. These findings suggest that the field of action regarding prevention of wildlife poisoning should be twofold: the institutions should mobilize in the protection of livestock, crops, and land, but also in the education of citizens about the harmful effects of wildlife poisoning.

Governmental employees participating in the research recognize the relevance of police work in wildlife poisoning, stressing that the Police should take these types of investigations seriously, while citizens should be informed about the importance of reporting poisoning incidents to the police. They also emphasize the importance of strengthening of the police force capacities by equipping the police with specialized canine units for detecting poisonous substances, increasing the number of agents in the field (including environmental inspectors, rangers etc.) for timely detection of poisoning incidents, forming specialized police units for environmental crimes, including wildlife poisoning, and equipping the police forces with expensive and sophisticated technology. On the other hand, they recognize that the police forces are currently not sufficiently equipped, as well as not sufficiently educated to investigate wildlife poisoning.

Other key aspects in the further protection of biodiversity, wildlife and vulture populations in Bosnia and Herzegovina as perceived by the government employees relate to enforcement of the existing laws (which are mostly found as sufficient but inadequately implemented), imposing the fines (i.e. under the Hunting Act), but also application of strict punishments for all forms of mass and non-discriminatory killing of animals, higher penalties for all forms of poaching, and declaring animal poisoning a criminal offense in general and not just if it occurred in a protected area (i.e. nature or national parks). In line with the better enforcement of existing laws, there is also a need for imposing a stricter control over the trade of legal poisoning substances (pesticides, rodenticides, etc.). These two factors - enforcement of the laws and control over the sales and usage of legal poisons have been identified as key barriers to preventing and sanctioning wildlife poisoning incidents.

It was highlighted by the representatives of the relevant governmental institutions that rangers in protected areas should have the authority to arrest persons who poison animals if they are caught in the act, and that possession of poison baits should be a separate offense, regardless of whether it has been proven that an animal was killed.

The research results also identify the need for improving the coordination among relevant institutions, which is perceived as a bigger challenge than the lack of resources. In line with this, there is a need for better coordination of efforts and capacities, inclusion of representatives of civil society organizations in the police investigations, as well as the cooperation between governmental institutions and civil society organizations i.e. regarding data collection about poisoning events.

There is also an evident lack of data about the sales of legal poisonous substances (pesticides, insecticides, rodenticides ...), and of databases on poisoning incidents, as well as of a national action plan to combat poisoning or a protocol defining procedures and responsibilities in investigations into wildlife poisoning. Raising awareness of the general public and key stakeholders (livestock breeders, farmers, hunters, institutions), a larger number of supplementary feeding sites for vultures, better

protection of wild ungulate populations, resolving the issues of pasture ownership and the right to use them, ensuring free electric fences and state/government financial compensation for the damages caused by wild animals to livestock breeders and farmers, have a key place in the prevention of wildlife poisoning incidents.

According to the respondents, all citizens need to be better informed to whom they should report cases of poisoning of wild animals. Also, it is necessary to promote the protection of vultures and inform the citizens about the dangers of poisoning to create a climate in which citizens are not afraid of risks and conflicts in their environment if they report poisoning cases.

The sensitivity of the natural balance and the possibility of it being easily disturbed, as well as the limited resources and space on Earth, were unanimously recognized by target group of employees in the institutions of Bosnia and Herzegovina. On the other hand, although plants and animals are recognized as equal in terms of the right to life and existence, the presence of the attitude that people are destined to rule over nature is still evident.

Conclusions

Although efforts have been made in the past several years to determine the actual scope of wildlife poisoning in Bosnia and Herzegovina by national CSOs, there has been very little data available about this occurrence in the country during the last 20 years, although it has been a deeply rooted practice until the 1990s. Almost no available data about animal poisoning exists among the relevant governmental authorities in the country, despite the fact that the practice of using poison baits to eliminate undesirable animals has been illegal for more than 30 years. Existing data almost exclusively relates to poisoning of pets, mostly dogs, in urban environments. The lack of a referent national laboratory where it would be possible to conduct forensic toxicological analysis, to confirm if a wild animal has indeed died as a consequence of poisoning, further complicates the issue. Most presumable poisoning events involving wildlife relate to unintentional poisoning mainly due to inadequate use of pesticides or other plant protection products used in agriculture.

On the other hand, wildlife poisoning is perceived as one of the three key threats to vultures in Bosnia and Herzegovina by the general population in rural areas, apart from poaching and the lack of food. Vultures are not perceived as primary targets of poisoning, but mostly as accidental fatalities from poison baits intended for other animals. However, further educational and awareness raising actions about the dangers of illegal poisoning of animals, and the importance of reporting these incidents to the relevant authorities, need to be implemented as almost half of the surveyed people in rural areas consider controlled institutionally conducted poisoning of wild animals to be an adequate measure for control of populations of pests and undesirable animals. Additionally, a great majority of surveyed people in Bosnia and Herzegovina perceive that wildlife poisoning mostly occurs intentionally (mostly by illegal poisons from the black market and to a somewhat lower percentage by abuse of legal poisoning substances such as pesticides, insecticides, etc.). Therefore, it is very probable that a significant number of intentional poisoning incidents remains unnoticed and unreported. People from the local communities perceive that the responsibility for wildlife poisoning mainly to rests on hunters, individuals who deliberately poison animals simply because they like killing things and livestock breeders and farmers.

Although Bosnia and Herzegovina has a complicated political and administrative setting, the existing legislation in place clearly prohibits the use of poison baits and any similar means of non-selective extirpation of animals. Relevant law enforcement institutions in the country are inexperienced in dealing in poisoning incidents, and significant efforts need to be invested to build up their capacities in order to be able to tackle this specific type of environmental crime. The lack of coordination and cooperation among relevant governmental institutions, lack of clear operational protocols, and the possibility of conducting toxicological analysis on wild animals are recognized as the main gaps that result in poor engagement and performance of the relevant authorities with wildlife poisoning in the country.

BULGARIA

Introduction

During the middle of the 20th century the use of poisoned baits was widely and systematically used to control populations of wild predators in Bulgaria, much like other neighboring countries of the Balkan region. The effects of this legal, governmentally sponsored initiative back then are well documented. The Bearded Vulture is considered to have been extinct since the 1970s when the last individual was found poisoned in the Eastern Balkan Mountains. Since then, only single vagrant individuals have been irregularly observed in southern Bulgaria. The Cinereous Vulture has been extinct from Bulgaria since 1993. The last breeding pair of the species was confirmed in 1993 in the Eastern Rhodopes. Decades of work on vulture conservation in the country conducted by the national CSOs, and in particularly through the recent reintroduction efforts within Vultures back to LIFE project (LIFE14 NAT/BG/000649) have created favorable conditions for the species to breed again. In 2021 first breeding attempts of the Cinereous Vultures have been documented after nearly 20 years. The Griffon Vulture population in Bulgaria rapidly declined throughout most of the 20th century and was thought to be extinct in the country in the 1960s mainly due to wildlife poisoning and changes in animal husbandry practices.

In the beginning of the 90s Bulgaria ratified the Bern Convention and the practice of using poison baits was finally banned. Additionally, the establishment of the Natura 2000 network in Bulgaria and hence the incorporation of the Birds and Habitats Directive further reinforced national legislation. However, although randomly distributed spatially and temporally, the illegal use of poison baits is still practiced as a common method for extirpation of wild predators, birds of prey, feral and stray dogs, and any other unwanted animals (e.g., wild boar, horses etc.).

Detection of poisoning incidents very much depends on the efforts invested in field searches for signs of poisoning or poisoned animals. Recently, through implementation of several LIFE projects, significant progress has been made in detection of poisoning, proper processing of poisoned animals, development of anti-poison awareness campaigns and judicial processing of poisoning incidents. Since the beginning of the 21st century systematic records and documentation of poisoning incidents have been kept, especially those related to vulture mortality, by national CSOs working on bird conservation in the country.

Historical perspective

Historical data relevant to wildlife poisoning in Bulgaria dates from the very beginning of the 20th century, when *Cyanide* and *Arsenic* were commonly used to kill indiscriminately any mammalian predators and birds of prey deemed undesirable or harmful to human activities. During the middle of the 20th century *Strychnine* was introduced and widely and systematically used by forestry officers, veterinary officers and hunters for such purposes in a nationalized and centralized economy of the country. After 1962 vultures were listed as protected species in Bulgaria, but the main reason for their population decline – the use of poison baits was not officially banned.

No specific survey on poisoned wildlife animals was conducted, nor records of such incidents kept, until the 90s, when BSPB project members in the Eastern Rhodopes started to conduct toxicological analyses of dead vultures. However, this practice was intensively introduced in wildlife conservation in Bulgaria since 2003 with the appointment of National working group on poisoning incidents which was coordinated by Fund for Wild Flore and Fau-

na (FWFF) within the Balkan Vulture Action Plan (BVAP). The FWFF, Green Balkans, BSPB, Birds of Prey Protection Society (BPPS), Balkani Wildlife Society and others work on their own projects and in co-ordination to combat the illegal use of poison baits in the environment.

Current situation in the country

Nature conservation organizations in Bulgaria have been very active in addressing the issue of wildlife poisoning, as it is one of the main threats that national population of vultures and other scavenger species are facing, and are managing their own databases about this practice, such as FWFF. Additionally, under the scope of LIFE+ project "The Return of the Neophron" (LIFE10NAT/BG/000152), BSPB has established together with other project partners the Poison Incident Database (PID), where available data about poisoning incidents that occur in Bulgaria are stored. A unified national database for recording and storing information regarding wildlife poisoning incidents is key for conducting adequate spatial analysis, determining the scope and severity of poisoning, and defining hotspots for poisoning in the country and subsequently directing conservation actions and effort where they are most needed.

Ministry of Environment and Water in 2021 approved the National Action plan to combat the illicit use of poisons in the wild, developed by BSPB. This plan represents an extremely important tool for combating one of the biggest threats to biodiversity in Bulgaria. The entry into force of this strategic document is a key step in the conservation of wildlife and a number of endangered species in the country.

Available information about wildlife poisoning in Bulgaria indicates that 88 poisoning and presumably poisoning events have occurred in the country during the period 2000-2020. According to the data compiled and analyzed in this study the most common driver behind the use of poison in Bulgaria are livestock losses, inflicted by mammalian predators, predominantly wolves (identified in 38% of registered poisoning events where mammalian predators were the target), but also jackals, foxes, and bears. In 2 poisoning events where bears were targeted, honey mixed with toxic compounds was used as a bait. The second most numerous cause of poisoning of wildlife in Bulgaria is misuse of pesticides in agriculture, which is responsible for 26,1% documented events (Figure 6.). Although this type of poisoning is unintentional, banned pesticides, such as Carbofuran, have been used for preparation of poison baits against rodents. Conflicts with birds of prey, that may often inflict damages to racing pigeons, and conflicts with shepherd dogs, unwanted by hunters because of conflicts with their dogs, as well as conflicts with stray dogs are also identified as motives for using poison in Bulgaria.

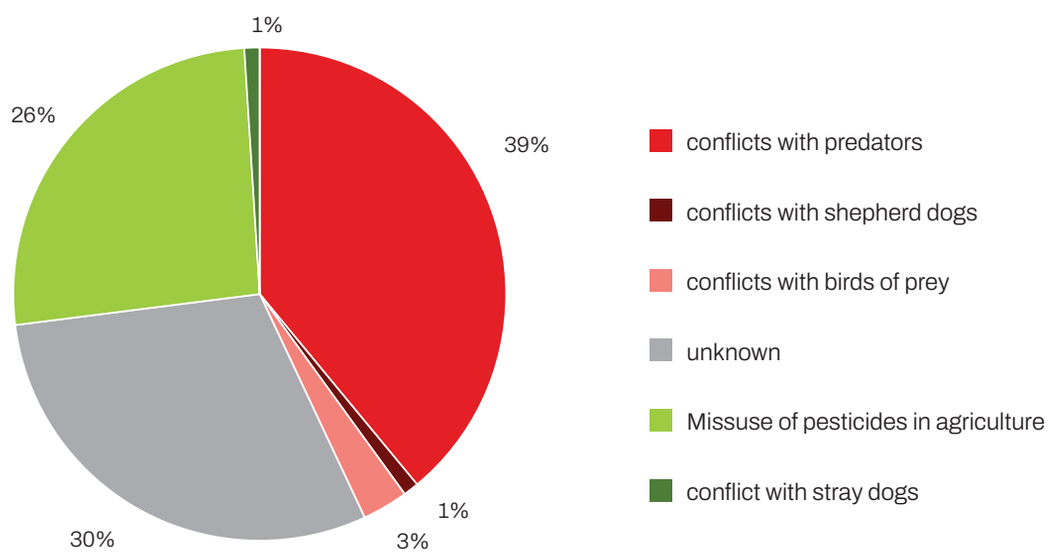


Figure 6. Motives behind wildlife poisoning in Bulgaria

Depending on the drivers behind poison use, there are several different groups of the society that most frequently use poison to kill wildlife, domestic animals or livestock: hunters, game keepers, livestock breeders, dove and pigeon keepers, farmers. The situation with poison use is very much dynamic and incidents may appear randomly in space and time. The most important areas however (hotspots for poisoning) are those in which large carnivores (wolf, jackal, bear) are frequently present and especially areas with extensive animal husbandry. It is more efficient to focus anti-poison actions to areas where certain conservation dependent species are present. However, a national anti-poison campaign covering all target groups is crucial for combating this issue long-term. There is no restriction to season when it comes to wildlife poisoning, but the vultures are usually affected in March-May, when the livestock is about to be moved to summer pastures.

According to the available data compiled for this study, toxic compounds that were used for poisoning were identified in 54% of wildlife poisoning events. The most frequently used toxic substances for wildlife poisoning are Carbamates, most notably *Methomyl* and *Carbofuran*, and Organophosphates. The last poisoning incident where *Strychnine* was used was registered in 2003. Toxicological analysis also confirmed the use of Zink phosphate for poisoning animals, and Lindane, which is often used both as an agricultural insecticide and as a pharmaceutical treatment for lice and scabies.

Stricter control of legally used pesticides and their application in agriculture should be enforced as well, where conservation dependent species may be poisoned in arable areas where these substances are applied legally. These actions should be planned species by species and site by site because substances that are lethal for one species may not be too dangerous for others (related to the way of application and introduction in the food chain) and vice versa.

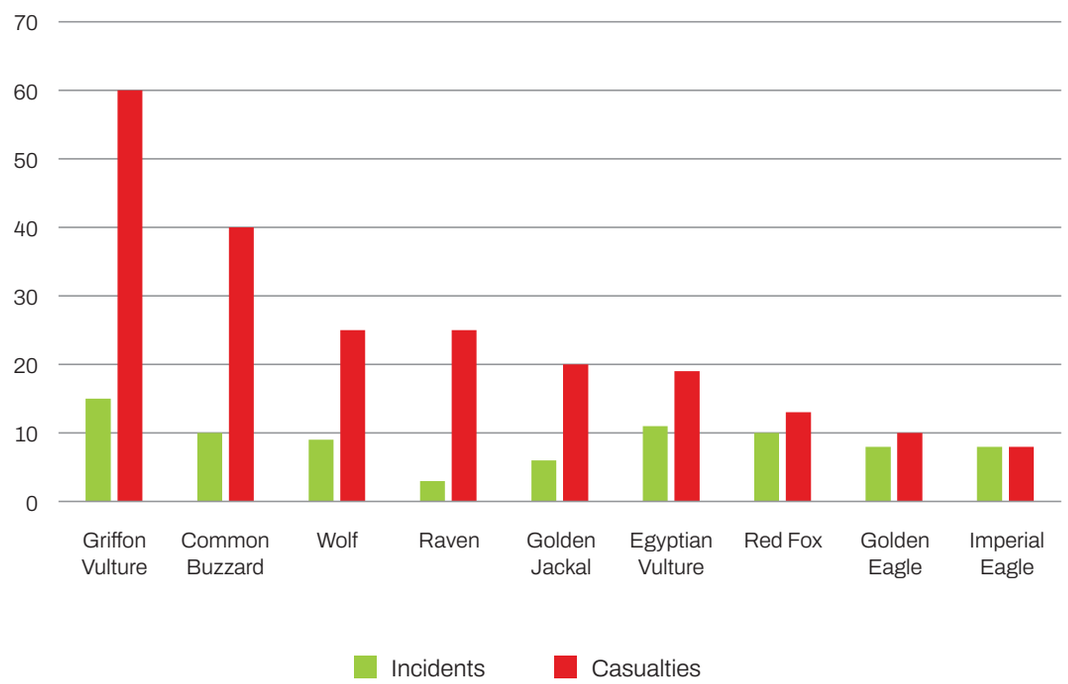


Figure 7. Common victims of wildlife poisoning in Bulgaria

A total of 30 species of wild animals have been found poisoned or presumably poisoned during the period from 2000-2020. The most common victims were Griffon Vultures, appearing in 17% of poisoning and presumably poisoning events (Figure 7). Sixty vultures in total we found poisoned and presumably poisoned within 15 separate incidents, but it is estimated that up to 90 birds ultimately might have perished from this practice. The most devastating poisoning event during this period occurred in March 2017 in the area of Kresna gorge (Peshev et al. 2018). The number of dead birds discovered amounted to 18, and it was estimated that at least 30-40 birds might have died, which was a significant blow to the local population, which had been restored there after years of conservation work. The Griffon Vultures found dead constituted the bulk of the local breeding population. The relevant authorities confirmed that the substance used for poisoning was Carbofuran and it is proved that the motive behind this incident was conflicts with wolves. The second most common victim of poisoning events according to the available data in Bulgaria (Figure 7.) is the Egyptian Vulture (19 individuals in 11 separate incidents), followed by the Common Buzzard (40 individuals in 10 separate incidents), Red Fox (13 individuals in 10 separate incidents) and Wolf (25 individuals in 9 separate incidents). Other victims of wildlife poisoning include Cinereous Vulture, Golden Eagle, Imperial Eagle, Long-legged Buzzard, Peregrine Falcon, Saker Falcon, Goshawk, Hen Harrier, Raven, Black Stork, White Stork, Common Starling, Partridge, Barn Owl, Tawny Owl, Goldfinch, Greater White-fronted Goose, Golden Jackal, Wild Boar, Brown Bear, Marbled polecat, Stone Marten, Badger, Hedgehog and Hare. The most numerous victim during this period was the Common Starling, as 244 individuals were found presumably poisoned within 3 separate events, from which 224 individuals in a single probable poisoning event due to misuse of pesticides in agriculture.

Available data indicates that wildlife poisoning in Bulgaria is still a common practice, showing no signs of significant decrease of occurrence during the past 20 years. The frequency of occurrence of poisoning events in Bulgaria is highly irregular and further efforts are needed to investigate the annual differences in the number of recorded events and if they truly reflect the actual scope of wildlife poisoning in the country.

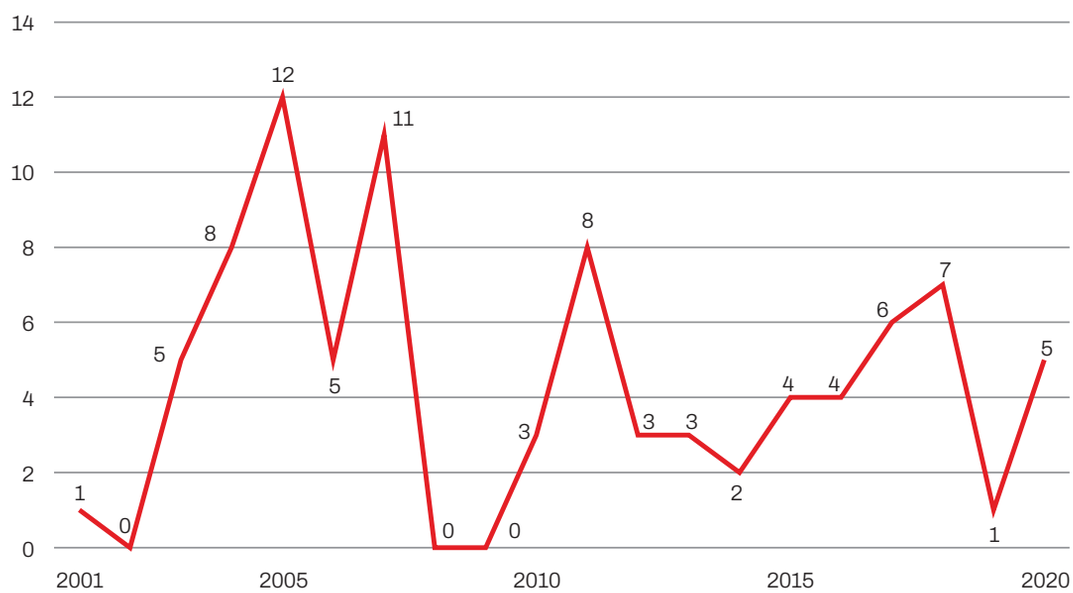
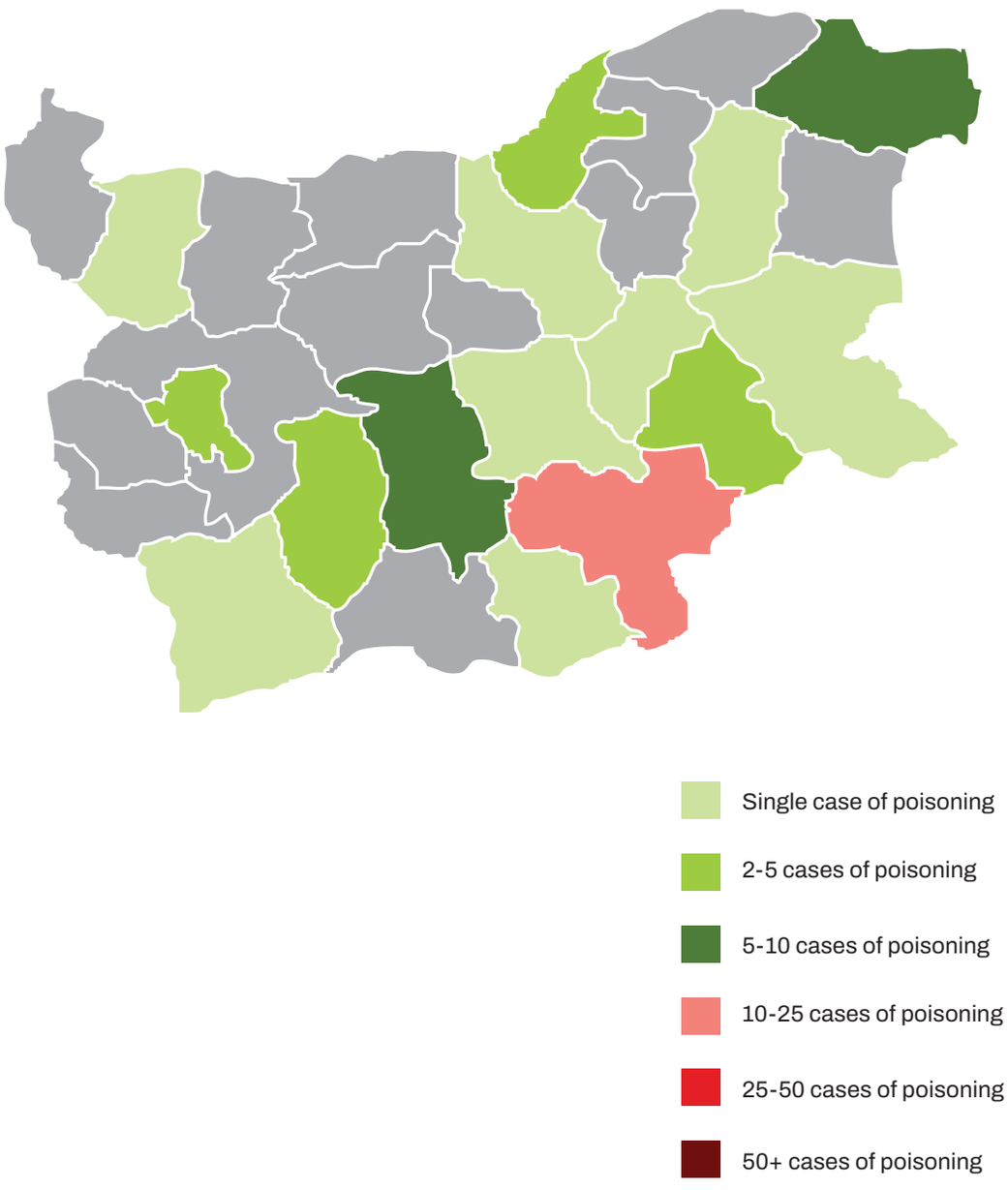


Figure 8. Number of poisoning events in Bulgaria within the research period



Map 4. Distribution of poisoning events by regions in Bulgaria during 2000-2020.

Legal framework

National legislation of Bulgaria strictly prohibits the use of poison baits to kill hunting and protected species. The action of setting poison baits on its own is forbidden, but poorly described and addressed in existing legislation and thus differently interpreted and often not applicable. In the Criminal Code, owning highly toxic substances without permission is considered illegal. However, all these measures are not enough, and additional explanatory texts and justifications should be included in existing legislation.

Existing national legislation relevant to wildlife poisoning in Bulgaria:

- **Biological Diversity Act** (State Gazette No. 77/9.08.2002)**:** Article 44. prohibits the use of poison, poisoned or anesthetic baits (Annex 5) for capturing or killing any species listed in Annex 4 of the Biological Diversity Act. Relevant EU legislation - Directive 79/409/EEC of the Council of April 2, 1979, on the conservation of wild birds and Directive 92/43/EEC of the Council of May 21, 1992 on the conservation of natural habitats and wild fauna and flora were integrated into the above mentioned national legislation.
- **Law for hunting and protection of game** (SG. 78/26 Sep 2000, amend. SG. 26/20 Mar 2001, amend. SG. 77/9 Aug 2002, amend. SG. 79/16 Aug 2002)**:** Article 65. prohibits the use of poisonous or anesthetic substances, as well as baits with such substances as a means or method in hunting.
- **Penal Code:** According to article 237. (Amend., SG 28/82; SG 89/86; SG 86/91; SG 85/97; amend., SG 92/02) who kills or catches such game in time of prohibition, in a prohibited place or by prohibited means, shall be punished by corrective labor for up to six months or by a fine of one hundred to three hundred levs, as well as by revoking of rights according to art. 37, item 7.

Relevant international treaties and conventions that Bulgaria is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified by ratified by Bulgaria on 25.01.1999, in force for Bulgaria since 01.05.1991 (State Gazette [1] 23/1995). It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Bulgaria

Research about the perception of key audiences in local communities, as well as relevant governmental institutions in Bulgaria, was not the target for the scope of this study. However, efforts were made to obtain information from relevant institutions through the online survey, while we did not have sufficient capacities to conduct the surveys in local communities where wildlife poisoning is frequently registered.

Employees of relevant institutions in Bulgaria are mostly well informed about the presence of certain species of vultures on the territory of Bulgaria today, such as the Griffon Vulture and Egyptian Vulture.

Wildlife poisoning is not acknowledged as the most important threat to the existence of vultures in Bulgaria. The key perceived threats to the vulture population in Bulgaria are accidental electrocution from electric cables or fences, excessive and negligent use of legal poisons (pesticides, insecticides, rodenticides) and accidental consumption of poisoned animals by vultures. On the other hand, wildlife poisoning is recognized as to certain extent accidental, but to certain extent also intentional, using illegal poisons from the black market.

The main responsibility for wildlife poisoning lies with hunters, livestock breeders, farmers, and people who deliberately poison animals to kill them, while the key reasons for the poisoning of vultures are protection of pastures and livestock from wild animals and protection of hunting grounds. Other important reasons are conflicts between people over land use (pastures, hunting grounds), protection from pests (rats, insects, etc.), protection of pigeons from birds of prey, protection of agricultural land from wildlife and birds of prey and even protection from stray dogs and cats.

The responsibility for reporting incidents of poisoning to institutions in charge thus lies with citizens, hunters, and veterinarians while citizens in general and livestock breeders have been singled out as the key target groups for awareness-raising campaigns on wildlife poisoning. However, respondents also recognize that the reporting process of the incidents of poisoning remains challenging because those who report someone risk conflicts in their communities.

The valleys of the Struma, Rila and Pirin rivers are perceived as the key areas most often affected by animal poisoning. The Forebalkans, Stara Planina, Trans-Balkan fields, the valley of the river Mesta and the Rhodopes have been identified as well.

The key obstacles for the prevention and sanctioning of wildlife poisoning have been identified as the complexity of the investigation, difficulties with evidence in the court, the insufficient education of public prosecutors for handling cases related to poisoning of wild animals, the insufficient or rare application of penalties based on the laws governing hunting grounds, and the black market for illegal poisons on the Internet.

Respondents are mostly uninformed or believe that there are no databases on poisoning incidents, that there is no national action plan to combat poisoning or protocol defining procedures and responsibilities in investigations of wildlife poisoning. The cooperation between governmental institutions and civil society organizations regarding data collection about poisoning incidents, is also mostly perceived as inadequate, or respondents state they are undecided and cannot evaluate it.

Low penalties for wildlife poisoning, the quality of the legal framework for punishing animal poisoning and whether the existing legislation regulates biodiversity protection well enough, as well as inadequate law enforcement are also perceived as important obstacles in the prevention, detection and sanctioning of wildlife poisoning.

The role of the Police and the investigation of wildlife poisoning are recognized as relevant police work, pointing to the need to introduce specialized police units that would deal with the crimes of wildlife poisoning. Respondents have divided opinions regarding the sufficiency of police force education and training to investigate wildlife incidents, the need to introduce modern technology and methods, and the extent of the problem of not reporting incidents to police. Regarding the investigation of animal poisoning incidents, important solutions include the need for specialized police units for environmental crimes, including wildlife poisoning, police reinforcement with specialized canine units for detecting poisonous substances used for wildlife poisoning, and the need to put more agents in the field (police, environmental inspectors, rangers, etc.) for timely detection of poisoning incidents.

Imposing of a stricter control of the trade of legal poisoning substances (pesticides, rodenticides, etc.), raising awareness of the general public and key stakeholders (livestock breeders, farmers, hunters, institutions), enforcing severe punishments for all forms of mass and non-discriminatory killing of animals, as well as higher penalties for every form of poaching/ illegal shooting, resolving issues of the ownership of pastures and rights to use them and state / government financial compensation for the damage caused by wild animals to livestock breeders and farmers are identified as having a key place in the prevention of wildlife poisoning incidents.

Respondents recognize that rangers in protected areas should have the authority to arrest perpetrators who poison animals if they are caught in

the act, and if poisoning of wild animals occurs in a commercial hunting area, the concessionaire should be deprived of the concession.

Increased number of supplementary feeding sites for vultures, and better protection of wild ungulate populations also have a key place in the prevention of wildlife poisoning incidents in the opinion of the employees from relevant governmental institutions.

Ecological awareness among the respondents employed in institutions in Bulgaria is evident in their attitudes about the sensitivity of the natural balance and the possibility of it being easily disturbed, as well as the fact that plants and animals have the same right to exist as humans. Some of the respondents, however, still believe that people are destined to rule over nature, and they fail to recognize that the Earth is like a spaceship, with very limited space and resources.

Conclusions

The practice of wildlife poisoning in Bulgaria is still an evident threat for many wild species in Bulgaria, especially for avian scavengers inhabiting the country such as vultures. The most common motive behind intentional use of poison and poison baits remains to be conflicts with mammalian predators, which often inflict damages to livestock and other types of agricultural production. Wolves are identified as the primary targets of poison baits, but also jackals, foxes and bears are specifically targeted. The increase in numbers and expansion of the distribution of jackals throughout Bulgaria, and wolves in certain areas, are potentially a cause of concern as it might lead to the more frequent conflicts with livestock breeders, hunters and game keepers, which are identified as groups of society that most often use poison to kill animals. Carbamates, most notably Carbofuran and Methomyl, are most often used for preparation of poison baits in Bulgaria, which indicates that an illegal market, or stockpiles of these substances exist in Bulgaria, similar to other countries from the region.

Vultures continue to be the most common victims of illegal wildlife poisoning in Bulgaria, appearing as victims in every third poisoning event. Griffon Vulture population suffered the most from this practice during the last 20 years, as 60 individuals in total were found poisoned and presumably poisoned, but it is estimated that up to 90 birds ultimately might have perished from this illegal practice during this period.

Non-governmental organizations in Bulgaria have been very active in combating illegal wildlife poisoning, as the main threat for vulture populations since the begging of the 21st century. Implemented actions that range from awareness raising among key stakeholders and general public, applying preventive measures in local communities where conflicts with predators occur regularly, providing specific training to relevant governmental institutions, setting up databases to record all potential poisoning incidents, and using GPS tracked birds as sentinels for poisoning have significantly impacted the perception about this practice and is indeed responsible for periodical decreases in the number of recorded poisoning events in Bulgaria. Bulgaria's Ministry of Environment and Water recently approved the country's National Action Plan to combat the illicit use of poisons in the wild, which is a key step towards creating a functional system for combating this environmental issue. Further specific training for law enforcement agents is crucial for reinforcing this action plan and ensuring its successful implementation in the long run.

CROATIA

Introduction

The first known organized and governmentally sponsored poisoning campaigns in Croatia started after the II World War, but such practices were present since the turn of the 20th century, as a legal method that hunters used to extirpate mammalian predators, primarily wolves and foxes. *Strychnine* was commonly used for the preparation of poison baits in an attempt to resolve the issue of wolf predation on sheep and other livestock. Although the use of poison baits for predator control was banned in 1972, the practice lingered on among livestock breeders, hawing a detrimental effect primarily on vulture populations in the country.

Griffon Vulture used to be widespread along the Croatian coast and it was also regular in some parts of continental Croatia until the end of 19th century. Throughout the 20th century its breeding area in Croatia was constantly shrinking and in late 20th century it became restricted only in the Kvarner islands. The Cinereous Vulture went extinct in Croatia during the 1950s, while the Egyptian Vulture was registered as a breeding species for the last time in 1987. The Bearded Vulture is believed to have gone extinct in 1910. Reasons behind severe population declines of vultures in Croatia are loss of traditional farming practices and the widespread practice of poisoning, especially after the II World War.

Concerning vulture populations, the biggest problems started during the second half of 1980s, when hunters introduced Wild Boars as a game species to the Kvarner Islands. During the same period an increasing number of Golden Jackals and Brown Bears started to cross from the mainland to islands and to inflict damages on livestock, especially lambs. When the Ministry of Environmental and Nature Protection issued the order to hunters to eliminate all introduced species from all islands in Croatia, hunters refused to remove them. Wild boars, jackals and bears killed thousands of sheep (not only lambs) and shepherds became desperate, and the easiest way for them to eliminate this threat was to place poison in sheep carcasses. Although poison use has been prohibited in Croatia by the National Hunting Act of 1972, it is still practiced, especially after the failure of the government to enforce the legislation related to removal of introduced and invasive game animals from the Kvarner islands. Furthermore, different banned substances (notably Carbofuran) can still easily be acquired on the black market from neighboring countries.

Historical perspective

The practice of wildlife poisoning is a well-documented practice in Croatia. Systematic records related to mortality of wildlife, and especially vultures, have been kept by CSOs, while a centralized database within relevant governmental institutions is still lacking.

The extent of wildlife poisoning in Croatia can be easily perceived from several well-documented records. For example, in Gorski kotar (small part of Croatia – 1.273 sq.km), where during the 40-year period (1946-1985) 26 brown bears and 177 wolfs were found poisoned, while during 1961-1972 3.6 wolves/year were poisoned (Frković in Sušić 2000). These poisoning incidents were a part of the governmental sponsored poisoning campaigns, which started after the II World War, similar to other countries in the region.

In the period from 1996-2013, in the Rescue Centre for Griffon vultures, 157 Griffon vultures arrived, 31 of which died, and 12 of them had significant neurological symptoms. In the same period, 59 dead vultures were found (of which 17 in one incident

of poisoning on the island of Rab in 2004), and 23 specimens (39%) were analyzed. Toxicological analysis conducted in that time period concluded that poisonous substances used for poison baits were from the group of Carbamates and Organophosphates (*Carbofuran, Methomyl, Deltamethrin*) (Sabočanec et al. 2005, Ćurić et al. 2008) were used. Some analyses had shown that Organochlorine hydrocarbon residues such as DDT and its isomers and PCB congeners were determined in muscle and liver of dead Griffon Vultures (Međugorac et al. 2001).

Based on the available data it was estimated that some 300-500 Griffon vultures have been poisoned during the period of the last 50 years, as there are 159-190 recorded in the period 1985-2013 alone (Sušić 2000, Sušić 2002, Lukač 2004). Therefore, we can say with certainty that wildlife poisoning is one of the most probable causes for extinction of the Egyptian and Cinereous Vulture from Croatia.

Current situation in the country

Systematic compilation of information relevant to wildlife poisoning, as well as documentation of poisoning incidents began in 2018 with the launch of the BAPP project. Information about wildlife poisoning incidents in Croatia for the past 20 years indicate that 40 separate poisoning and presumably poisoning incidents have occurred in the country. More than 50% of incidents were documented from 2018 onwards, which indicate once again that if more efforts are invested into investigating the scope of poisoning, more poisoning events will be discovered. According to the available data gathered for the purpose of this study, the main drivers behind wildlife poisoning in Croatia are:

- Intentional use of poison baits, to kill mammalian predators (jackals, wolves, martens)
- Intentional use of poison baits, to eliminate introduced game animals (wild boars) and predators (jackals) on island ecosystems

Although the motives behind most wildlife poisoning incidents remain unknown, the majority of better investigated incidents indicate that the main driver behind the use of poison baits in Croatia is conflicts with predators, predominantly jackals, (27%), followed by conflicts with introduced game animals (wild boars) in island ecosystems (Figure 9). A significant component of poisoning incidents recorded during the last 20 years in Croatia can be defined as unintentional poisoning, which occurred most likely due to misuse of pesticides in agricultural practices, or improper application of preventive measures against pests, such as rodents and gastropods.

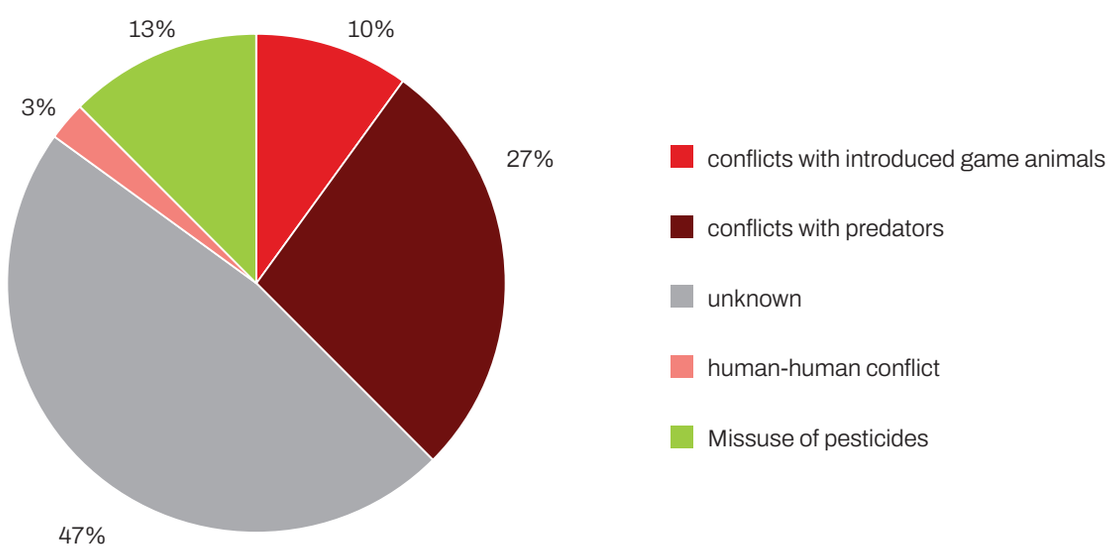


Figure 9. Motives behind wildlife poisoning in Croatia

Forensic toxicological analysis has been conducted in 62,5% of registered potential poisoning incidents in Croatia, which represents the highest percentage in comparison to other countries in the region. Carbamates are the most dominant group of toxic substances used, where *Carbofuran* was the most frequently used substance for poisoning wildlife in Croatia, responsible for 76% of known poisoning incidents in the country. Toxicological analysis also confirmed the use of *Methomyl*, *Methiocarb*, *Metaldehyde* and *Chlorophacinone*.

A total of 12 species of wild animals have been found poisoned or presumably poisoned during the last 20 years. The most common victims were Griffon Vultures, appearing in 45% of poisoning and presumably poisoning incidents within this period (Figure 10). 52 vultures we found poisoned and presumably poisoned in 18 separate incidents. The last case of mass poisoning of Griffon Vultures occurred in December 2004 when 17 individuals were found poisoned from Carbofuran in a single poisoning incident on the island of Rab, due to conflicts local livestock breeders have with introduced wild boars, and the damages they inflict upon their sheep, especially lambs. Second most numerous victim of poisoning events in Croatia is the Common Buzzard (18 individuals in 6 separate events).

Insufficient evidence exists related to unintentional poisoning due to veterinary products used for treatment of livestock, especially sheep which are the main food source for the breeding Griffon Vulture population, and lead poisoning. Therefore, it is difficult to determine if these products could have a significant impact on avian scavengers in Croatia.

The conflict between livestock breeders and introduced wild boars as game animals on island ecosystems, where existing Griffon Vulture population breed and mostly forage, seems to represent the most important potential threat for poisoning to occur in the natural environment. There are reports that shepherds on Kvarner Islands are sustaining heavy losses, especially of lambs, due to predation by wild boars and jackals. Another problem could also arise with wolf packs, as their number is increasing in other areas of Croatia, which are inside of the foraging area of Griffon vultures. Further investigation of the scope of these damages sustained by the local shepherds would be very relevant for implementation of preventive actions against potential poisoning incidents.

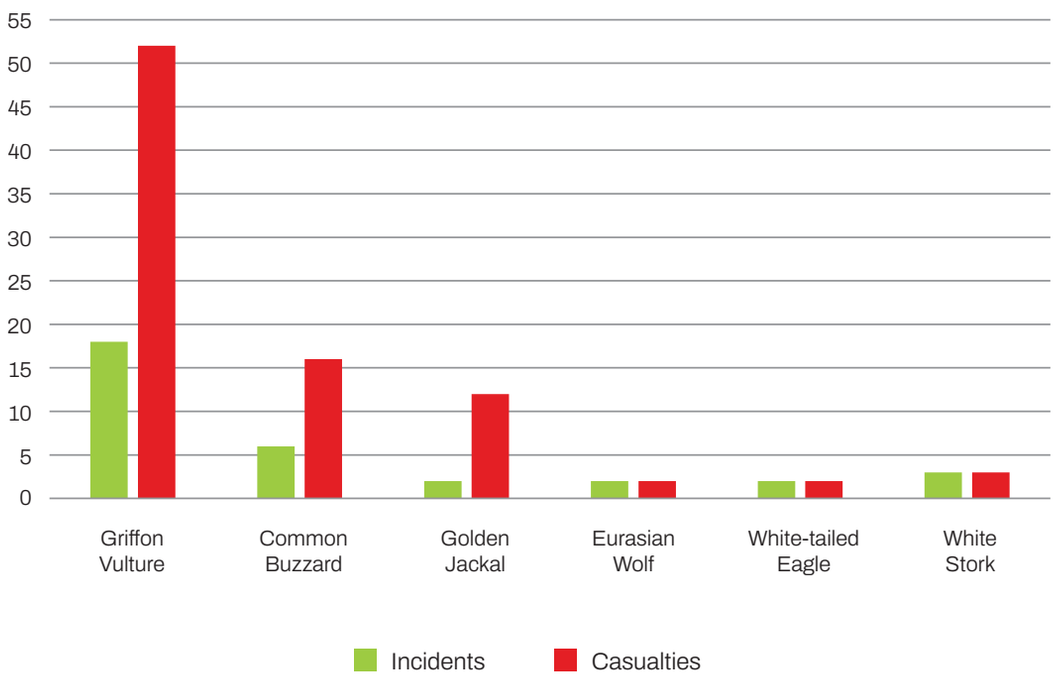
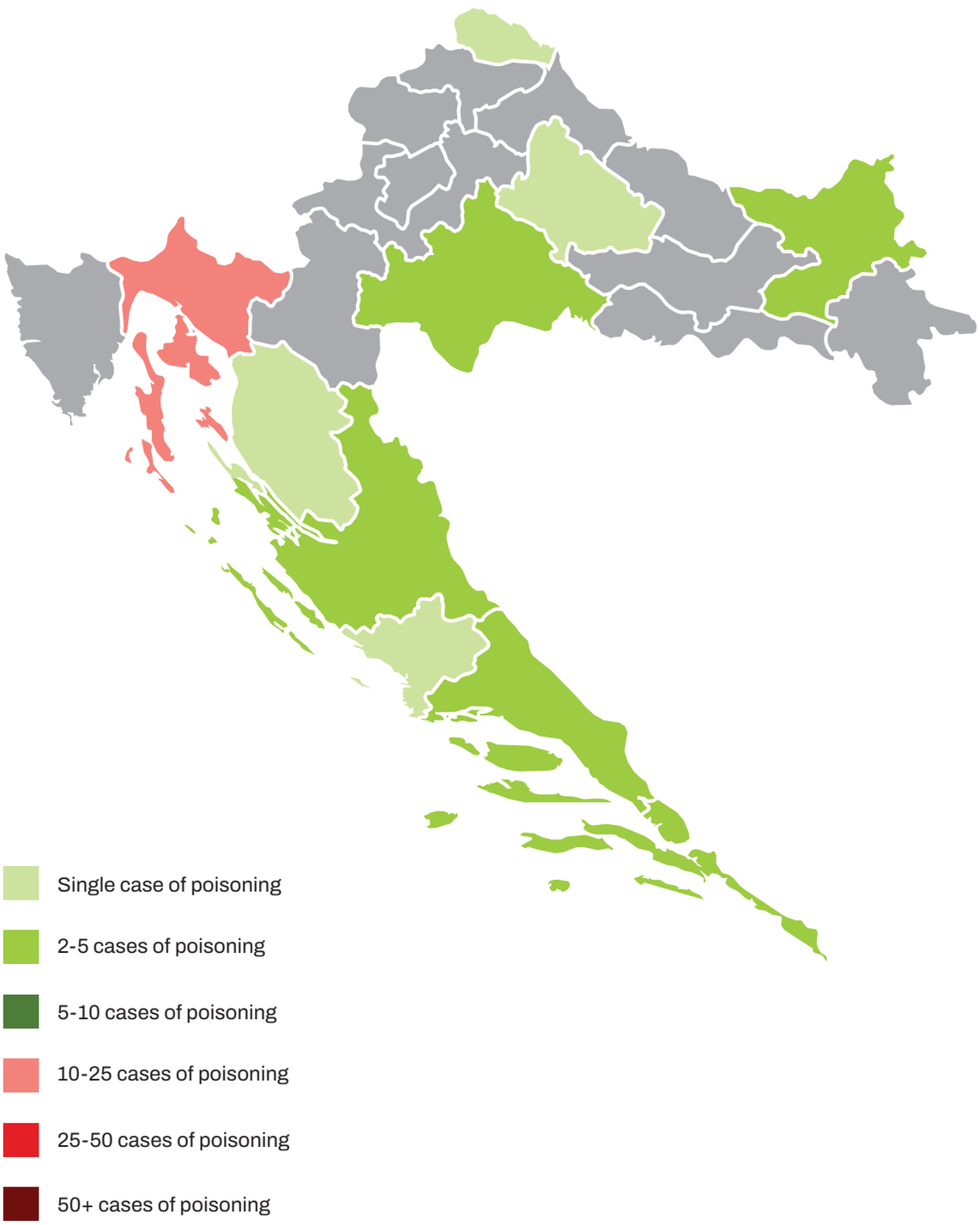


Figure 10. Most frequent victims of poisoning events in Croatia



Map 5. Distribution of poisoning events by regions in Croatia during 2000-2020.

It is important to mention that poison baits are also documented to be used for eradicating stray and abandoned domestic animals, most commonly dogs and cats, both in rural and urban environments in Croatia. Two incidents of poisoning of stray dogs with Carbofuran were recorded by the relevant veterinary institutions in the country, and several other presumably poisoning incidents.

According to the available information obtained from the State's Attorney Office of the Republic of Croatia about a total of 6 wildlife poisoning incidents have been prosecuted since the year 2000. In 2 cases the investigation was able to identify the potential perpetrators and bring charges against them. In the case from 2004 from the island of Rab the accused was found not guilty of the charges brought against him for poisoning a Griffon Vulture and Common Buzzard, while in the case from 2020 where on two separate occasions 1 wolf, 1 fox and 1 Golden Eagle were found poisoned is still ongoing. In other investigated cases either the perpetrators could not be identified, or the investigation concluded that the poisoning incident was not a criminal offense.

Legal framework

Existing national legislation relevant to wildlife poisoning in Croatia:

- **Nature Protection Act:** Published in Official Gazette of the Republic of Croatia 80/13, 15/18. Nature Protection Act transposes the Birds Directive into Croatian legal system and represents a general framework for the protection of wild birds in Croatia. Nature protection Act prohibits the use of all means, arrangements or methods that can cause the local disappearance or a significant decline in population numbers of a species. In particular, use of poisons and poisoned baits is prohibited (Article 66) and is an infraction punishable by fine not to exceed 500,000.00 HRK for legal entity or 50,000.00 HRK for natural persons (Article 227). Deliberate killing or capture by any method, if not in accordance with the Nature Protection Act, is also an infraction punishable by fine not to exceed 200,000.00 HRK for legal entity or 30,000.00 HRK for natural persons (Article 228).
- **Hunting Act:** Published in Official Gazette of the Republic of Croatia 140/05, 75/09, 153/09, 14/14, 21/16, 41/16, 67/16, 62/17 it prohibits large-scale or non-selective means and methods, including poison, for hunting game (Article 64) which are punishable by fine not to exceed 100,000.00 HRK (Article 96).
- **Criminal Code:** Destruction of protected natural values, game poaching and killing or torture of animals are felonies according to the Croatian Criminal Code (Official Gazette of the Republic of Croatia 125/11, 144/12, 56/15, 61/15, 101/17). The following articles are relevant to vulture poisoning:

According to the Article 200 paragraph 1 of the Criminal Code whoever, contrary to regulations, kills or destroys a specimen of a protected species of an animal shall be punished by imprisonment not exceeding three years. According to the paragraph 2 of the same Article whoever commits the same offence against a strictly protected wild species of an animal shall be punished by imprisonment from six months to five years.

According to the Article 204 paragraph 2 of the Criminal Code whoever hunts game in such a manner or by such means that cause their massive destruction or by using prohibited accessory equipment, shall be punished by imprisonment not exceeding three years.

According to the Article 205 of the Criminal Code whoever kills an animal without a justified reason or severely maltreats it, inflicts unnecessary pain on it or puts it through unnecessary suffering, shall be punished by imprisonment not exceeding one year, or two years if the offence is committed out of greed.

Relevant international treaties and conventions that Croatia is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified with the Act on Ratification of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (Official Gazette of Republic of Croatia -IT 6/00). It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in Croatia

Surveys of relevant stakeholders in local communities in Croatia were conducted within three counties: Ličko-senjska, Primorsko-goranska and Splitsko-dalmatinska županija. Among the respondents were 119 farmers, 50 cattle breeders and 42 hunters. We generally measured the environmental awareness of the respondents with an abbreviated version of the questionnaire known as NEP (New Ecological Paradigm). In general, respondents are predominantly "pro-environmental", yet do not have a clear departure from anthropocentrism (roughly every other respondent agrees with the statement that humans are destined to rule the rest of nature). Those involved in livestock farming are less likely than two other groups to agree that plants and animals have the same right to exist as humans, and hunters are less likely than two other groups to agree with the statement that "humans are destined to rule over the rest of nature."

When it comes to respondents' knowledge of vulture species native to their country and continent, most respondents answered all questions correctly, but at the same time a considerable number of respondents answered incorrectly, which indicates the need for education. When it comes to respondents' attitudes about vultures and poisoning, most respondents recognize that vultures play an important role in the ecosystem (this is the question with the highest average agreement). On the other hand, it is certainly negative that a significant proportion of respondents agree with the statements "Animal poisoning is sometimes justified" and about a fifth of respondents agree (summed up answers "mostly agree" and "strongly agree") and "Poisoning Animals are a problem only when they pose a danger to humans ", with which more than a third of respondents agree. A comparison of the three groups shows that hunters are more inclined to attitudes that recognize the importance of vultures, and on the other hand cattle breeders and farmers are more inclined to perceive wildlife poisoning as sometimes justified.

Respondents rate their knowledge of poisoning on average 2.7 on a scale of 1 (where 1 is very poor and 5 is excellent). Accordingly, large proportions of respondents answered that they do not know when poisoning most often occurs in a year (20.6%) and in which county (54.1%). Compared to the current actual situation, of the three counties most affected by the problem of poisoning, respondents are the least aware of animal poisoning in the Primorje-Gorski Kotar County.

In total, just over 60% of respondents believe that poisoning of wild animals occurs intentionally, and most often through the abuse of legal toxic substances (pesticides, insecticides, etc.). Respondents estimate that individuals who deliberately poison animals because they simply like to kill are most often responsible for poisoning, followed by farmers, then hunters and cattle breeders. At the same time, hunters are significantly less likely than farmers to estimate that they themselves are often responsible for poisoning wild animals.

When respondents are asked to assess how often certain reasons are behind the poisoning of wild animals, they put the protection of pests (rats, insects, etc.) in the first place in terms of frequency, the protection of agricultural areas from wild animals in the second place and protection of pastures and livestock from wild animals in the third place. At the same time, we did not find that there was a statistically significant difference in estimates between cattle breeders, farmers and hunters (Figure 11).

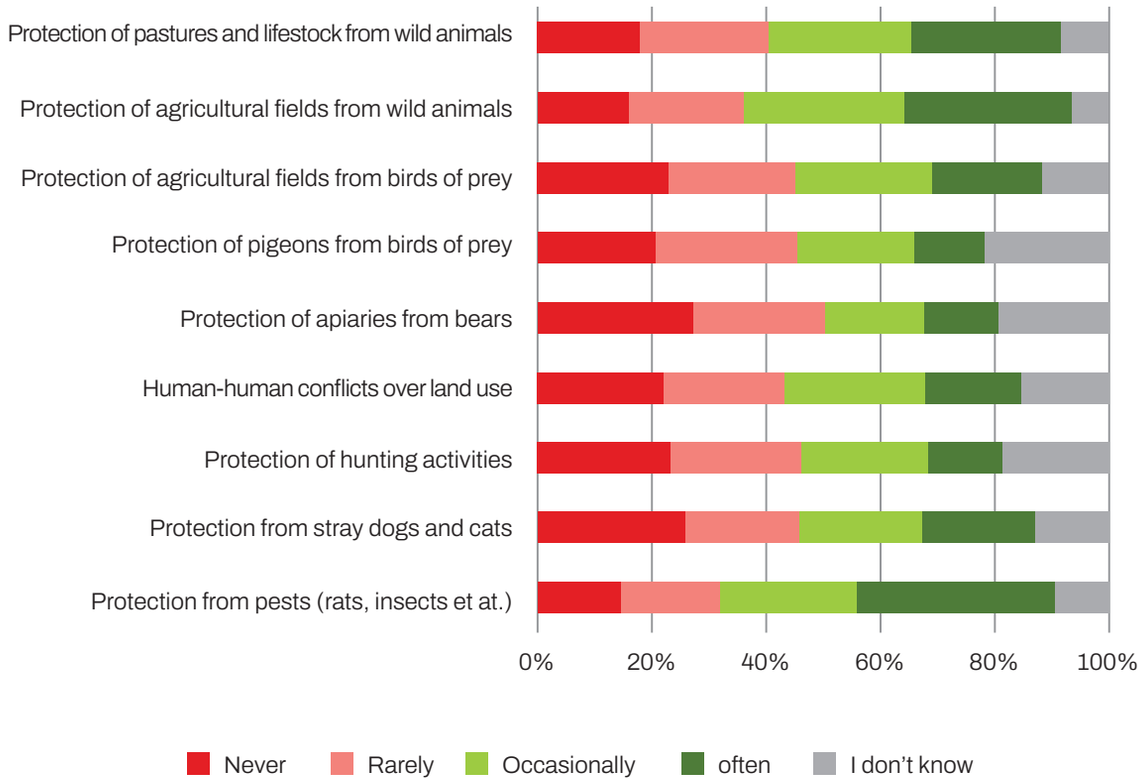


Figure 11. Perceived motives behind wildlife poisoning in Croatia

Approximately one in four respondents has known of at least one case of animal poisoning in their environment (excluding rodent control) in the last 10 years. Of those who know of such cases, most know of cases of intentional poisoning, most commonly in populated areas. Respondents themselves or people in their environment were most often informed about poisoned pets or sheepdogs or guard dogs.

When it comes to the attitudes of respondents on reporting cases of poisoning to the competent institutions, there are very few respondents who would not agree that poisoning should be reported by hunters, veterinarians and anyone who has knowledge of such cases. On the other hand, almost 80% of respondents agreed with the statement that people who report someone from their environment for animal poisoning risk quarrels and conflicts in their community. Slightly fewer of them, but still more than half of the respondents believe that due to the fact that the perpetrators are unknown because the poisoning takes place in remote locations and people do not know who needs to alleviate animal poisoning. The comparison of livestock breeders, farmers and hunters did not reveal any differences.

Approximately one-fifth of the respondents said that they would not, or did not know, report the poisoning to the police, while it is encouraging that 45.7% of them said that they would report it if it could have negative consequences for them. Of those who are unwilling to report, in almost two-thirds of cases it is because they do not come into conflict with people from their environment (Figure 12).

The majority of respondents (57.6%) consider the investigation of wildlife poisoning important, and at the same time only 14.5% of them know about a specific case of police investigation of poisoning.

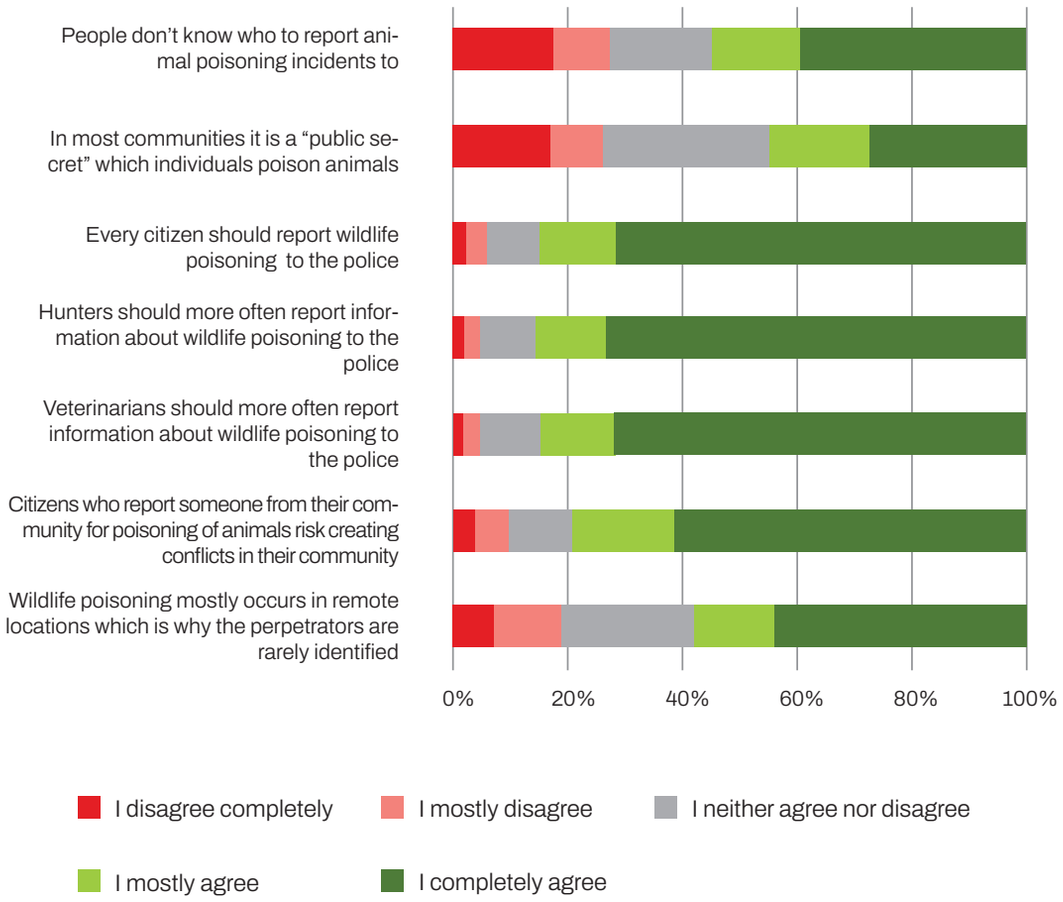


Figure 12. Personal attitudes towards reporting poisoning incidents to the relevant authorities

By far the largest number of respondents (61.7%) believe that the most important thing is to raise awareness about animal poisoning among citizens in general, with no statistically significant difference between livestock, farmers and hunters. Of the necessary preventive measures, respondents are most inclined to the state to compensate livestock and farmers for wild animals, followed by a measure to inform the public about the problem of wildlife poisoning, followed by measures to control the import and trade of legal toxic substances and raising fines for wildlife poisoning. At the same time, livestock breeders are more inclined to agree with the statement about the need for the state to compensate farmers and farmers for the damage caused by wild animals, while hunters are more likely to detect the need to build more feeding grounds for vultures.

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Croatia

A total of 62 employees of relevant governmental institutions in Croatia were surveyed during this research. The largest share of respondents are in lower or middle status in relation to the organizational hierarchy in the institution. 17.7% of respondents in their work are in direct contact with the issue of poisoning of wild and domestic animals, while slightly less than a quarter of them have been in contact with this issue at least once in their work. Only every tenth respondent has received at least one training related to the detection and processing of wildlife poisoning cases. Cooperation between government institutions and non-governmental organizations is rated 2.6 on average.

When it comes to respondents' knowledge of vultures, most respondents answered all the questions correctly. In general, the shares of respondents who answered questions incorrectly are still slightly lower than those in the survey of livestock farmers, farmers and hunters. For example, half of the respondents in the latter survey believe that vultures feed on captured large mammals, rodents and domestic animals, while in this survey these shares are significantly lower.

Respondents rate their knowledge of poisoning on average 2.6 on a scale of 1 to 5 (where 1 is very poor and 5 is excellent). Even a higher proportion of respondents, compared to those in the survey of cattle breeders, farmers and hunters, answered they do not know when poisoning most often occurs in the year (33.9%). Also, representatives of institutions from the three counties that are most affected by the problem of poisoning best recognize that it is a problem in Lika-Senj County, and least recognize this problem in Split-Dalmatia County.

Unlike respondents in the survey of livestock farmers, farmers and hunters, who believe that wildlife poisoning most often occurs intentionally, the largest share of respondents in the survey of representatives of institutions (38.7%) believe that it happens by accident, misuse of legal toxic pesticides. insecticides, etc.) substances, out of ignorance. Respondents in a survey of representatives of institutions estimate that farmers or cattle breeders are most often responsible for poisoning, followed by individuals who deliberately poison animals because they simply like to kill.

When respondents are asked to assess how often certain reasons are behind the poisoning of wild animals, they on average put protection against pests (rats, insects, etc.) in the first place in terms of frequency, second protection of pastures and livestock from wild animals, and protection of agricultural areas from wild animals in the third place. In this regard, it can be generally noted that the assessments of the main reasons are similar to those in the survey of livestock, farmers and hunters, with representatives of the institutions more often answering "I don't know" and less often answering that some of these reasons never stand out.

When it comes to respondents' attitudes about reporting poisoning cases to the competent institutions, respondents mostly believe that poisoning should be reported (more often) by veterinarians, hunters and anyone who has knowledge of such cases. Let us remind you that the respondents from the survey among cattle breeders, farmers and hunters mostly agree with the same three statements. However, we see an interesting difference in the statement "People do not know to whom to report animal poisoning": a larger share of respondents in the survey of livestock, farmers and hunters disagree with this statement (27.4%, compared to 12.9% of respondents from the ranks of representatives institution).

Regarding the methods that need to be applied in poisoning investigations, the representatives of the institutions put toxicological analysis in the first place, although it is interesting that one third of the respondents did not recognize such analysis as important. Since the list of offered answers is based on the experience of Spain, where all the above methods are used in interdisciplinary teams, the fact that respondents rarely recognized the relevance of many of these methods suggests the need for education on good practices in other countries.

Regarding the capacities for processing poisoning cases, it is generally possible to note that a large part of the respondents could not determine themselves according to the allegations in the questions asked. Representatives of the institutions at least agree with the statement "Public prosecutors are sufficiently educated to handle cases related to wildlife poisoning." On the other hand, they are mostly inclined to agree on average that they rarely impose penalties under the Hunting Act.

Regarding the punishment of various illegal acts that harm animals and nature, the general impression is that the respondents who participated in the survey of representatives of institutions

support strict punishment. Of all the allegations offered, they strongly agree with "All forms of mass and non-discriminatory killing of animals (traps, poisoning, explosives, etc.) should be severely punished", and immediately afterwards that more punishments are needed for all which forms of poaching. Also, over two-thirds of respondents agreed with the statement that conservationists (rangers) should have the authority to arrest people who poison animals if they are caught in the act.

Regarding resources for poisoning investigations, respondents mostly agree with the statement "We need more people in the field (police, conservationists, etc.) to be able to detect poisoning cases in time", while the least agree with the statement "There are enough in Croatia laboratories that have the capacity for the necessary toxicological analysis". In general, attitudes about the need for greater resources for poisoning investigations dominate, but it is interesting that almost a fifth of the respondents do not recognize search dogs for the detection of poisons used against wild animals as a relevant resource.

Regarding the capacity of the police to investigate poisonings, the main problem is the non-reporting of poisoning cases to the police. But the second statement according to the level of average agreement is "Police do not take seriously the need to launch investigations into wildlife poisoning", while respondents least agree with the statement that the police are sufficiently equipped and educated to investigate wildlife poisoning. We can summarize that the attitudes of the respondents suggest that there is room for better capacity building of the police for wildlife poisoning investigations, but also for raising awareness of the importance of these investigations.

Approximately a quarter of respondents are aware of the fact that in Croatia there is no database on animal poisoning incidents, a national action plan to combat animal poisoning or a protocol that will define procedures and responsibilities in investigations into wildlife poisoning. However, the answers of the participants in the research indicate that it is possible that some institutions or their organizational units still have internal protocols and a database of poisoning cases.

Respondents working in state institutions, as well as those surveyed from the groups of livestock breeders, farmers and hunters, put in the first place raising awareness of wildlife poisoning among citizens in general, ie the general public. Respondents, on average, consider the most important work to raise awareness of the general public and key stakeholders (livestock, farmers, hunters, institutions), followed by the introduction of stricter control over the import and trade of legal toxic substances. We find it interesting to point out that, comparing the average answers to the offered claims, respondents from state institutions give less priority to state monetary compensation for livestock and farmers, compared to respondents from the survey of cattle breeders, farmers and hunters, who support this measure.
We also asked the interviewed representatives of the institutions to assess how important certain aggravating circumstances are, which make prevention and sanctioning more difficult. Respondents estimate that these are first of all difficulties with evidence in court, followed by insufficient and unclear protocols for police actions and too low penalties for animal poisoning, while they perceive the black market of prohibited poisons over the Internet as the least important problem.

Respondents, like those from the survey of cattle breeders, farmers and hunters, are predominantly pro-environmentally oriented, but with a slightly different emphasis. Respondents from the ranks of representatives of institutions thus strongly reject anthropocentrism (whose indicator is agreement with the statement "People are destined to rule over the rest of nature") and put the problem of limited resources in the first place.

Conclusions

Efforts invested during the last couple of years towards assessing the scope of wildlife poisoning and its effects on populations of species of conservation concern in Croatia have resulted in the increase of the number of recorded poisoning incidents in the country, making it very evident that this illegal practice represents a serious conservation issue. The main driver behind the use of poison baits in Croatia are losses to livestock due to conflicts with predators, especially jackals, but also with wild boars, which have been introduced to the Kvarner islands for hunting purposes, and which inflict significant damages to local shepherds. Wildlife poisoning in Croatia had the worst effect on Griffon Vultures, as these scavengers appear as casualties in every second poisoning event. Over the course of the last 20 years a total of 52 individuals perished in poisoning and probable poisoning events.

Anti-poison activities implemented in Croatia by national CSOs resulted in establishing good cooperation with relevant governmental institutions, which led to their increasing engagement in managing wildlife poisoning incidents. This is mostly evident with those institutions responsible for conducting forensic necropsies and toxicological analysis on presumably poisoned wild animals. Since 2018 toxicological analysis have been conducted in over 85% of potential poisoning events, which is unprecedented compared to other countries from the region. Carbofuran is the most frequently used substance for poisoning wildlife in Croatia.

Livestock breeders, farmers and hunters in Croatia perceive that poisoning of wild animals occurs mostly intentionally, and most often through the abuse of legal toxic substances (pesticides, insecticides, etc.). Individuals who deliberately poison animals because they simply like to kill are perceived to be most often responsible for poisoning, followed by farmers, then hunters and livestock breeders. Protection of agricultural land and production is perceived as the biggest motive for poisoning of wild animals, followed by protection of pastures and livestock.

Unlike people who live in rural areas, who believe that wildlife poisoning most often occurs intentionally, the largest share of respondents in the survey of representatives of relevant governmental institutions believe that it occurs mostly by accident, due to misuse of legal toxic (pesticides. insecticides, etc.) substances, out of ignorance. Also, they perceive that farmers and livestock breeders are most often responsible for poisoning, followed by individuals who deliberately poison animals because they simply like to kill. Similar to other countries in the Balkans, one of the biggest gaps in dealing with potential poisoning incidents in Croatia is the unwillingness of citizens to report these cases to the police, as well as low capacities of enforcement agencies to respond and actively investigate them. Additional efforts are needed for raising awareness about the importance of reporting poisoning events and the impact of this practice on wildlife and human health, as well as for providing specific training for investigation of poisoning incidents to the relevant law enforcement institutions in the country.

GREECE

Introduction

The use of poison baits as a method of population control for predators (mainly mammals such as foxes or wolves, but occasionally also birds, insects, etc.) has been illegal in Greece since 1993. However, in the following years after its banning, deliberate poisoning for the same purpose continued illegally in most regions where conflict with predators were still present. Moreover, poison was used not only to kill wild animals but also dogs (feral, stray, shepherd, hunting dogs). The use of poison baits is still a deeply rooted practice in rural areas of Greece and national populations of vultures, raptors and mammalian predators continue to be seriously affected by the perpetuation of this practice. This practice is well documented, and the CSOs from Greece have been very vigilant in documenting and monitoring poisoning incidents.

Conflicts with wildlife, which often result in damages to crops, livestock and game animals are the most common drivers behind the use of poison baits in the environment. However, a very significant driver of poison use are also human conflicts among different stakeholder groups. Farmers, livestock breeders and hunters usually stand accountable for these human-wildlife and human-human conflicts and the use of poison baits that usually follows. Although agricultural and stockbreeding cooperatives and hunting clubs are formally against the use of poison baits, the practice is still widespread among these groups. The extensive use of poison baits in Greece was the main reason for population declines of all vulture species in the country and is currently the biggest restrictive factor for their recovery, especially in mainland Greece.

The absence of a clear-cut and comprehensive legal framework addressing the illegal use of poison baits greatly hinders the resolution of the problem, although a step in the right direction was initially made in 2018 with the endorsement of a Ministerial Decision on Local Action Plans against wildlife poisoning. Further progress is expected in 2022 once it becomes a Joint MD, involving other relevant authorities and law enforcement agencies.

Historical perspective

The use of poison baits was a common practice in Greece since the beginning of the 20th century. Since 1939 the use of *Strychnine* to cull foxes and other wild species regarded as “vermin” was regulated with annual circulars published by the Ministry of Agriculture. As from 1969 and until 1981, the Forestry Services oversaw the culling of wild animals and systematically used baits made of strychnine that were placed during the night and collected in the morning. After this, strychnine was substituted with *Potassium cyanide*, in order to avoid secondary poisoning, which had already been observed to have severely affected populations of avian scavengers, raptors and other species that often scavenge. Literature records for instance state that 75 jackals were killed in October 1931 in Samos, while 5108 wolves and jackals were culled in the whole country between 1933-1939 (most of them believed to be killed with the use of poison baits). According to the Ministry of Agriculture, during the period 1971-1979, 700-800 wolves were culled each year, while the numbers of foxes ranged from 40.000 to 74.000 individuals per year from 1974-1981.

Following the pressures exerted by national environmental associations and Nature protection policies defended in the European Union, the use of poison baits was finally completely banned in Greece in 1993. However, people in rural areas were so accustomed with the practice that despite its prohibition, and owing to the lack of law enforcement, the use of poison baits endured as a traditional practice for resolving conflicts with wildlife and continues to take its toll on their populations.

The survival of many protected species has been directly threatened by the use of poison baits. Many avian scavengers went extinct in different areas of Greece or declined significantly in numbers due to this practice. The Bearded Vulture went extinct from continental Greece at the turn of the 21st century, when the last individual on the continental part of the Balkan Peninsula, in the mountains of Almopia in the Greece-North Macedonia border area, disappeared in 2004. Currently the only population of this species in the whole Balkan Peninsula can be found on the island of Crete, where 6-7 breeding pairs still endure (Xirouchakis 2019). The Cinereous Vulture was relatively widespread in Greece. Following a severe population decline dating since the 1950s, the species became resident only to the Dadia-Lefkimi-Soufli Forest National Park (Xirouchakis & Tsiakiris 2009; Skartsi *et al*. 2010). A second breeding group of Cinereous Vultures that was discovered in the mountain Olympos in the 1980s collapsed in 1989 due to secondary poisoning (Tucker and Heath 1994). The Egyptian Vulture used to be very common and widespread, breeding across all continental Greece and on many islands (Handrinos & Akriotis 1997). By the beginning of the 20th century though, numbers had started to decrease, and although still considered common, in the 1980 the species had disappeared from all islands and southern Greece. In 2021 the population is reduced to only 6 territories, or 4-5 breeding pairs and one solitary individual (Egyptian Vulture New Life project LIFE16 NAT/BG/000874). The species main threat, particularly in the present time, is the illegal use of poison baits. The population of the Griffon Vulture in mainland Greece, once widespread in all mainland massifs and semi- mountainous areas in Greece, has crashed, mostly because of the poison baits, and has been reduced to 29-37 breeding pairs, or 165 – 240 individuals in total (Xirouchakis 2019).

Current situation in the country

National nature conservation organizations in Greece have invested significant efforts towards combating the illegal practice of wildlife poisoning. Illegal poisoning of wildlife in Greece is very common and has forced several species to the brink of extinction. These circumstances conditioned the creation of the Anti-Poison Task Force, which was formed in 2012 and consists of environmental CSOs (ARCTUROS, Hellenic Society for the Protection of Nature, Hellenic Ornithological Society (HOS), Callisto, WWF Greece and Hellenic Wildlife Care Association ANIMA) and the Natural History Museum of Crete. Since 2014, under the framework of LIFE+ project "The Return of the Neophron" (LIFE10 NAT/BG/000152), HOS is coordinating the Task Force and managing the Poison Incidents Database. The main objective of the Task Force is to promote proposals and institutional changes to eradicate the killing of wildlife by poison baits and to make known the extent of this conservation problem at local and national level. The continuous efforts of the Task Force members to collect as much information as possible is supporting the further development of the database and provides a better perception of this practice's characteristics, as well as its underlying reasons.

A regularly updated database represents an extremely valuable tool for combating wildlife poisoning and can lead to the identification of hot spots for poisoning and consequently to a better prioritization and more efficient utilization of the relevant authorities' already limited resources. Until now, poisoning incident data collection is carried out mainly by the members of the Task Force and secondly by the public authorities. Under the scope of the "Return of the Neophron" LIFE project, the Anti-Poison Task Force produced a very detailed technical report on the illegal use of poison baits in Greece (Ntemiri & Saravia 2016). This document provides insight into the current situation with use of poison baits in the country. Significant amount of information available from this report, as well directly from the PID was integrated in this study.

From the year 2000 to 2020 a total of 581 poisoning and presumably poisoning incidents have been recorded in Greece which resulted in mortality of wildlife and domestic animals, most notably dogs. Every poisoning and potential poisoning incident where at least one individual of a wild species was found dead was considered as a wildlife poisoning incident. Additional 346 incidents have been recorded during this period where only domestic animals were casualties of poisoning and were therefore not analyzed in detail for the purpose of this study.

Although the motives behind the great majority of wildlife poisoning incidents remain unknown, according to the data compiled from more successfully investigated cases most common drivers behind the use of poison baits are conflicts with mammalian predators which inflict damages to livestock (33 poisoning events) and to populations of game animals in hunting areas, which was the motive behind 26 poisoning events that occurred within this period (Figure 13).

Forensic toxicological analysis has been carried out for 58 (9,9%) potential wildlife poisoning incidents. The low number of toxicological analyses is mainly due to the following reasons: specimens were in advanced state of decay and difficult for conducting toxicological analysis; civilians who reported poisoning incidents are unwilling to proceed with official complaints or have already buried or destroyed the specimens and as a result, no samples could be taken for toxicological analyses; In some cases, the referent services due to lack of operational capacities and funds were unable or unwilling to handle poisoned animals and take or send samples for analysis (difficulty in finding the culprit/extra bureaucracy). The procedure for conduction of toxicological analyses is also hindered by the fact that to date there is no clear legislative framework to define the competent services, as well as lack of operational capacities, for the proper handling of animal poisoning incidents (animal removal, extraction of samples and delivery to specialized labs for analyses, operational capacities of referent toxicological laboratories).

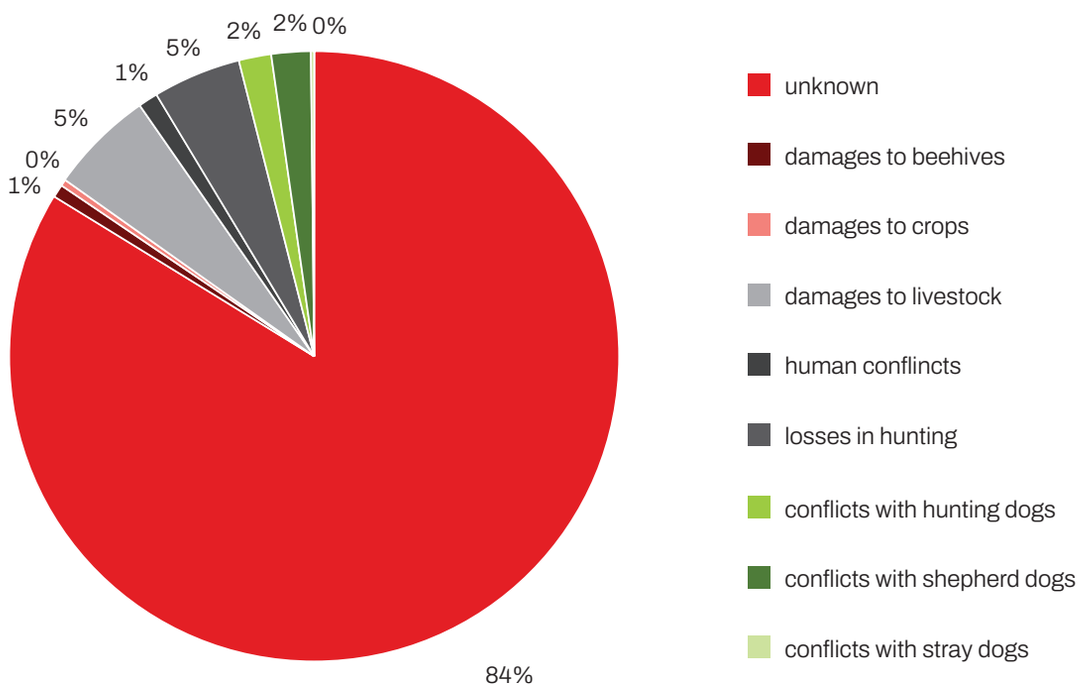


Figure 13. Motives behind wildlife poisoning in Greece

According to the available data, a total of 14 toxic compounds were used for setting up poison baits in Greece during this time period, and these are *Carbofuran, Potassium cyanide, Methomyl, Methamidophos, Fenthion, Sulphur, Methyl-Parathion, Endosulfan, Cyproconazole, Metribuzin*, *Phorate, Chlorpyrifos, Heptachlor* and *Endrin aldehyde*. The most widespread type of poison baits in Greece is the use of a piece of meat, often a liver or a sausage, laced with an approved or illegal pesticide. For large carnivores, like the wolf, whole carcasses of livestock laced with poison are commonly found to be used. The results of the conducted toxicological analyses showed that phytosanitary products from the group Carbamates are most frequently used for wildlife poisoning. These include approved and legally available products but also products banned at national, European or international level. The most frequently used substances for wildlife poisoning, identified during the investigation of poisoning events, was *Methomyl*, registered in 20 poisoning events. The use of Methomyl in powder form was banned in Greece in 2008 but its use was reapproved in liquid form in early 2013. Another commonly used Carbamate for preparing poison baits is *Carbofuran*, which was registered in 10 poisoning incidents. Carbofuran was banned in Greece since 2008 but is still regularly used for wildlife poisoning.

Potassium cyanide, registered in 16 poisoning events, is the second most used toxic substance (Figure 14). Poison baits with Cyanide are frequently found as a capsule covered with wax. This type is different to the others in that it doesn't cause secondary poisoning, meaning an animal feeding on a poisoned animal will not be poisoned itself. Cyanides are extremely toxic and when the capsule breaks, they can cause instant death though inhalation, digestion, or skin contact. Apart from Metamidophos, which was registered in 5 poisoning events, all other toxic substances were registered in single poisoning incidents. This insecticide has not been approved for use in

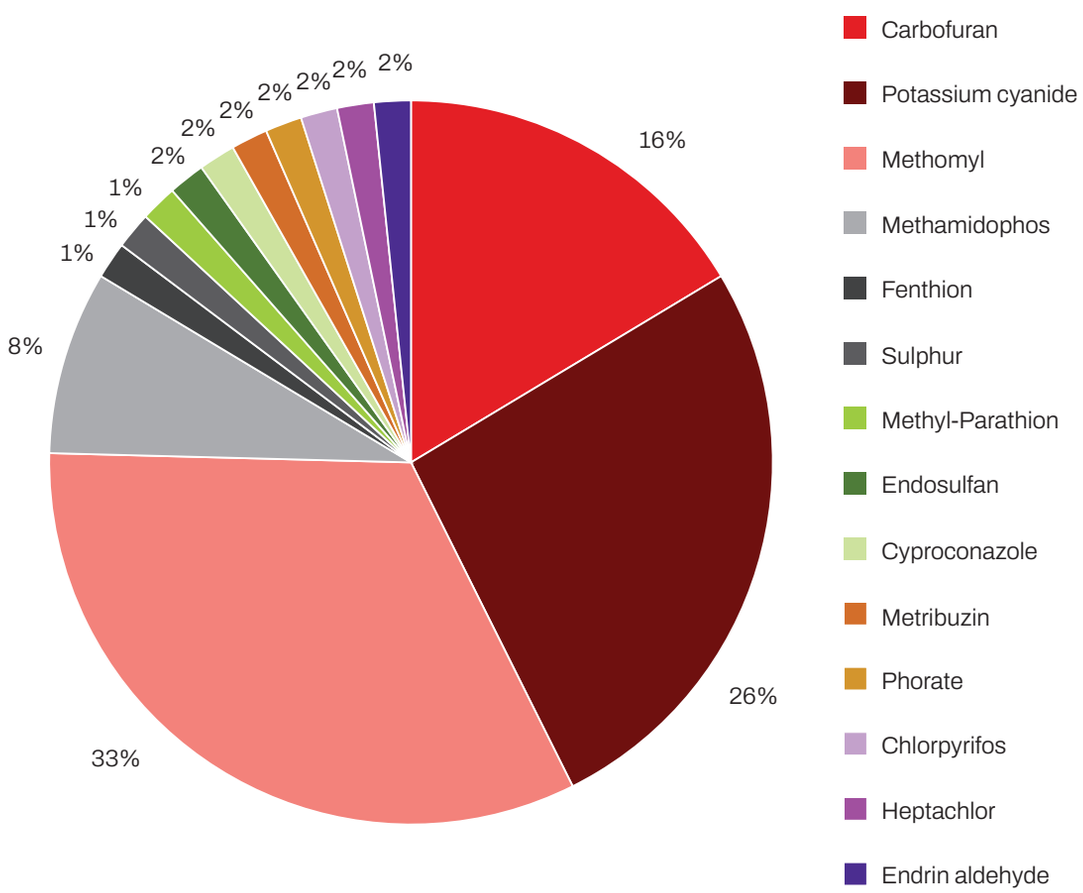


Figure 14. Registered toxic compounds used for wildlife poisoning in Greece from 2000-2020

the EU since 2008.
Poisoning in Greece during the period from 2000-2020 caused the mortality of 29 species of wild animals. According to the available data, this practice had the worst effects on the group of vultures, primarily Griffon Vultures, causing the death of 213 individuals within 169 separate poisoning and probable poisoning incidents, and other avian scavengers, such as the Common Buzzard, which was recorded in 94 incidents with 109 individuals found poisoned or presumably poisoned. Additionally, a total of 22 Cinereous Vultures were found dead within 16 separate incidents, and 19 Egyptian Vultures within 12 poisoning and probable poisoning incidents. The single most numerous species that was recorded in poisoning incidents in Greece was the Red Fox, suffering 348 casualties within 110 separate events (Figure 15).

Other recorded casualties include Bearded Vulture, Golden Eagle, Short-toed Eagle, Marsh Harrier, Honey Buzzard, Common Kestrel, Peregrine Falcon, Saker Falcon, Eleonora's Falcon, Long-eared Owl, Eagle Owl, Barn Owl, Scops Owl, Dalmatian Pelican, Magpie, Beech marten, Pine marten, European badger, European hedgehog, Brown bear, Golden jackal, Wolf, Wildcat and Wild boar.

Poison baits are often placed by individual hunters for the control of the fox population. The fox is considered to be the main factor limiting hare populations, a prized game species, and it is also poisoned to facilitate hunting dogs to train and chase hares, as they may chase foxes instead of the desired quarry. Apart from hunters, farmers may also place poison baits if bears, wild boars or even smaller mammals, like badgers and martens, inflict damage to their crops.

Available data indicates that the use of poison baits in Greece is still a common practice, showing no signs of significant decrease in occurrence during the past 20 years. The Anti-poison Task Force in Greece has been vigilant in recording and actively searching potential poisoning events in the countryside and in systematically storing the data in the Poison Incident Database.

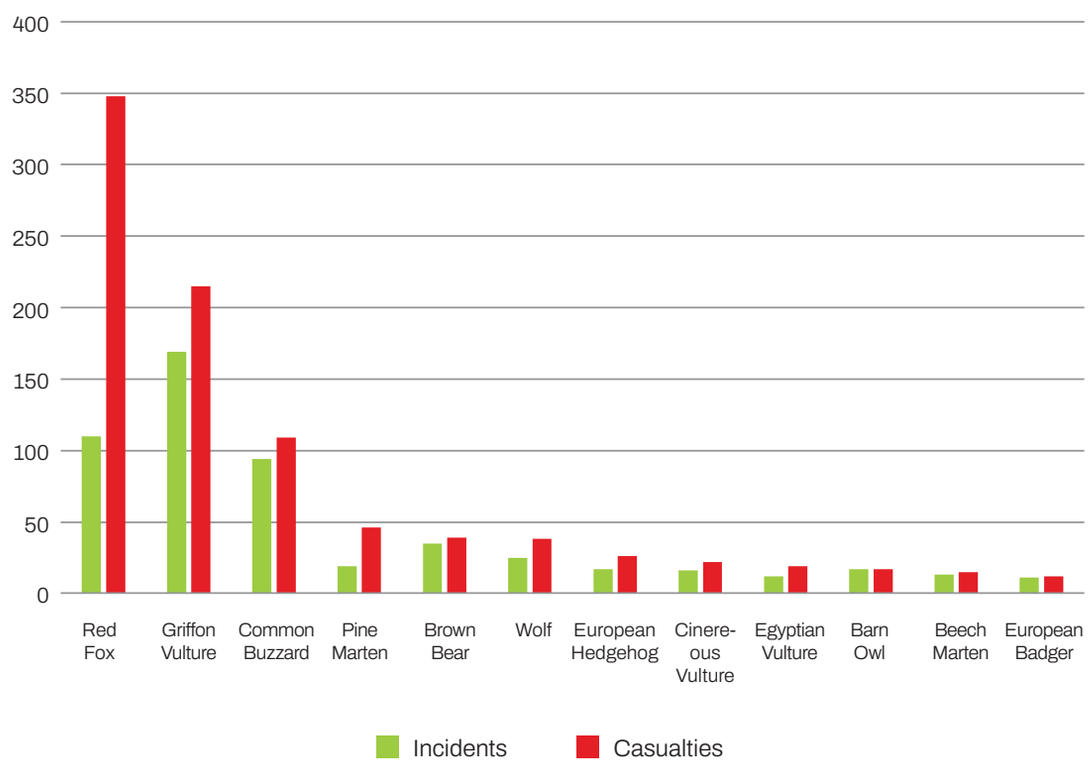


Figure 15. Common victims of poisoning in Greece (2000-2020)

The anti-poison efforts in Greece were significantly reinforced with the establishment of two Canine Teams (Anti-poison dog units) in 2014 which greatly facilitated their work in combating wildlife poisoning. Apart from being a preventive means, the Canine Teams contribute to the dissemination and increase of awareness regarding this conservation problem, and they also assist the competent authorities in their pre-trial work, collecting findings that can be used as evidence during the investigation and the judicial procedure. For example, From March 2014 till May 2021 the two teams carried out 440 patrols, covering 1057 km and detecting 212 poisoned animals and 227 poison baits in 102 poisoning incidents. During the two years that the Canine Teams were active (2014-2015), 28% of the total poisoning events recorded in the database were detected thanks to the use of the Teams, proving just how effective these units can be and underlining the importance of having such a tool in the fight against poison. It is important to highlight that the Ministry of Environment has acknowledged the usefulness of this teams and will start operating seven of them across Greece in 2022.

The sudden decline in recorded potential poisoning events in 2020 may be attributed to a general reduction of activities in the field from many relevant stakeholders due to the outbreak of the Covid19 pandemic, but this can only be validated with new data in the years to come.

The use of poison baits for extirpation of undesirable domestic animals outside of settlements is a common practice on Greece. A total of 346 poisoning and potential poisoning events have been recorded during the period 2000-2020 in Greece where the casualties were only domestic animals (Figure 16). In this case, this practice frequently aims to reduce the presence of abandoned hunting, shepherd, or pet dogs. However, significant and frequent motives for using poison baits are also human conflicts, namely local disputes, and land use conflicts. These conflicts most often result in intentional use of poison baits, targeting specifically shepherd and hunting dogs. Poisoning has been confirmed in 39 events (9,35%) that cause mortality of domestic animals. The most commonly used toxic compounds for these poisoning events by far is *Methomyl*, which is responsible for 66,67% of confirmed poisoning incidents with domestic animals. Other compounds that have been identified during toxicological analysis include *Carbofuran* (6 poisoning incidents), *Potassium cyanide* (4 poisoning incidents), *Endosulfan* (2 poisoning incidents), *Methamidophos*, registered in only 1 poisoning incident.

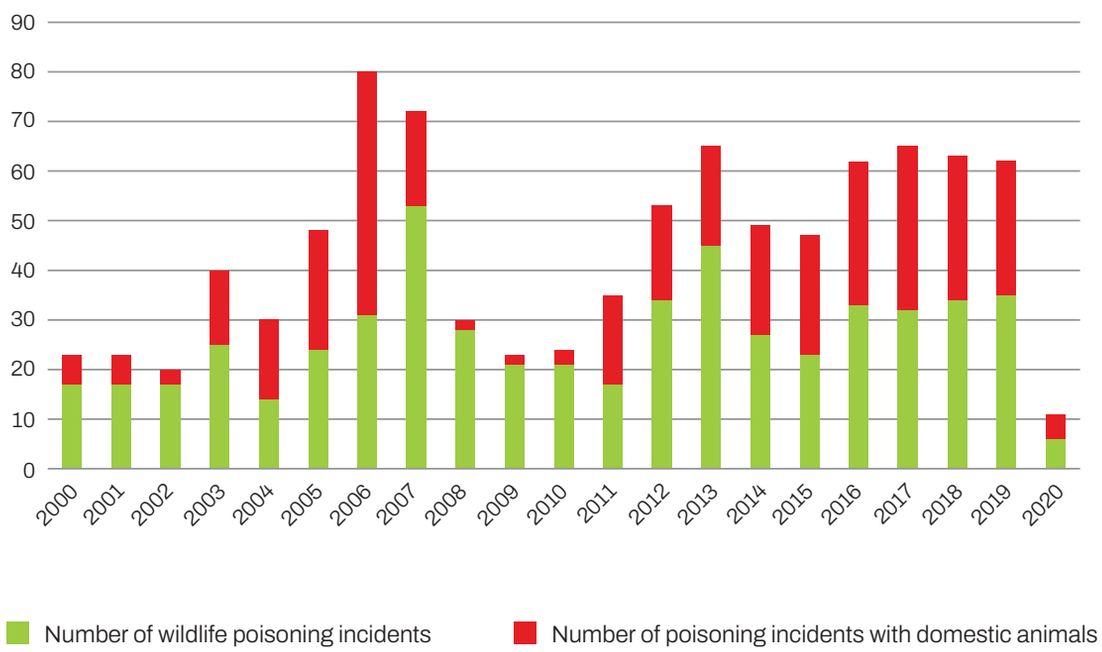
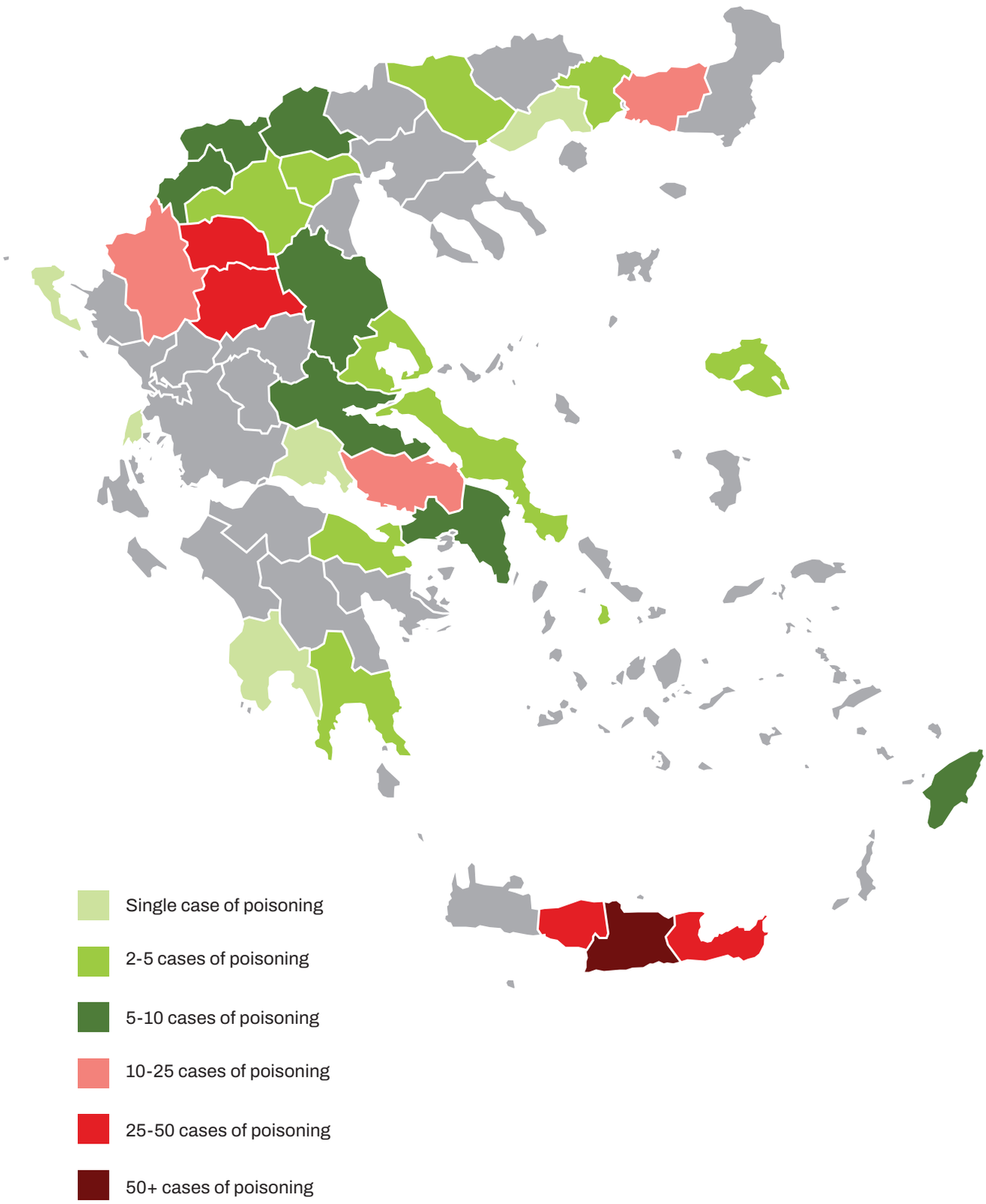


Figure 16. Number of poisoning events in Greece within the research period



Map 6. Distribution of poisoning events by regions in Greece during 2000-2020.

Legal framework

The use of poison baits is strictly prohibited in Greece under national legislation due to the extensive negative consequences to wildlife, especially to rare and endangered species. There are special provisions that regulate everything about poison use (special procedures, terms, prerequisites and criteria that would allow this practice).

Existing national legislation relevant to wildlife poisoning in Greece:

The present legal framework for the fight against poison baits is determined by the provisions of **Presidential Decree 67/1981** "On the protection of indigenous Flora and Wild Fauna and on the determination of the coordination procedure and the Control on their Research" (OGG 23/v. A'/30.01.1981) », which was issued under authorization of article 16 of Law 998/79. Article 9 of P.D. 67/1981 provides that "Toxic substance or any other poison use for the elimination of identified harmful species is prohibited, as these substances endanger protected species of wild fauna and indigenous flora".

- **Penal code:** Refers to "Poisoning of livestock fodder", according to which any person who intentionally poisons pastures, meadows, lakes or other sites of livestock watering is sentenced to a minimum of six months imprisonment. If this act caused deaths or serious and permanent damage to livestock of another person, then the maximum sentence is ten years incarceration. 2. Any person who is unintentionally found guilty of the criminal act of par. 1 is sentenced to a maximum of two years imprisonment or to pay a fine.

- **Law 1300/1982-On preventing and suppressing animal stealing and animal killing:** animal killing is punished under the provisions of article 1 par.2 Law 1300/1982 with a minimum sanction of a two (2) year imprisonment and a fine (OGG 129/v. A'/13.10.1982).

- **Joint Ministerial Decision 37338/1807/E.103/01.09.10 -** Definition of measures and procedures on the conservation of wild birds and their habitats, in compliance with the provisions of Directive 79/409/EEC, "On the conservation of wild birds" of the European Council of April 2nd 1979, as codified by Directive 2009/147/EC.. », (OGG 1495 / v. Β' / 06.09.2010)**:** Article 8, par. 1 (Prohibited hunting gear/means) states that during hunting, capturing or killing birds, the use of any means, installation or method of mass and non-selective capturing or killing that may cause local extinctions of a species is prohibited, especially these means, installations or methods cited in Annex III (case 1) of article 14. Poison bait or tranquilizer use is among these methods. According to article 11 par. 2.a.c., offenders of the aforementioned article are sentenced to a fine of 100 to 300 Euros. Moreover, according to article 11 par. 2.b.c., offenders of the aforementioned article are sentenced to up to a year imprisonment and a fine.

Relevant international treaties and conventions that Greece is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified by Greece under Law 1335/1983 "Ratification of International Convention on the conservation of European wildlife and natural habitats" (OGG 32/v. A'/14.03.1983). It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in Greece

The survey included a total of 42 respondents from communities of Meteora and Mesolonghi, which are one of the key areas for Egyptian and Griffon vultures in Greece, and also areas where wildlife poisoning incidents are frequently recorded. People from local communities in Greece are relatively well informed about the presence and breeding of different vulture species in the country. They are most familiar with the presence of the Griffon Vultures, as well as the Egyptian Vulture, while further informing is needed for Cinereous Vulture.

Wildlife poisoning is perceived as a key threat to the vulture populations in Greece. Respondents perceive that vultures are killed mostly by accident from eating poisoned animals or from ingesting poison baits intended for other animals, that is, that they are not killed intentionally.

People from local communities in Greece recognize the importance of the vultures for both humans and the environment. Also, the majority of respondents display some environmental awareness by agreeing that it is difficult to maintain the natural balance (84%), while about two thirds agree that plants and animals have the same rights as humans and that the Earth has limited space and resources. However, at the same time they put human interests first (i.e., by believing that wildlife poisoning is only a problem when it poses a threat for humans) and advocate for government-controlled activities in regulation of pests, including poisoning of wild animals (98-100%).

Members of local communities in Greece believe that livestock breeders and hunters are mainly responsible for wildlife poisoning (77% and 67% respectively). They are followed by farmers (around 60%) and individuals who deliberately poison animals simply because they like killing things (Figure 17). Also, the majority of respondents (nearly 90%) recognize veterinarians, hunters, as well as the general public (every person) as key groups responsible for reporting information about wildlife poisoning to the police.

About 80% of respondents perceive that wildlife

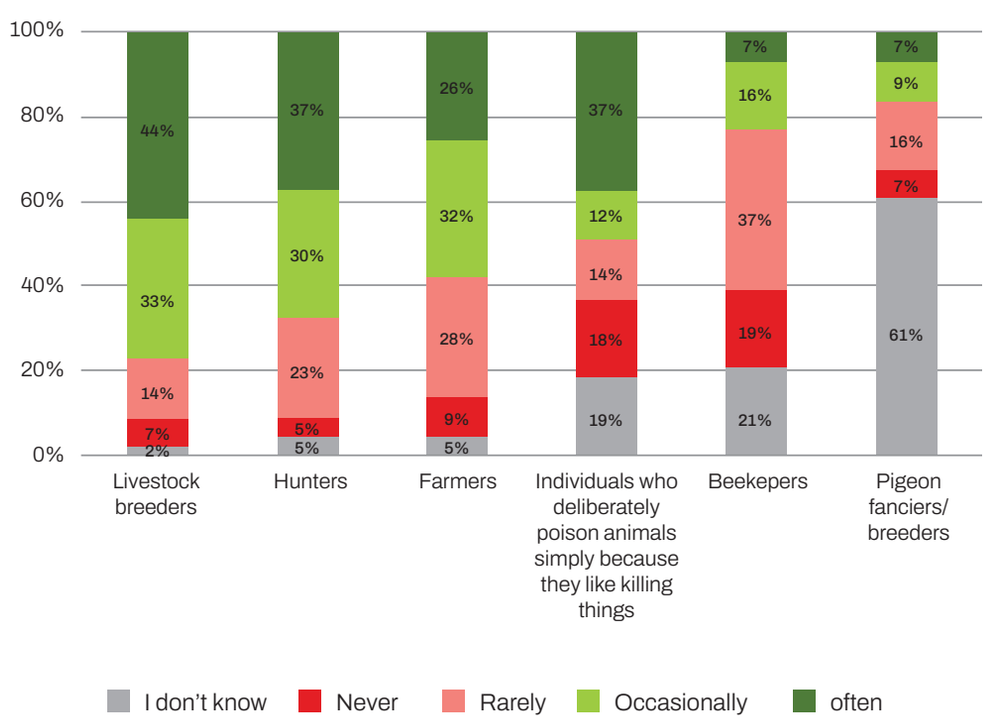


Figure 17. Perception of groups responsible for wildlife poisoning in Greece

poisoning commonly occurs intentionally, mostly by misuse of poisoning substances (every other respondent) or by illegal poisons from the black market (23%). 1 out of 10 believes that wildlife poisoning most commonly occurs accidentally, by misuse of legal poisoning substances out of negligence or ignorance.

Almost 80% of respondents would report information about poisoning to the police, but 42% of respondents claim that they would report it only in the case if it wouldn't have negative consequences for them, while 1 in 10 stated that they would not report the poisoning at all. The main obstacle for reporting poisoning is the risk of conflicts with people from their communities. Also, nearly two thirds of respondents claim that a potential barrier for reporting incidents is that they do not know whom to report animal poisoning incidents to.

The results indicate that it is necessary to further communicate and inform the citizens about the possibilities of reporting wildlife poisoning, (i.e., to whom to report potential poisoning events), as well as to point out the importance of the contribution of each individual to the process of reducing the occurrence of illegal wildlife poisoning.

Protection from stray dogs, cats and pests, as well as protection of pastures and livestock are the most frequent motives for poisoning wild animals, so it is necessary to work on solutions to these problems in order to achieve a reduction of this practice (Figure 18).

In the past 10 years, 8 out of 10 respondents claim to have heard of at least one poisoning incident in their community. Half of the witnesses are knowledgeable about intentional poisoning of any type of animal in settlements or inhabited areas, while 1 in 5 claims to know about accidental poisoning of vultures.

Western Greece and Thessaly are the regions of Greece identified as wildlife poisoning "hot spots" (near one fourth of respondents mention each region), while Eastern Macedonia and Thrace follows (12%).

The key measure for prevention and combating

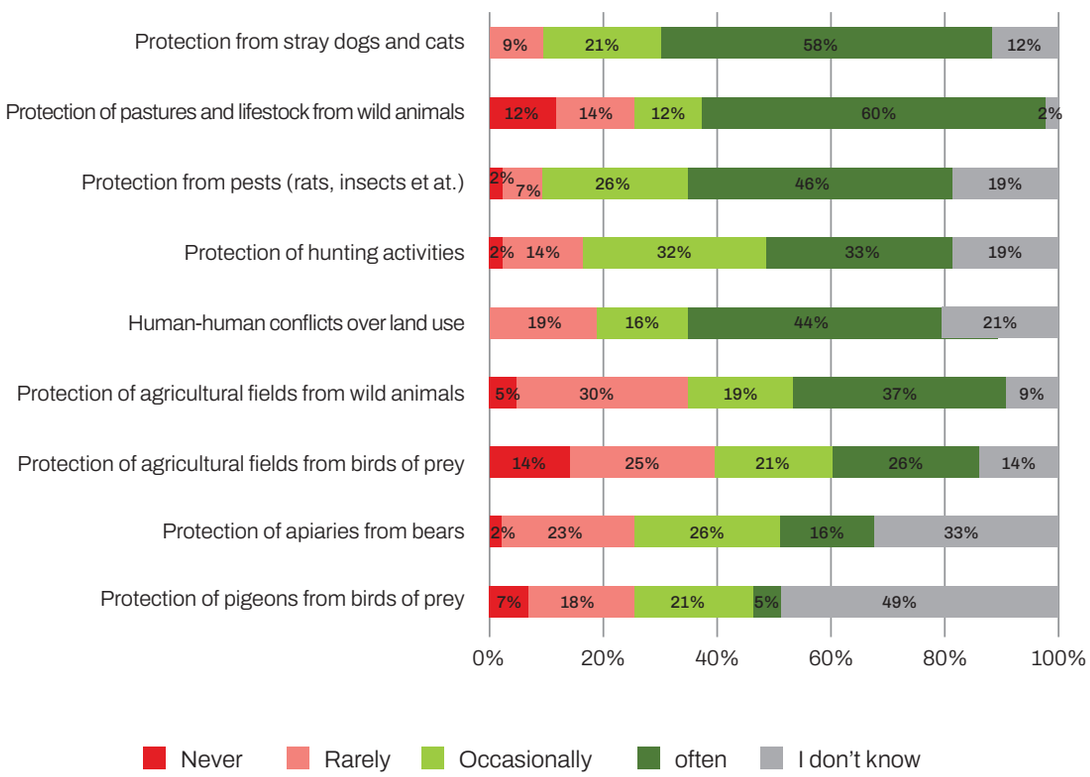


Figure 18. Perceived motives behind wildlife poisoning in Greece

wildlife poisoning, identified by almost all respondents, is raising awareness of the general public about wildlife poisoning. Also, 9 out of 10 respondents believe that it is important to enforce a stronger control of import and trade of legal poisoning substances, to increase administrative fines for wildlife poisoning, as well as that state/government should financially compensate the damage to livestock breeders and farmers caused by wild animals.

The target groups for the awareness campaign about the threats of wildlife poisoning are citizens in general (44%), as well as livestock breeders (37%). 1 out of 10 respondents claims that hunters also need to become more aware of this problem.

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Greece

Employees of relevant governmental institutions from Greece are relatively well informed about the species of vultures that nest in their country. They are unanimous in acknowledging the presence of the Egyptian Vulture, and most of them believe that both the Cinereous and Griffon Vulture breed in their country. The sample included 17 respondents in total out of 42 employees from targeted institutions.

Wildlife poisoning is highlighted as the most prominent threat that endangers the vulture populations in Greece. Vultures are not perceived as the primary targets of poisoning, but mostly as accidental casualties, that perish either due to ingesting poison baits intended for other animals or eating animals that died from poisoning. Respondents believe that poisoning is mostly done intentionally, and that it occurs primarily by misuse of legal toxic substances such as pesticides or insecticides, etc. and to a lesser extent with illegal poisons from the black market.

Employees from relevant institutions in Greece (somewhat less than three quarters of them) identify Eastern Macedonia and Thrace as the region in Greece where wild animals are most frequently poisoned. Other regions that are identified as areas where wildlife poisoning occurs often are Crete (every other respondent), Western Macedonia (6 respondents) and Central Macedonia (5 respondents).

Respondents attribute the responsibility for wildlife poisoning mainly to livestock breeders and hunters, followed by farmers. This is mostly in line with the key perceived motives behind wildlife poisoning - *protection of pastures and livestock from wild animals, protection of agricultural land from wild animals* and *protection of hunting activities.* This implies the need for preventive and sanctioning measures aimed at these groups. *Conflicts about land use* (pastures and hunting areas) are also perceived as a significant motive behind the occurrence of wildlife poisoning, and as such they dictate the need for legal intervention in order to resolve these issues.

When it comes to key obstacles for the prevention and sanctioning of animal poisoning, institutions officials from Greece are unanimous in the belief that the *complexity of the investigation* is the greatest obstacle faced. *Bad law enforcement, difficulties with evidence procedures in court*, *low penalties for wildlife poisoning, poor reporting of information from witnesses* and *inadequate and unclear protocols for police action* are also perceived as relevant. These findings suggest, among other things, that it would be beneficial to analyze/evaluate existing protocols and procedures in investigative processes, to optimize the process.

The respondents believe that it is the shared responsibility of all citizens (every person) to report information about wildlife poisoning to the authorities. Nevertheless, most of them also believe that people who report someone from their community for the poisoning of wild animals, risk altercations and conflicts in their community, which presents an important barrier for reporting poisoning incidents. This highlights that it is crucial to communicate the significance of reporting wildlife poisoning to the general public, and to encourage witnesses and everyone who has information to come forward.

Livestock breeders are singled out as the most im-

portant target for awareness raising campaigns, which is in line with the perceived responsibility of this group for wildlife poisoning.

In order to make progress in the prevention, detection and sanctioning of wildlife poisoning, institutions officials believe that it is necessary to introduce *specialized canine units in the police for detecting poisonous substances used for wildlife poisoning*, to *assign more agents to the field* (police, environmental inspectors, rangers etc.), as well as to *delegate specialized police units for environmental crime*.

One of the key barriers for successful combating and prevention of wildlife poisoning is that the existing laws are not enforced sufficiently. Half of the respondents believe that the legal framework for punishing poisoning is good, but the problem is in law enforcement. Another potential obstacle identified by one half of the respondents, is that public prosecutors are not sufficiently educated for managing incidents related to the poisoning of wild animals. The opinions are similarly divided when it comes to the existing legislation concerning biodiversity. 2/5 of the respondents do not believe that it is adequate and the same number of them are indecisive, which implies that the current legislation should be revised.

Regarding their awareness about existing protocols and plans - the majority of institutional employees are informed regarding the existence of a protocol defining procedures and jurisdictions for investigating wildlife poisoning, and a national plan for combating wildlife poisoning, but they are relatively uninformed about the existence of a database for poisoning incidents.

The majority of surveyed governmental employees also consider the collaboration between governmental institutions and civil society organizations regarding data collection about poisoning cases to be inadequate. Half of the respondents also endorse the inclusion of civil society representatives in wildlife poisoning investigations, further highlighting the need for cooperation of government officials and members of civil society organizations. When it comes to the investigations themselves, most of the institutions employees also consider the *lack of coordination among institutions to be a greater problem than a lack of resources*. These results indicate that working on improving communication and coordination among institutions and between institutions and civil society organizations, can lead to a higher probability of identifying responsible perpetrators and preventing further poisoning of wild species.

Employees from governmental institutions in Greece are in favor of enforcing the strictest punishment for all forms of mass and non-discriminatory killing of animals, including imprisonment. They believe that having poison baits should be treated and sanctioned as a separate offense. Most of them believe that fines should be higher and that rangers of protected areas should have additional authority in wildlife poisoning cases.

Regarding the engagement of police authorities in wildlife poisoning incidents, the key barriers for successful detection and prevention of wildlife poisoning are reflected in the perceived lack of knowledge and adequate equipment of police representatives, but on the other hand, such incidents are not sufficiently reported to the authorities in the first place. Half of the respondents believe that modern technology and methods are necessary to carry out this type of police work, and close to half of the respondents advocate that it is necessary to introduce specialized police units for environmental crime.

A potentially significant reason for not reporting wildlife poisoning incidents is that citizens are not sufficiently informed to whom such cases should be reported, as well as a certain fear that such a reporting could have harmful consequences for them. These results point to the need for raising awareness of the importance of each individual's contribution in the prevention of wildlife poisoning. On the other side, the importance of reducing wildlife poisoning should be promoted within whole communities, in order to reduce people's concerns about negative reactions in the immediate environment, that could be reduced as a result of a general shift of public opinion. In addition, the relevant information for reporting wildlife poisoning cases should be made widely available to all citizens.

Representatives from relevant governmental in-

stitutions in Greece consider that for achieving success in investigation of wildlife poisoning incidents, it is necessary to introduce the following measures: *canine units, toxicological analysis*, *fingerprint analysis*, and *using the records of sale of legal poisoning substances*.

When it comes to preventive measures - more supplementary feeding sites for vultures, free shepherd and guard dogs, resolving problems related to pasture ownership and improved protection of wild ungulate population are also recognized as important measures that could lead to better protection of wildlife species and prevention of poisoning.

Employees from relevant institutions in Greece share a common belief that plants, and animals have an equal right to exist just like humans, and they recognize the fragility of the natural balance. In addition to this, the prevailing belief among them is that the Earth has limited space and resources. The majority of them do not believe that humans are destined to dominate over the rest of nature.

Conclusions

Wildlife poisoning in Greece is a very common practice, one which has devastating effects on many wild species, primarily those that resort to scavenging as a source of food. Vultures are the group of species which are affected the most by the illegal use of poison baits, appearing as casualties in every third wildlife poisoning event in the country. Griffon Vulture is the most common species of vultures, and wildlife in general, to get poisoned in Greece. The practice of setting poison baits has caused mortality of 213 individuals over the course of the last 20 years and has crippled the population inhabiting mainland Greece to the point of extinction. Wildlife poisoning continues to be the most significant threat for vultures inhabiting mainland Greece, and also poses a threat for populations of neighboring countries, as birds from Bulgaria, Croatia and Serbia have also been found poisoned there. CSOs in Greece have been very diligent in recording all potential poisoning events in their national database and making it publicly available to all interested parties. From the data used for the purpose of this study it is evident that the most important drivers for the use of poison baits are damages which mammalian predators inflict on livestock and game animals in hunting areas as well as conflicts between different land users groups.

Conduction of toxicological analysis is a big gap in the overall management of poisoning events, as there is only one referent national laboratory in the country (Athens Veterinary Centre), operating with only one staff member responsible for conducting forensic toxicological analysis. On the other hand, these analyses have confirmed that numerous toxic compounds have been used for preparation of poison baits, unlike in other countries where only 2-3 substances are usually used for poisoning. The most commonly used compounds are Carbamates (52%), primarily Methomyl, followed by Potassium cyanide. Additionally, the diversity of baits used for poisoning in Greece, often prepared to target specific species, suggest that the practice of wildlife poisoning is still a deeply rooted one and commonly practiced.

According to the results from the interviews carried out, wildlife poisoning is perceived as a key threat to vulture populations in Greece by people from rural areas. They perceive that vultures are killed mostly accidently from eating poisoned animals or from ingesting poison baits intended for other animals. Livestock breeders and hunters as perceived as groups mostly responsible for wildlife poisoning. Same perception about the effects of wildlife poisoning on vultures, drivers and responsible groups for poisoning have employees of relevant governmental institutions. Livestock breeders are singled out as the most important target group for awareness raising actions. Additionally, law enforcement agencies in Greece are perceived of having insufficient capacities, as well as engagement, for investigating poisoning incidents. Therefore, specific training towards these stakeholders would be crucial for building up capacities and achieving better results in the investigation of this practice.

NORTH MACEDONIA

Introduction

Earliest records of wildlife poisoning from North Macedonia relate to organized poisoning campaigns primarily against wolf populations. The use of poison baits started to take their toll among vultures and other scavenger species in the country since 1947. Although the use of poison baits for predator control was banned in 1985, the practice is deeply rooted, especially in rural areas. Poison baits continued to be used by livestock breeders and are usually placed after wolf packs inflict major damages to livestock. Poisoning of stray dogs is also common in and around most of the rural and urban settlements, and some of their carcasses are occasionally available for vultures on the settlements dumping sites.

As a result of the practice of poison use, which is most frequent in the period between February and April, an estimated number of 1000-3000 Griffon Vultures have been poisoned since 1947 till today. Poison use is likely one of the underlying causes for extinction of the Bearded and Cinereous Vultures from North Macedonia. Although both species last bred in the country in the 1980s, the last individuals of these species remaining in the country in 2002 were lost in 2005–2006. In the same period, the populations of both Griffon and Egyptian Vulture declined strongly mainly because of the illegal use of poison baits for the control of predators and feral dogs, but also as a result of food shortage, habitat loss and disturbance, which may lead to their extinction as well (Velevski *et al*. 2013; Grubač 2014).

Historical perspective

The effects of the practice of using poison baits in the environment on wildlife is well documented in North Macedonia, especially on scavengers such as vultures, which are mostly affected by this practice. The first recorded poisoning event with Griffon Vultures in North Macedonia is from Shar Planina Mountain, where hundreds of birds were poisoned in the period 1947-1954 (mostly on the territory of Kosovo, Naumov 1981). Since then, such practice has been often documented in North Macedonia, and Grubač (2000) mentions poisoning of about 100 vultures and other avian scavengers around Prilep in 1979. Reasons for the use of poison in the past were almost exclusively related to governmentally sponsored nation-wide poisoning actions against wolves and other mammalian predators.

Apart from this, it is very important to note that a single case of misuse of rodenticides for pest control is responsible for the loss of an entire pre-migratory flock (60-70 individuals) of Egyptian Vultures in 1992, which practically crippled the population that continued to decline since. This incident highlights the threat that improper use of such, and similar toxic compounds can have on scavengers and other wildlife, and the importance of enforcing better control of the application of pesticides and rodenticides in agriculture. Other motives for poison use identified in the past include intentional use of poison baits, to eliminate feral and stray dogs from local communities, use of poison (insecticides) to reduce damages to beekeepers - mainly targeted at martins, and intentional use of poison to resolve human-human conflicts between neighbors.

Even though the use of poison and poison baits has been prohibited in 1985 with the change in national legislation, the practice still endured as an affordable and effective method for elimination of undesirable animals and wildlife in both rural and urban areas, especially after different pesticides become readily available on the market in high concentrations for low prices. By then, the

Cinereous and Bearded Vulture became extinct as breeding species in the country and only individual vagrant birds were occasionally recorded. A single pair of Bearded Vultures endured in the country until 1985 when the solitary female died from poisoning, and with her the species practically became extinct from the Balkan Peninsula (except the island population on Crete).

Current situation in the country

The practice of wildlife poisoning in North Macedonia has been generally well documented since the beginning of the 21st century onwards. Relevant governmental institutions keep records of all wildlife poisoning cases that were investigated and prosecuted, while national non-governmental nature conservation organizations, such as Macedonian Ecological Society (MES), remain vigilant in documenting all poisoning and presumably poisoning events that occur and mortality induced by it. Most available records relate to poisoning events that cause mortality of vultures, eagles and similar emblematic species which are of a higher conservation concern. Generally, incidents with these species are more often reported to the authorities by citizens, and therefore it is very likely that mortality of other species goes unrecorded.

During the period of 2000-2020 a total of 29 poisoning and presumable poisoning events were documented in North Macedonia. Although the motives behind most poisoning events remain unknown, the most common drivers behind the use of poison baits identified within this period were conflicts with predators in rural areas, predominantly wolves and jackals (Figure 19). These conflicts are responsible for 31% of all poisoning events documented. Other drivers of poison use identified include conflicts with stray dogs.

Forensic toxicological analysis has been conducted in only 2 events and remains the biggest gap in conducting proper investigation of poisoning incidents in North Macedonia. In both cases *Methomyl* was identified as the substance used for poisoning. Relevant national laboratories are lacking operational capacities and equipment to conduct analysis of samples from wild animals and this issue should represent one of the priorities in future actions concerning combating wildlife poisoning in the country.

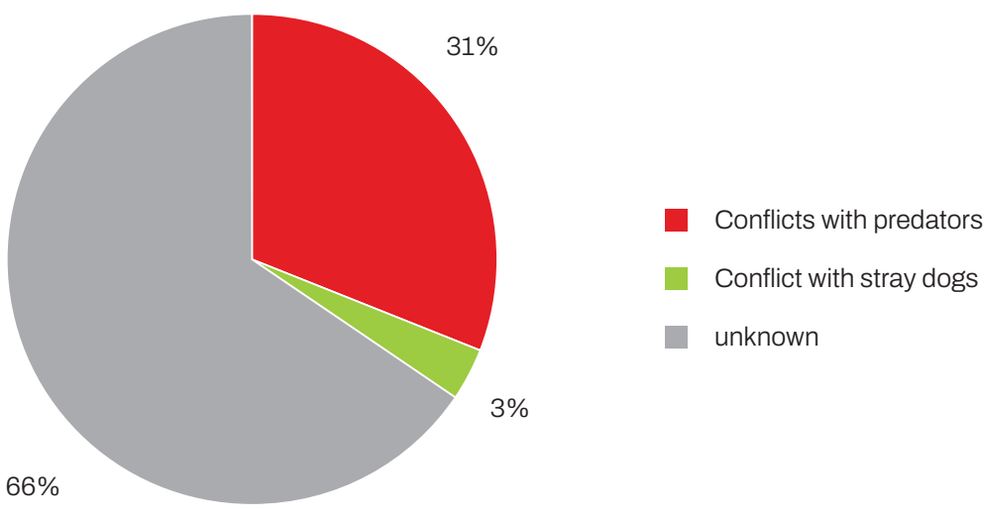
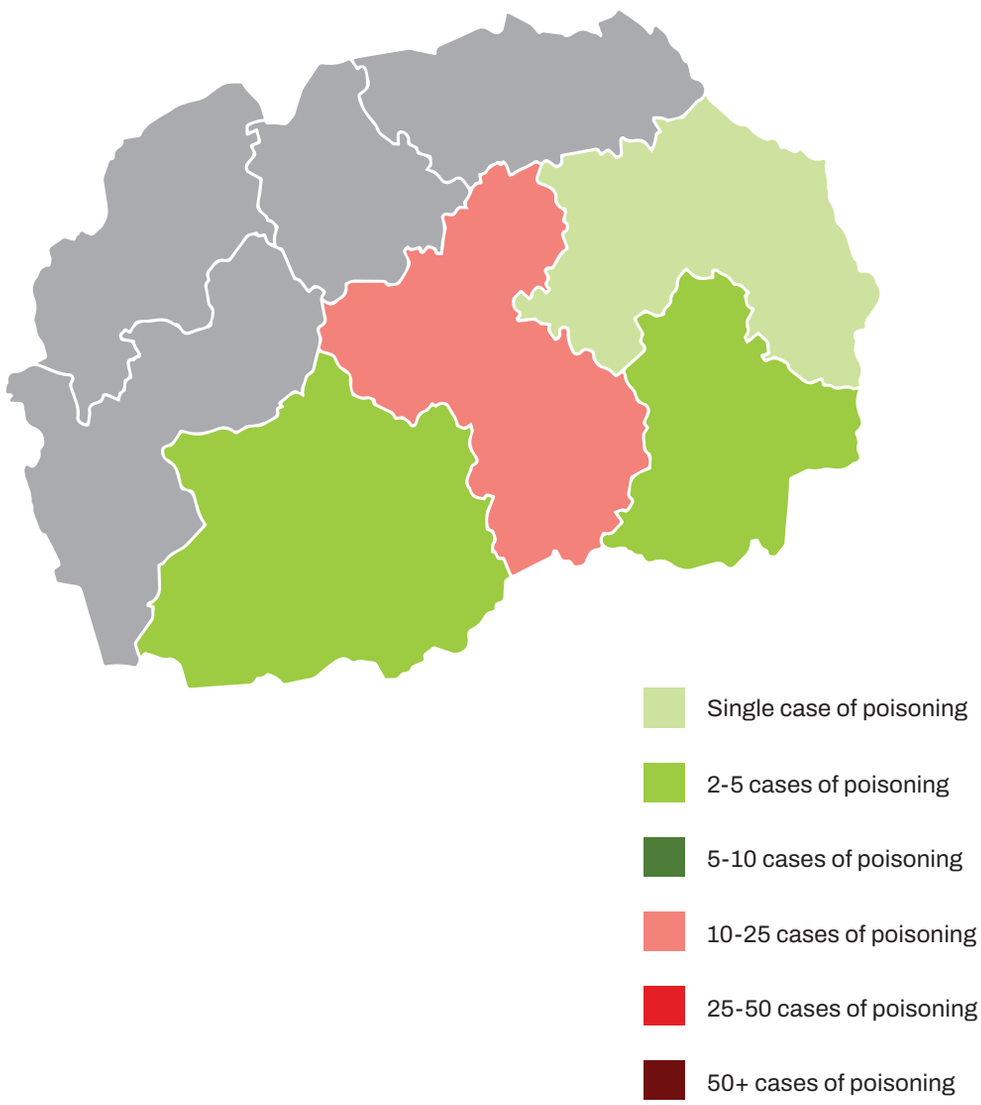


Figure 19. Motives behind wildlife poisoning in North Macedonia

A total of 6 species of wild animals have been found poisoned or presumably poisoned during the period from 2000-2020 in North Macedonia. According to the available data, the most common victims by far were Griffon Vultures, with mortality recorded in 75,8% poisoning and presumably poisoning incidents. A total of 102-125 individuals were found poisoned and presumably poisoned within 22 separate events. The Griffon Vulture breeding population reached its lowest number in 2006 (12 breeding pairs), followed by a slight recovery but has fallen again, numbering up to 14 pairs in 2019. Several events of mass poisoning of Griffon Vultures have been recorded during this period. In 2001 12 individuals were found dead in Mariovo, 14 individuals in 2003 in St. Nikole, 7-15 individuals the same year in Demir kapija, and 5-7 individuals in Mariovo in 2014. The second most numerous victim of poisoning events in North Macedonia is the Egyptian Vulture (4 individuals in 2 separate incidents), followed by Imperial Eagle (3 individuals in 2 separate incidents). Other species affected by this practice include Golden Eagle, Common Buzzard, Golden Jackal and Hooded Crow.



Map 7. Distribution of poisoning events by regions in North Macedonia during 2000-2020.

Based on the available data about wildlife poisoning, the use of poison and poison baits in the recent period seems unevenly distributed, being more frequent in the regions of Mariovo, Tikves, Ovce Pole and likely Plackovica Mt. These areas are one of the most important agricultural areas in the country, which could be the reason for more frequent conflicts with various wildlife, especially predators.

There is some overlap and uncertainties with jurisdiction between legal bodies regarding prevention, control, and investigation of illegal poisoning. Firstly, the proper procedure for reporting wildlife poisoning incidents is unclear, mainly which institution needs to be contacted first. Therefore, more efficient, clear-cut legal protocols for describing responsibilities in reporting, investigating and processing cases of wildlife poisoning need to be developed and distributed within all responsible institutions to precisely define jurisdiction of each one within national legislation and avoid overlaps. Also, communication and information exchange between responsible institutions and sectors related to jurisdiction, responsibilities need to be enhanced. Apart from this, clear-cut protocols and Standard Operational Procedures related to duties and responsibilities of existing governmental laboratories about processing poisoned animals, as well as accredited protocols and security measures in sampling are lacking and need to be developed to facilitate their work.

According to the data that we were able to obtain from the State Environmental Inspectorate and State Hunting Inspectorate, criminal charges against unknown perpetrators were brought up in two wildlife poisoning cases, in 2007 when 19 Griffon Vultures were found most likely poisoned in the area of Mariovo, and in April 2011, when 2 Egyptian Vultures, 1 Common Buzzard. 1 Raven, and 2 dogs were found poisoned. No court rulings were made in either case.

Legal framework

The Republic of North Macedonia overall has good legislation in place related to the use of poison substances in the natural environment, where wildlife poisoning is clearly defined as an illegal activity, punishable under Criminal law.

Existing national legislation relevant to wildlife poisoning in North Macedonia:

- **Hunting law:** Article 54. states that hunting is prohibited by any means which can lead to massive losses to populations of game animals, including the use of poisonous substances.
- **Law on nature protection:** Article 43. prohibits the use of non-selective means of capturing and shooting of wild species, as well as use of substances that may cause local exhaustion or serious disturbance of the populations of those species, in accordance with the international agreements ratified by the Republic of North Macedonia, and in particular: poison and tranquilizing substances and poison and tranquilizing baits.
- **Law on plant protection products:** Although this law does not particular refer to wildlife poisoning, it is relevant because it describes the legal use and application of toxic substances in agriculture. Inadequate use and application of these phytosanitary products are often a source of unintentional poisoning of various wildlife.
- **Criminal law:** Article 230. refers to persons who store, disintegrate, or keep hazardous waste that has traits of explosiveness, reactivity, inflammability, extravagance, toxicity, infectivity, carcinogenicity, mutagenicity, teratogenicity, ecotoxicity or toxicity release property through chemical reactions and biological reproduction. Under the Criminal law they are liable to be penalized by prison sentence from one to five years.

Relevant international treaties and conventions that North Macedonia is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified with the Law on Ratification ("Official Gazette of the Republic of North Macedonia no. 49/97) and entered into force in 1999. It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species,

namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in North Macedonia

Surveys in North Macedonia were carried out in communities of Mariovo and Vithacevo, which have a population of 550 inhabitants. The sample included 31 respondents in total, most of which (52%) are livestock breeders and farmers. Respondents from local communities are relatively knowledgeable about the vultures that inhabit their country, but with a significant number of them are undecided or do not have information about vultures and factors that threaten their populations in North Macedonia.

Wildlife poisoning stands out as the most important factor endangering the vulture population in North Macedonia (71%). Poison baits intended specifically for vultures are in the second place among the key reasons that lead to the significant decrease of the population of these species (23%), while the first are also poison baits, but intended for other animals (42%).

The results of the research imply that people from local communities in North Macedonia are aware of the importance that vulture species have for the entire ecosystem, but also for human activities, and they believe if vultures were left alone, without interfering, their numbers would increase (75% to 80% of respondents agree with this). Also, close to two-thirds of farmers and hunters who took part in the survey share the opinion that the natural balance is very delicate and easy to disturb, and that people, plants, and animals should have equal rights to exist.

On the other hand, it seems that despite the awareness of the importance of vultures, they, like wild animals, are generally placed in a subordinate position in relation to humans. Two thirds of respondents cite attractiveness for tourists as the vultures' main value, while 4 out of 10 respondents believe that people dominate nature, and the same number believe that wildlife poisoning is a problem only when it is endangering people.

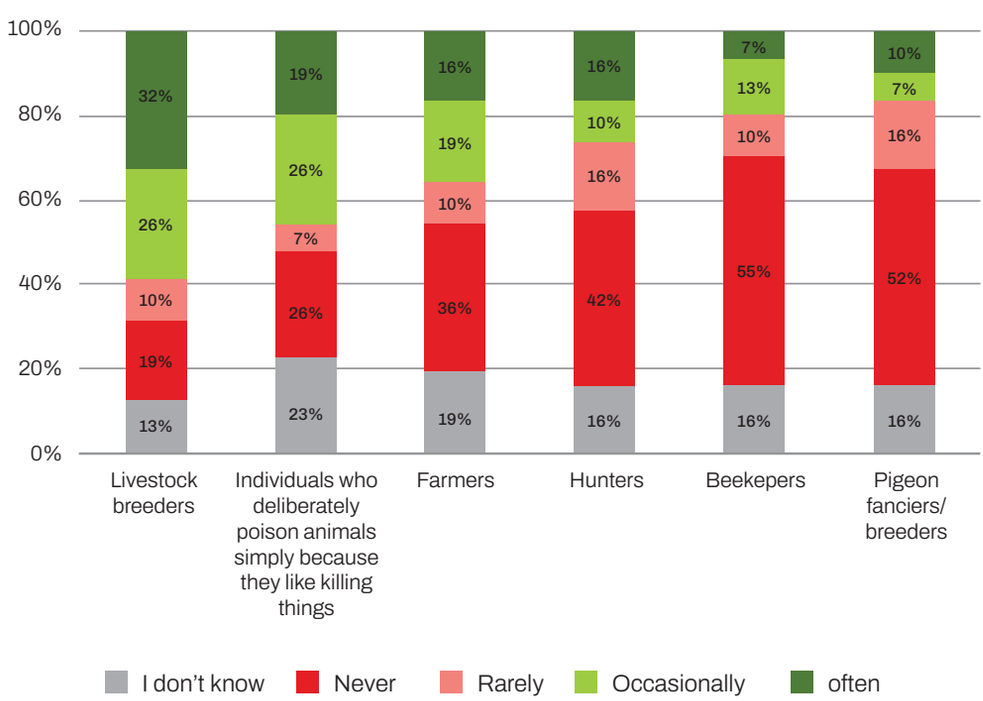


Figure 20. Perception of groups responsible for wildlife poisoning in North Macedonia

Respondents believe that the poisoning of wild animals is the result of intentional actions, mostly by using illegal poisons from the black market (55%), and in a smaller percentage by misuse of legal poisoning substances (19%). The groups that are recognized as mainly accountable for wildlife poisoning are livestock breeders and individuals who deliberately poison animals simply because they like killing things (58% and 45%, respectively). Hunters, veterinarians, and citizens in general (every individual) are on the other hand perceived as primarily responsible for reporting cases of wildlife poisoning to the relevant authorities.

One of the most important obstacles for reporting wildlife poisoning events to the police is the concern about potential negative personal consequences, as well as the possibility of disapproval or inconvenience within their community. While four out of ten respondents would report the incidents regardless of these consequences, every third shows concern about the negative impact reporting would have on them, while one fourth wouldn`t report such cases at all because among other things, they do not receive any personal benefits from such actions.

According to the results of the survey, about two-thirds of respondents from targeted occupational fields believe that people do not have enough information about the institutions to which they can report incidents to. This can also be considered as a barrier that reduces the likelihood of identifying those responsible for wildlife poisoning. All this points to the importance of further communication and raising the awareness of citizens about endangered species, problems of wildlife poisoning, referrals to relevant institutions and government officials who have a significant role in solving these problems, as well as in emphasizing the importance of the contribution of each individual to reducing wildlife poisoning.

The key motives behind the poisoning of wild animals are protection of pastures and livestock from wild animals and protection from pests, implying the need for improving existing measures for the protection of economic goods (Figure 21).

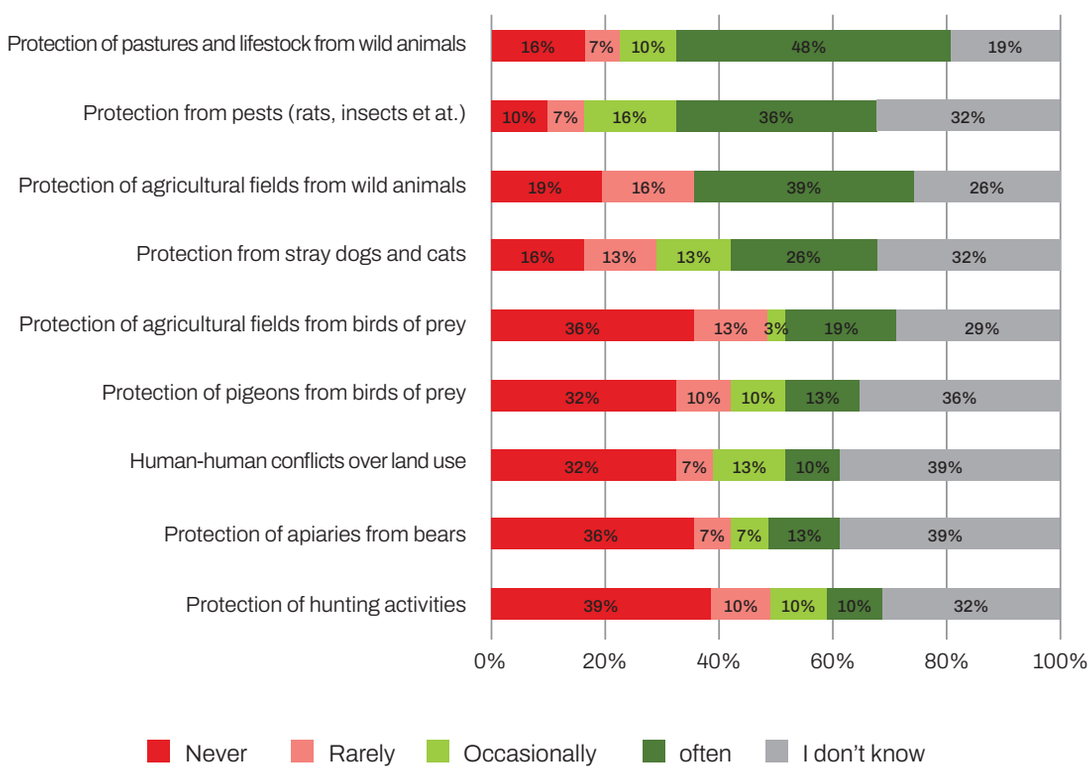


Figure 21. Perceived motives behind wildlife poisoning in North Macedonia

About two-thirds of respondents claim they knew at least one poisoning incident with animals in the past 10 years. These were mostly the intentional cases of poisoning inside the settlements and inhabited areas (67%), but intentional poisoning cases outside of settlements because of conflicts with animals cannot be overlooked either (48%). Also, 80% of respondents in North Macedonia claim that they encountered incidents in terms of pet and hunting or guard dog poisonings in their households or community.

Southwest and Western Macedonia are perceived as regions in this country where the poisoning of wild species most often occurs (16% both), while around 40% of respondents claim not knowing what the key "hot spot" areas are.

Respondents, in general, agree that different measures should be undertaken in order to reduce wildlife poisoning and protect endangered species. About two-thirds of them consider necessary setting up additional supplementary feeding sites for vultures and increasing administrative fines for cases of wildlife poisoning, better information and more intense public campaigns about wildlife poisoning, and financial compensation to livestock breeders and farmers for the damages caused by wild animals. Half of the respondents believe that wildlife poisoning investigations are an important part of police work.

Campaigns related to raising awareness of the negative consequences of wildlife poisoning should primarily be aimed at citizens in general (32%), as well as livestock breeders and game wardens (16% each).

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in North Macedonia

Officials employed in relevant institutions in North Macedonia are well informed about vulture species inhabiting their country. They are familiar that Griffon Vulture and Egyptian Vulture are present and breed on the territory of the country.

Wildlife poisoning and extensive use of legal toxic compounds (pesticides, insecticides, rodenticides) are perceived as the key threats to the vulture populations in North Macedonia (by around half of the officials). Wildlife poisoning is considered to be both accidental and intentional, by misuse of legal poisoning substances such as pesticides or insecticides or by using illegal black-market poisons. On the other hand, poisoning of vultures is mostly perceived as unintentional secondary poisoning by consuming poisoned animals or poison baits intended for other animals.

The key target groups responsible for wildlife poisoning are identified as livestock breeders, hunters and individuals who intentionally kill animals out of aggressive impulses. These groups mostly resort to wildlife poisoning to protect the pastures, agricultural land and livestock from wild animals and birds of prey, to protect hunting grounds, and as a protection from pests, stray cats and dogs.

Officials are not well informed about the regions of North Macedonia where wildlife poisoning most frequently occurs. They most often mention Eastern and Central Macedonia (around one third of respondents) as affected areas.

In terms of legislation and legal processing intended to sanction poisoning incidents, representatives for the governmental institutions emphasize *inadequate law enforcement* (even though they perceive the legal framework for punishing the practice of poisoning animals as good), *lack of coordination among relevant institutions*, *low penalties for wildlife poisoning* and *sporadic imposing of fines* (i.e. under the Hunting Act). They however mostly trust public prosecutors and their level of education for managing incidents related to the poisoning of wild animals.

Considering sanctions for various unlawful actions damaging to animals and the environment, majority of officials endorse severe punishments for all forms of mass and non-discriminative killing of animals (trapping, poisoning,

explosives, etc.), as well as increase of fines for every type of poaching or illegal shooting. They also acknowledge the need for treating the possession of poison baits as a separate offense, regardless of whether it has been proven that an animal was killed and believe that the rangers in protected areas should have the authority to arrest perpetrators, if they are caught in the act. Similarly, majority of them would advocate imprisonment sentences for poisoning of animals as opposed to only administrative (financial) sentences.

The majority of representatives from relevant institutions in North Macedonia are not informed about the existence of National action plan for combating wildlife poisoning, a protocol defining procedures and jurisdictions for investigating wildlife poisoning and a database for poisoning incidents of birds. They also caution of inadequate cooperation between governmental institutions and civil society organizations in collecting data about poisoning incidents, which is in line with the perception that lack of coordination between relevant institutions and organizations is a bigger problem than the lack of resources.

Among the key aggravating circumstances and obstacles for prevention and sanctioning of wildlife poisoning they highlight the difficulties with evidence procedures in court, and lack of control over the prescribed use of legal poisons, such as pesticides, rodenticides, etc.

Considering the role of the Police in investigating wildlife poisoning incidents employees of relevant governmental institutions recognize the complexity of the investigations, assessing at the same time the capacities of the police as inadequate in terms of human capacities and in terms of education and training of police forces. Majority of officials believe that the Police should be strengthened by introducing of additional forces (people) in the field for timely detection of poisoning incidents and to deal more effectively with the situation where most incidents occur in remote locations (posing a serious barrier for identifying of the perpetrators). Strengthening would also imply introduction of specialized police units for environmental crime, including wildlife poisoning, and introduction of specialized canine units for detecting poisonous substances. They are however uncertain or divided in opinion about the level of equipment of the police for investigating wildlife poisoning and the need for expensive and sophisticated technology.

All respondents state that toxicological analyzes are necessary in police investigations of wildlife poisoning, but that their expensiveness also poses significant barrier to effective investigations. In addition, almost all respondents recognize the necessity for the records of the sales of legal poisoning substances.

Two-thirds of respondents believe that there is a necessity for additional efforts to change the attitude of the police towards a more serious understanding of the need to investigate wildlife poisoning. An additional obstacle in the work of the police is the failure to report cases of poisoning to the police force, which should be the responsibility of veterinarians and hunters, but also the general population (every person). However, most officials believe that the lack of information to whom incidents of animal poisoning should be reported is an important impediment.

Considering measures for preventing wildlife poisoning, almost all institutional employees believe that further raising of awareness among citizens in general, livestock breeders and game wardens, imposing a stricter control of the sales of legal poisoning substances, creating additional supplementary feeding sites for vultures and better protection of population of wild ungulates are the key preventive measures that can help reduce wildlife poisoning.

The results of the research indicate a developed environmental consciousness among officials in North Macedonia. They understand that plants and animals have an equal right to exist as humans, and that the natural balance in a closed system such as the Earth, with very limited space and resources, is very delicate and easily disturbed. Also, optimism for future

actions exists in the beliefs of two thirds of respondents who doubt that humans are destined to rule over the rest of nature.

Conclusions

The practice of wildlife poisoning during the last 20 years in North Macedonia had the worst effects on populations of vultures inhabiting the country. Griffon Vultures are by far affected the worst by poisoning, appearing in over 70% of all recorded incidents. Up to 125 individuals perished from this illegal practice from 2000 to 2020, making it evident that it represents the most important threat for the dwindling national population, and one of the biggest obstacles for their recovery in the country. Circumstances are similar for the Egyptian Vulture as well. Although only 4 individuals were recorded to have perished from poisoning, it is still a heavy blow to the small and decreasing national population. Conflicts with mammalian predators, mainly wolves and lately jackals, which inflict damages to livestock are the main reason why people in North Macedonia resort to poisoning. Only 7 wild species have been recorded as victims of potential poisoning within 30 separate incidents, which likely indicates that only incidents with those large and more emblematic species, such as vultures, eagles, wolves, and bears, which are usually of higher conservation concern, are mainly reported to the authorities and investigated. Therefore, it would be recommendable that further efforts are invested into researching the full scope of illegal poisoning and its effects on other species in North Macedonia. Additionally, awareness raising activities about the damaging effects of wildlife poisoning on the environment and human health, and especially about the importance of reporting potential poisoning events to the relevant authorities should be implemented on a larger scale in rural areas of the country.

Currently the biggest gap in the management of poisoning incidents is the lack of a national toxicological laboratory which would conduct forensic toxicological analyses on wild animals. Therefore, this should be one of the priorities to resolve within future anti-poisoning initiatives in North Macedonia

Wildlife poisoning is perceived to be the most important factor endangering vulture populations in North Macedonia by inhabitants of rural areas. They believe that the poisoning of wild animals is the result of intentional actions, mostly by using illegal poisons from the black market, and in a smaller percentage by misuse of legal poisoning substances. The groups that are recognized as mainly accountable for wildlife poisoning are livestock breeders and individuals who deliberately poison animals simply because they like killing things. The key motives behind wildlife poisoning are perceived to be protection of pastures and livestock from wild animals and protection from pests, implying the need for improving existing measures for the protection of economic goods derived from agriculture.

SERBIA

Introduction

Poisoning and the use of poison baits was identified as the main culprit behind the disappearance and decline of vulture populations in Serbia from the late 19th to the early 21st century, but poisoning incidents were poorly documented and investigated by the relevant authorities. Vultures and other avian scavengers were most often recorded as victims of poisoning events, being collateral damage of poison intended for some other species regarded as vermin, while birds of prey are common victims of intentional and non-intentional poisoning.

Since the beginning of the 21st century, poisoning and suspected poisoning events in Serbia have been better documented and recorded by both responsible governmental institutions and relevant national CSOs. Bird Protection and Study Society of Serbia (BPSSS) has compiled and analyzed all available data relevant to illegal killing or harming of birds, including poisoning, within the Report on illegal shooting, poisoning, trapping, possessing and trade of wild birds in the Republic of Serbia for the period 2000-2017 (Ružić *et al* 2017), making this data publicly available. Excessive and inadequate use of legal, but also illegally sold pesticides like *Furadane* (Carbofuran) and *Kreozane* is still a common practice in the country, and intentional use of poison baits, as well as misuse of these toxic compounds in agriculture continues to take its toll on wildlife.

Placement of poison baits in the environment with the goal of reducing the population numbers of various mammalian predators, primarily jackals, wolves, foxes and feral dogs is highlighted in the Red book of fauna of Serbia as one of the main factors that negatively affects many birds of prey, causing the greatest damages to populations of eagles (White-tailed Eagle, Golden Eagle) and vultures. Although the use of poison baits is strictly prohibited by law in Serbia, this practice still endures, especially in commercial hunting areas and/or their vicinity, and avian scavengers are regular casualties, either directly by consuming poison baits or indirectly by eating other poisoned, dead animals. In addition, inexpert placement of poison baits, as a measure of population control for rodents in agriculture and forestry, takes a great toll on wild birds that primarily feed on these animals.

Historical perspective

Wildlife poisoning was a deeply rooted practice in Serbia, and its effects on many species have been well documented, especially on vultures, being one of the most common victims of poisoning events in the past. First cases related to the use of poison for eliminating wildlife in Serbia were recorded during the end of the 19th and beginning of the 20th century in Vojvodina and some parts of Eastern Serbia, when *Strychnine* was used for culling wolfs. A period of massive organized, government sponsored legal poisoning actions against wolves and other carnivore populations followed. Poisoning actions were carried out throughout the country after the II World War, during the period 1947-1976, which led to massive poisoning and disappearance of Griffon Vultures and other vulture species in Serbia, similarly to other countries in the region (Grubač 1998, 2000). Apart from strychnine, *Hydrogen cyanide*, was also commonly used. Results of these actions were obvious to measure with the catastrophic decline, range constriction and complete disappearance of vultures and other scavenger species from the country.

Poisoning of wolves and other mammalian predators was the main reason for extinction of the Griffon Vulture from the majority of its former breeding range in Serbia (Marinković 1999, Grubač 2000). It is estimated that around 700 vultures were poisoned in Serbia during poisoning actions in 1959 (Mardešić & Dugački in Marinković, 1999). Since 1975 the poisoning of wolves and other carnivores was officially made illegal with the changes to the national legislation. By then the local communities, especially in rural areas became accustomed to the use of poison and poison baits to resolve conflicts with wildlife and the practice, although significantly less frequent than in the past, is still very much present and causes significant losses to populations of many species. Since 1980 the illegal practice of poisoning of stray dogs, wolves and other wildlife was continued and caused mortality of numerous Griffon Vultures and other avian scavengers.

Current situation in the country

Wildlife poisoning is still very much present and a well-documented practice, especially those poisoning events that cause mortality of birds, in numerous regions in Serbia. Poisoning events recorded since 2000 until the end of 2020 in Serbia occurred mostly in the vicinity of commercial hunting grounds and on outskirts of rural areas. Relevant governmental authorities keep records of all wildlife poisoning cases that were investigated and prosecuted, while national non-governmental nature conservation organizations remain vigilant in documenting all poisoning and presumably poisoning events that occur and mortality induced by it. BPSSS has established a Bird Crime Task Force (BCTF) for several years which works actively at detecting and reporting all incidents associated to illegal killing and harming of wild birds, both to the relevant authorities and general public. Also, they have developed a database for keeping records of individual poisoning incidents, their associated legal proceedings and penal administrations, which makes analysis of the scope and severity drivers and stakeholders associated with wildlife poisoning possible.

According to the available data, during this 20-year period a total of 293 poisoning and probable poisoning events have been recorded. Based on the analyzed data wildlife poisoning in Serbia can be mostly attributed to:

Intentional poisoning with poison baits:

Poison baits discovered are very diverse, and they range from carcasses of entire animals (usually sheep, pigs, goats, but also ducks, geese, feral pigeons, dogs) laced with a toxic substance, to small pieces of meat, boiled eggs laced with poison. A few poisoning events have been documented where fish laced with poison have been used as baits. Poison baits are used to eliminate any kind of undesirable wild and domestic animals that cause or might inflict damages to human activities mainly in rural areas. Although the motives behind most documented poisoning events remain unknown (70,1%), from those events that have been better investigated we can see that the main driver behind the use of poison baits in Serbia are conflicts with predators (14,1% of total registered poisoning events), mainly jackals and foxes, followed by conflicts with stray dogs (5.5% of total registered poisoning events) and conflicts with birds of prey (Figure 22). Intentional poisoning of birds of prey is associated with conflicts that pigeon fanciers have with birds of prey and the damages they can inflict to racing pigeons. Poison is usually smeared over live pigeons which are then released in the vicinity of nests of breeding birds during the rearing period, increasing the chances that the poisoned food also reaches the clutch. Goshawks, Peregrine and Saker falcons are the primary targets for this type of poisoning. These incidents are also frequent during winter period, when wintering birds from other populations arrive and the number of conflicts with pigeon fanciers increase.

Misuse of phytosanitary products in agriculture:

Misuse of pesticides and other toxic compounds in agriculture is a common cause of mortality for many species in Serbia, and it is responsible for 7,9% of all documented poisoning events in the country. There are two main types that can be distinguished based on the documented poisoning events so far. Unintentional poisoning due to inadequate place-

ment of poison baits for rodents (baits are placed outside of rodent holes, on the surface of agricultural fields) is a common occurrence. Baits for rodents usually consist of corn seeds threated with rodenticides or other toxic compounds. Other type of poisoning related to the misuse of phytosanitary products is intentional poisoning, where poison baits, mostly corn seeds treated with Carbofuran, are used to eliminate various undesirable animals, such as Corvids, pheasants, feral pigeons, wild boars and badgers. These baits are usually placed on agricultural fields, but also within rural and urban settlements.

Forensic toxicological analysis has been conducted in 15% of documented poisoning events that occurred from 2000-2020. Most available records relate to poisoning events that cause mortality of vulture, eagles and similar emblematic species which are of a higher conservation concern. Generally, incidents with these species are more often reported to the authorities by citizens, and therefore it is very likely that mortality of many other species caused by poisoning goes unrecorded and unconfirmed. According to the available data, *Carbofuran* is by far the most dominant toxic compound used for wildlife poisoning in Serbia. This banned pesticide has been used in more than 90% of poisoning events. Two types of Carbofuran were documented to have been used for the preparation of poison baits, purple granulated form, and pink liquid form. Other compounds used for poisoning include *Kreozan* (Dinitro-o-cresol), which was registered in 5 poisoning events, while traces of *Arsenic* were discovered in victims of one poisoning event. It is important to note that over 30% of toxicological analysis conducted on potentially poisoned wild animals have been conducted from 2017 onwards, which indicates that relevant authorities in Serbia have invested more efforts in investigating wildlife poisoning incidents, but also national nature conservation organizations, which have a crucial role in monitoring, recording and raising awareness among the general public and other key stakeholders about this conservation issue. First organized efforts towards monitoring and combating wildlife poisoning and other bird crime related issues in the country were made by BPSSS in 2014, with the establishment of their BCTF within the organization. Since then, annual surveys have been conducted in the northern part of the country (Vojvodina Province) during winter period when wildlife poisoning most frequently occurs. However, it is important to note that many poisoning cases reported to the relevant authorities by BPSSS are based on information received from concerned citizens.

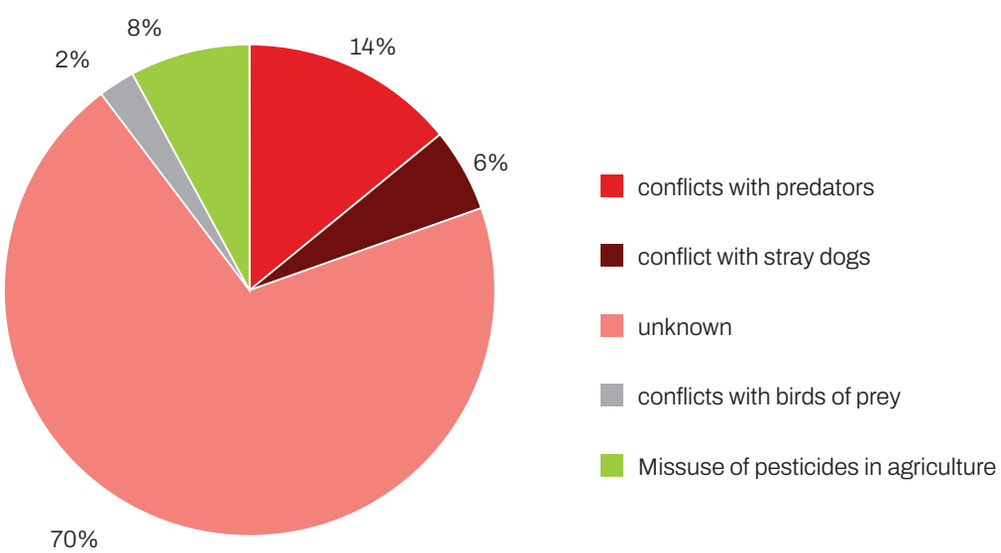


Figure 22. Motives behind wildlife poisoning in Serbia

Wildlife poisoning in Serbia caused the mortality of 51 species during this period. According to the available data, this practice had the worst effects on birds of prey. The most common victim of poisoning is the Common Buzzard, recorded in 88 poisoning events with a total of 246 individuals found poisoned or presumably poisoned (Figure 23). The second most common victim is the White-tailed Eagle, recorded in 73 poisoning events with a total of 109 individuals, followed by Marsh Harrier, recorded in 29 poisoning events with 85 individuals found poisoned or presumably poisoned.

Other recorded casualties include Goshawk, Sparrowhawk, Peregrine Falcon, Red-footed Falcon, Common Kestrel, Black Kite, Red Kite, Imperial Eagle, Hen Harrier, Montagu's Harries, Rough-legged Buzzard, Long-legged Buzzard, Graylag goose, Grey Herron, Great Egret, Long-eared Owl, Eagle Owl, Little Owl, Tawny Owl, Ural Owl, Jackdaw, Common wood-pigeon, Common Crane, Griffon Vulture, Great Bustard, House Sparrow, Tree Sparrow, Turtle Dove, Collared Dove, Song Thrush, Common Starling, Roe deer, Stone marten, Wild boar, Badger.

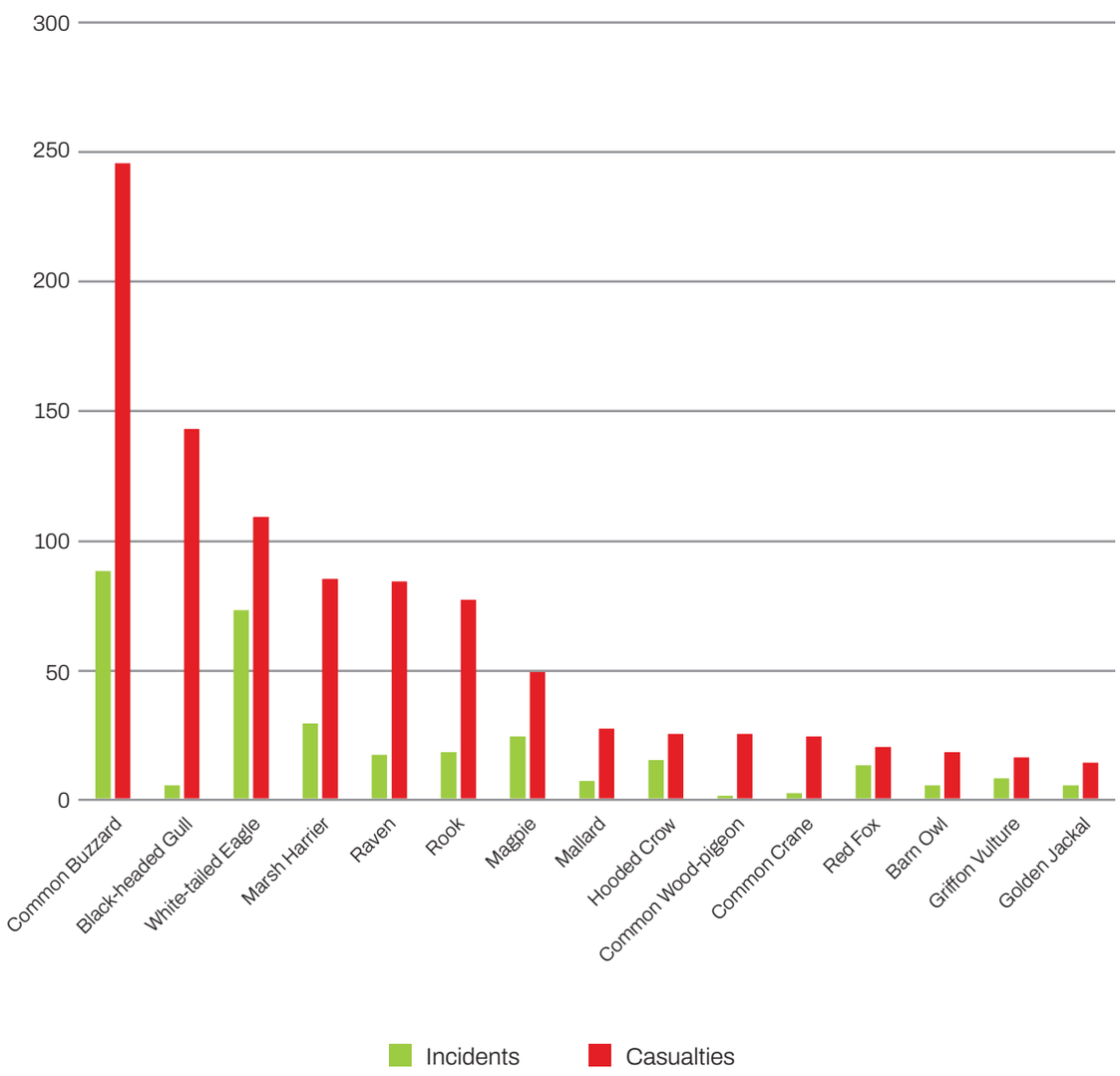


Figure 23. Common victims of poisoning in Serbia

The last known probable event of vulture poisoning (6 poisoned Griffon Vultures) in the country was recorded in 2008 in Trešnjica gorge, near the breeding colony of the species. Governmental engagement in preservation of the last breeding colonies of Griffon Vulture in Serbia which were facing extinction due to illegal wildlife poisoning during the 80s and 90s was crucial for the survival of the species. Special nature reserves were created, providing safe food within supplementary feeding stations, public awareness campaigns and monitoring has been conducted by both governmental and CSO sector, which greatly contributed to eliminating poison bait use in the region of the country where vultures were still present. Additionally, depopulation and the consequent reduction in population of livestock reduced the conflicts with wild predators, and with it the use of poison for resolving those conflicts. However, as poisoning remains a common practice in many other regions in Serbia, it still represents potentially the greatest threat for the populations of these avian scavengers in the country.

Available data about wildlife poisoning from Serbia indicates that this practice is still very common, showing clear signs of increase during this 20-year period. This annual increase in the number of recorded poisoning and presumable poisoning events can mostly be attributed to the growing investment of efforts by the BCTF in combating this illegal practice, ranging from raising awareness about this important conservation issue among general public, enforcement agencies and other relevant authorities to active search for poison baits and potential poisoning events in the field, especially in those areas where this practice is more common. This resulted in a significant increase of alerts and reports from citizens over the years about potential poisoning incidents both to the relevant authorities and BPSSS. The significant decline in recorded potential poisoning events in 2019 may be attributed to an overall reduction of activities in the field from many relevant stakeholders due to the outbreak of the Covid19 pandemic, but this can only be validated with new data in the years to come.

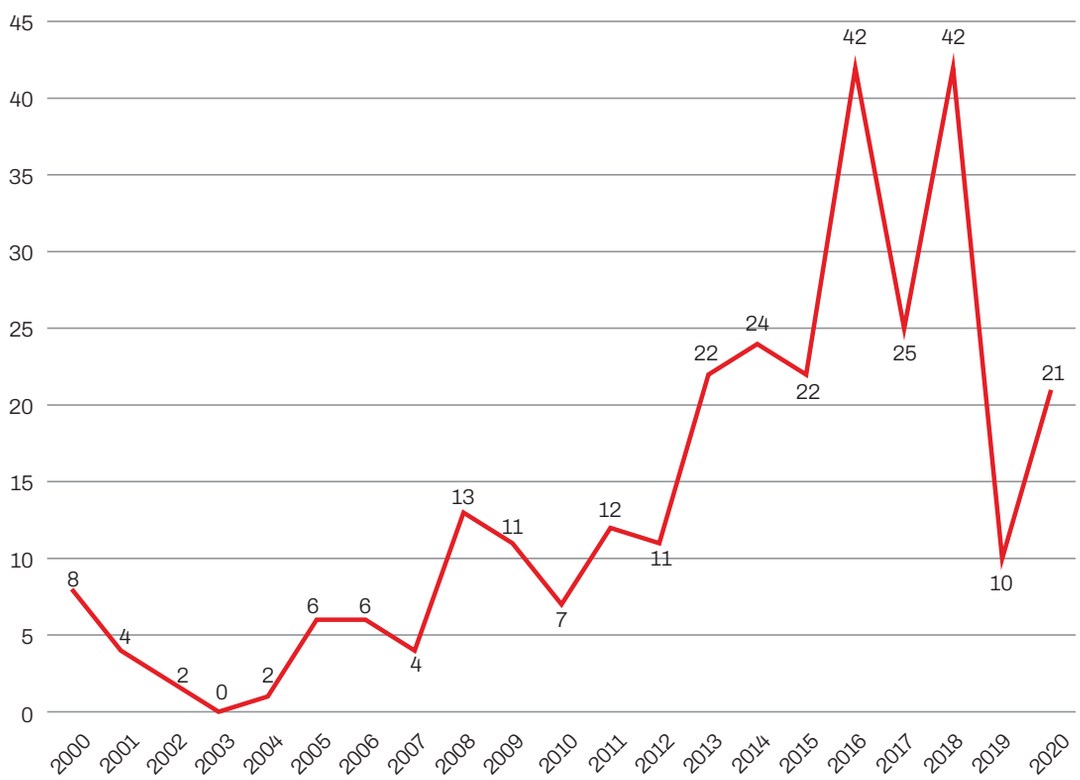
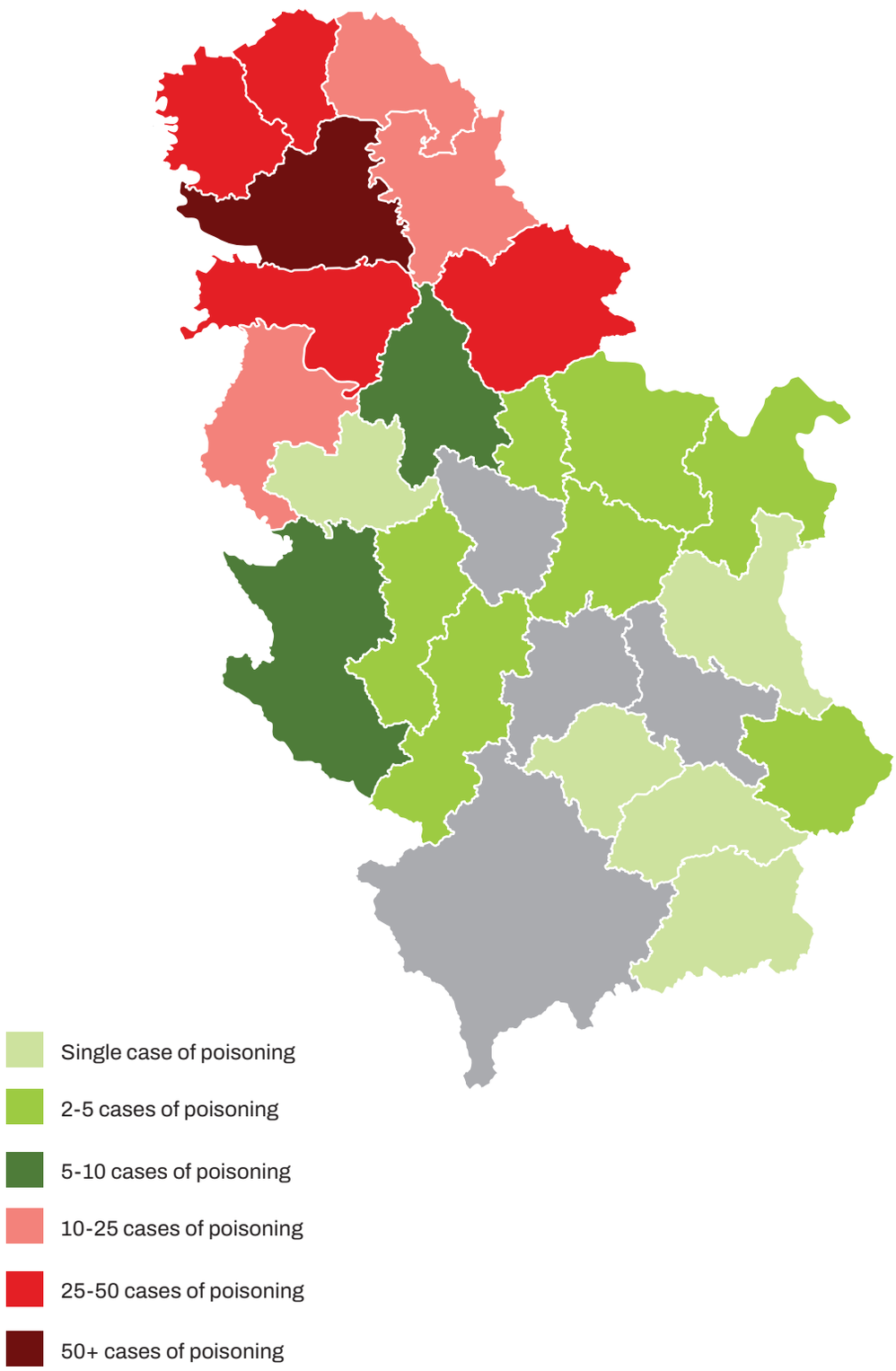


Figure 24. Number of poisoning events in Serbia within the research period



Map 8. Distribution of poisoning events by regions in Serbia during 2000-2020.

The great majority (83%) of all recorded poisoning incidents in Serbia during this period originate from the region of Vojvodina. Such spatial distribution of poisoning and potential poisoning events is somewhat biased and represents primarily the result of intensive field work that BPSSS has conducted in the region towards detection of potential poisoning events, where they are based, and where most of their members, volunteers and supporters are located. The reality of wildlife poisoning is that if one invests more time and effort in looking for wildlife poisoning, the more potential poisoning events will be recorded. Therefore, it is expected that the region of Vojvodina would have the highest concentration of poisoning incidents compared to the rest of the country, where very few efforts are invested in detection and prevention of poisoning. The main driver of poison use in this region of Serbia are conflicts with jackals and stray dogs which can often cause damages to game animals in commercial hunting areas, and to livestock in rural areas. Additionally, Vojvodina is the most intensively farmed region in Serbia which is why cases of misuse of pesticides and other phytosanitary products are mostly recorded here as well. Therefore, it is highly probable that the current distribution of poisoning events does not reflect the realistic situation and scope of the illegal use of poison in the whole country.

Reducing the threat that wildlife poisoning poses to many wild species in Serbia primarily depends on much stricter enforcement of existing legislation by relevant governmental authorities, especially legislation related to the control of production, trade and application of pesticides and similar chemical compounds used in agriculture. Banned substances are relatively available on the existing black market and were even recorded to have been advertised through social networks such as Facebook, various internet adds and freely sold on local fairs and markets in rural areas.

There are uncertainties with responsibilities and jurisdiction of relevant institutions regarding prevention, control and investigation of poisoning incidents. Therefore, more efficient and clear-cut legal protocols for describing responsibilities in reporting, investigating, and processing cases of wildlife poisoning need to be developed. Also, communication and information change between responsible institutions and sectors related to jurisdiction, responsibilities need to be enhanced. Apart from this, the development of organized systems and protocols related to reporting, collecting and disposal of dead animals would also be very useful in reducing the amount of unsafe food available for scavengers, thus reducing the probability of poisoning to occur.

According to the data we were able to obtain, there is only one poisoning incident that occurred in the last 20 years where the culprit was successfully identified, prosecuted and sentenced, while in several other incidents where protected wildlife species were poisoned, charges were brought up against unknown perpetrators. The case dates to April 2020 when 5 dead Common Cranes were found poisoned in an agricultural field from corn seeds laced with Carbofuran, which were inadequately set as baits for rodents.

Legal framework

Serbia has good national legislation in place related to the use of poison substances in the natural environment, where wildlife poisoning is clearly defined as an illegal activity, punishable under Criminal law.

Existing national legislation relevant to wildlife poisoning in Serbia:

- **Law on nature protection:** Article 79. prohibits the use of certain means of catching and killing wild species animals endangering and harassing their populations and/or habitats, disrupts their well-being and can cause their local disappearance, which include the use of poison or tranquilizing baits.
- **Law on hunting and game animals:** Article 22. prohibits the use of phytosanitary substances and other chemical substances in quantities and dosages that can cause damages to game animals, as well as intentional poisoning of game animals.
- **Criminal law:** According to article 269, whoever, by violating these regulations,

kills, hurts, tortures or otherwise abuses animals, shall be punished by a fine or imprisonment not exceeding one year. Additionally, according to article 276, whoever hunts game animals whose hunting is forbidden or who hunts without a special permit a particular game animal for which hunting requires such a permit or who hunts in a manner or means that inflicts mass destruction of game animals, shall be punished by imprisonment for a term not exceeding three years.

Relevant international treaties and conventions that Serbia is parties to:

Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979): Ratified with the Law on Ratification ("Official Gazette of the Republic of Macedonia no. 49/97) and entered into force in 1999. It prohibits the use of any non-selective means of capture or killing as well as of means that may induce local extinction or heavily disturb the populations of a species, namely means listed in Annex IV", while in Annex IV of the same Law, which is entitled "Prohibited means and methods of hunting and other forms of exploitation", "Poisons and poison or tranquilizing baits" are included.

Perception of the illegal practice of wildlife poisoning in local communities in Serbia

Surveys in Serbia were carried out in communities of Svilojevo and Pešter, and the sample included 45 respondents in total. Respondent from the local communities in Serbia are generally well informed about the presence of Griffon Vultures in their country. However, they are inadequately informed when comes to the presence of the other vulture species and whether they breed in Serbia. They are also not sufficiently informed about the issue of wildlife poisoning in Serbia and its impact on wildlife.

Wildlife poisoning is perceived as the biggest threat to the vulture population in Serbia. However, awareness needs to be additionally raised and become more widespread since only a third of respondents (29%) perceive it as the greatest danger that vultures face. Poisoning is followed by electrocution as a result of collision with electric cables (18%). Lack of food and disturbance are both seen as the third most important threat to vultures in Serbia (13% each), this is followed by poaching (11%).

Vultures in Serbia are considered to be victims of unintentional poisoning, as they are perceived to perish due to eating poisoned animals, or poison baits intended for other animals. Only a small number of respondents believe that vultures are the targets of intentional poisoning (7%).

Nearly 70% of respondents acknowledge the important role that vultures have in the ecosystem and 60% of them believe that their existence is important for humans as well. These findings indicate a prevailing positive attitude towards vultures and their role in the environment. In line with this are the respondents' general attitudes towards nature – they believe that the Earth has limited space and resources, that plants and animals have the same right to exist as humans do and that the balance of nature is very delicate and easy to disturb.

Further informing about the risks and consequences of intentional poisoning of animals is necessary, as about one third of respondents believe that governments should organize controlled campaigns of poisoning as a means to control populations of feral animals and pests, and around one quarter of them find that occasionally poisoning of wildlife is justified. However, it should be noted that respondents are divided when it comes to this question. 40% of them believe that it is not justified and one third is undecided. In addition to this, they are similarly divided when it comes to whether humans have the right to rule over nature - 36% of them believe that it is the destiny of humans to rule over nature while 40 % consider this not to be true.

A little less than 60% of respondents from the targeted local communities in Serbia believe

that wildlife poisoning happens intentionally – approximately in equal measure either through the abuse of legal poisoning substances such as pesticides and insecticides, or through the intentional usage of illegal poisoning substances from the black market. About one quarter of respondents are of the opinion that wildlife poisoning most often happens accidentally, through the misuse of legal poisoning substances out of negligence or ignorance.

Respondents from local communities in Serbia (Figure 25) perceive the following groups to be the most responsible for wildlife poisoning: farmers (62%), livestock breeders (49%) and hunters (34%). When it comes to the responsibility for reporting information/knowledge about wildlife poisoning to the police, the majority of respondents (71%) believe that this should be the responsibility of all citizens in addition to hunters and veterinarians.

For the majority (60%) the most important barrier for reporting incidents of wildlife poisoning is avoiding coming into conflict with members of their community. Nearly 40% of respondents state that they would report the incident only if they knew that there would be no negative consequences for them, 13% of the respondents would not report it and nearly 10% are undecided. In addition to this, there appears to be somewhat of a diffusion of responsibility, as one fifth of the respondents believe that that are enough people who are already dealing with the issue of wildlife poisoning and their involvement is not necessary.

Another key barrier is the perception that citizens do not know who to report these incidents to – nearly 70% of respondents share this attitude and on the other side only 10% disagree with this statement. These findings imply that it is necessary to provide citizens in affected communities with important information concerning whom they can report wildlife poisoning cases to, but also to work on shifting public opinions in the direction of normalizing the reporting of these cases and additionally empowering citizens to participate in the identification and prevention of poisoning incidents.

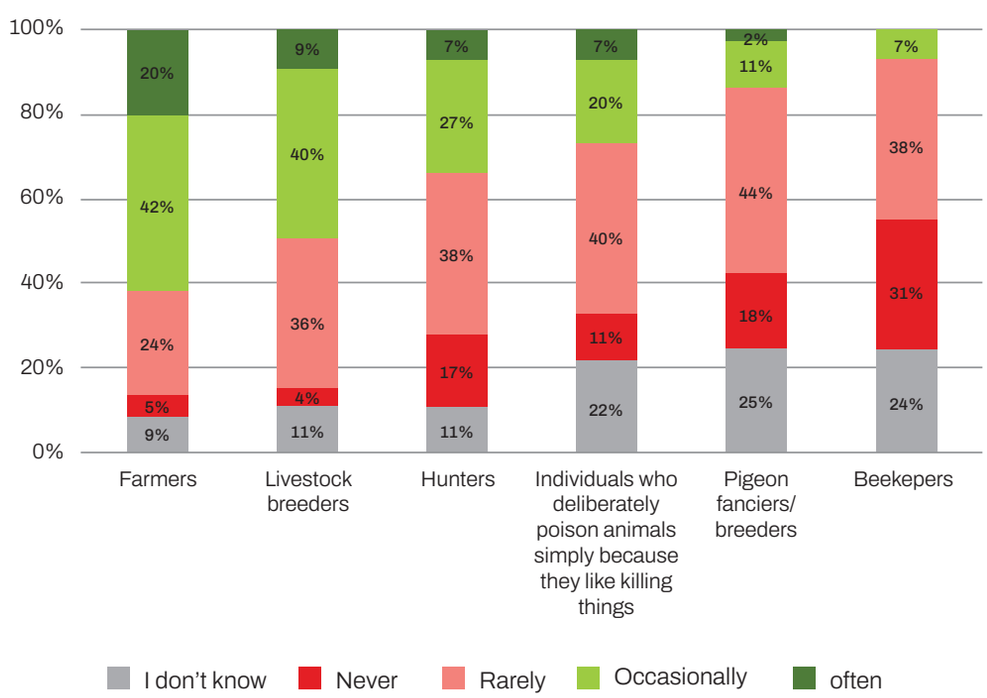


Figure 25. Perception of groups responsible for wildlife poisoning in Serbia

The most frequently highlighted motives for wildlife poisoning are *protection from pests*, (76%), *protection from stray dogs and cats* (51%), *protection of agricultural land, pastures and livestock from wild animals* (27% each). These finding imply that there is a need to raise awareness about alternative solutions to these issues that could be offered and applied with less detrimental effects on the environment (Figure 26).

Around half of the respondents claim to know of at least one case of poisoning in their community/environment in the past ten years. The majority of these are cases of intentional poisoning. Nearly 70% of them claim to have encountered cases of intentional poisoning in settlements, whereas more than one fifth of report encountering incidents when someone intentionally poisoned wild animals outside of settlements. The majority of poisoned animals were pets, followed by bees and guard dogs.

When it comes to regions where poisoning occurs, approximately one third of the sample believes that Vojvodina is the region where poisoning occurs most often. It is followed by East and South Serbia, West Serbia and Šumadija, and Belgrade (11%, 9% and 9%, respectively), which are all identified as problematic areas regarding wildlife poisoning.

Regarding measures for prevention and combating wildlife poisoning, the one that is singled out as the most important is that the state/government should financially compensate the damage to livestock breeders and farmers caused by wild animals (82%). It is closely followed by increasing administrative fines for wildlife poisoning (78%), increased informing of the general public about wildlife poisoning (76%) and stronger control regarding import and trade of legal poisoning substances (67%). Additionally, 44% of respondents consider wildlife poisoning investigations to be important police work.

One third of the sample believes that awareness about the issue of wildlife poisoning needs to be raised among citizens in general. They are followed by farmers (25%), livestock breeders and hunters (9% each).

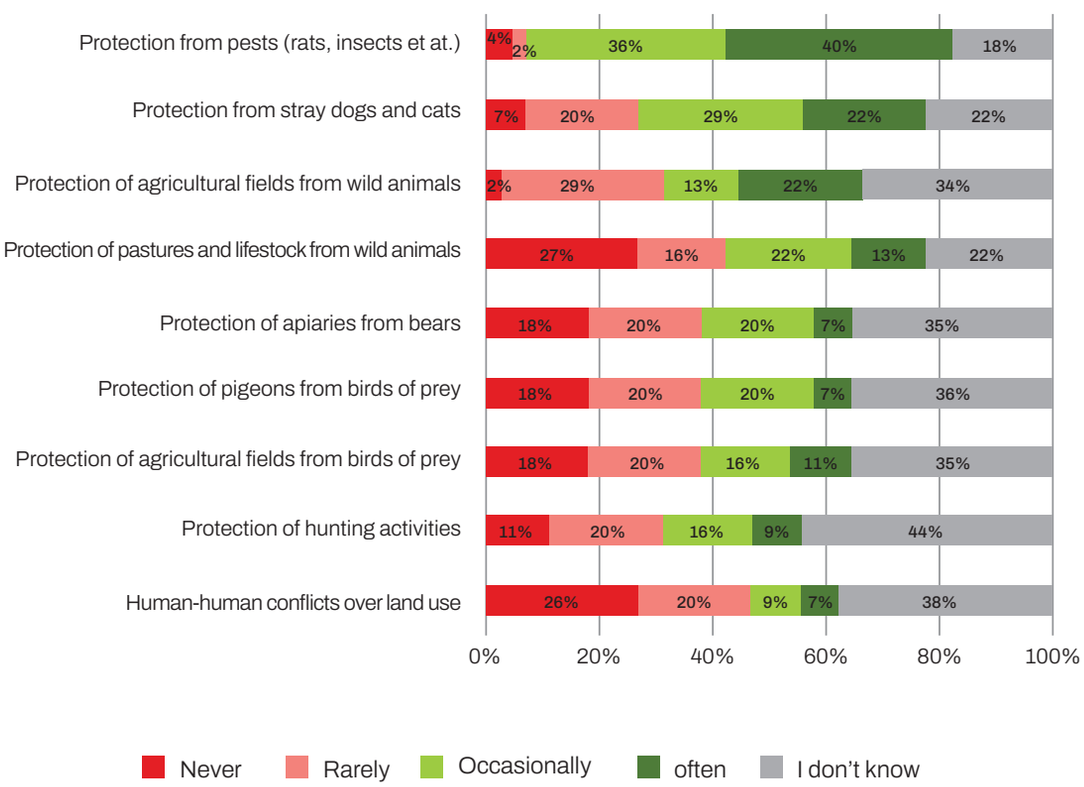


Figure 26. Perceived motives behind wildlife poisoning in Serbia

Perception of the illegal practice of wildlife poisoning within relevant governmental authorities in Serbia

Representatives of relevant governmental institutions in Serbia are well informed about certain species of vultures, such as the presence of the Griffon Vulture in their country. However, there is somewhat of a lack of knowledge when it comes to the conservation status of other species of vultures, as one third of the respondents think that the Egyptian Vulture still breeds in Serbia and a little less than one fifth believe the same for the Cinereous Vulture.

Wildlife poisoning is acknowledged as the most important threat to the existence of vultures in Serbia (by around half of the officials), but the usage of legal toxic compounds (pesticides, insecticides, rodenticides) is also amongst top identified dangers that leads to poisoning of wild animals (approximately every fifth respondent).

While the majority of the respondents believe that the key cause of vulture poisoning is accidental, either through ingestion of poison baits intended for other animals or by eating animals that died of poisoning, opinions of respondents are divided when it comes to the question of whether wildlife poisoning occurs accidentally or intentionally. Close to half of institutions employees believe that wildlife poisoning happens accidentally by misuse of legal poisoning substances and negligence, while the other half believes that wildlife poisoning happens mostly intentionally, by using illegal poisons from the black market or through abuse of legal poisoning substances.

Farmers, and to a lesser extent hunters, but also individuals who deliberately poison animals out of aggressive and destructive impulses are perceived as the most responsible groups for wildlife poisoning. This is partially in line with what respondents consider to be the most important motives for the poisoning of wild animals. Above two thirds of officials from relevant institutions consider *protection from pests* and *agricultural land from wild animals*, *protection of pastures and livestock from wild animals* and *protection from stray dogs and cats* to be the key motives behind wildlife poisoning that should be addressed by joint institutional efforts. Conflicts among people about land use (pastures, hunting areas) should also be legally addressed in this process.

Vojvodina and Western Serbia and Šumadija are the regions of Serbia, that should be paid special attention in the fight for wildlife protection according to the opinion of employees of relevant governmental institutions.

Inadequate enforcement of the laws, low penalties and rare imposing of the fines for wildlife poisoning, inadequate and unclear protocols for police action, complexity of the investigations, difficulties with evidence procedures in court, inadequate education of public prosecutors to handle the incidents related to poisoning of wild animals, lack of control over the prescribed use of legal poisons, such as pesticides, and online black market for banned poisons are all perceived as important aggravating circumstances and obstacles for the prevention and sanctioning of wildlife poisoning in Serbia.

Poor reporting of poisoning events from witnesses is also perceived as an important obstacle, and the responsibility for reporting information about wildlife poisoning to the police is allocated to all members of the population (every person), as well as hunters and veterinarians. This is hindered by perceived risk of altercations and conflicts in local communities that people who report poisoning events face, but also by the lack of information to whom to report animal poisoning incidents to. Therefore, citizens in general, and specifically farmers, are identified as the most important target groups for awareness raising actions.

The respondents are mostly uninformed about the existence of database for poisoning incidents in Serbia, National action plan for combating wildlife poisoning and protocol defining procedures and jurisdictions for investigating wildlife poisoning. Although a few of the respondents claim that they use the data from the existing database for poisoning incidents of birds for carrying out work within their jurisdiction, the small number of officials informed about the database are divided

about the clarity of protocol for documenting poisoning incidents and they mostly agree that the existing database is not adequately used for informing the public and raising their awareness about the problem of wildlife poisoning. At the same time, results of the research indicate the need for improvement of the cooperation between governmental institutions and civil society organizations regarding data collection about poisoning incidents.

Representatives from the relevant governmental institutions in Serbia emphasize the important role of police work in investigation of wildlife poisoning incidents. Several aspects regarding the capacity of the police that need improvement have been identified, from the need to introduce specialized police units for environmental crime, specialized canine units for detecting poisonous substances, to introducing additional agents (police, environmental inspectors, rangers etc.) in the field, training and capacity building for police forces, to the need to involve representatives of civil society organizations in wildlife poisoning investigations. Insufficient education of the police forces for investigating these incidents and lack of coordination among relevant institutions is perceived as a bigger problem than the lack of resources and equipment. Respondents are indecisive and not completely sure about the need for expensive and sophisticated technology in police investigations of wildlife poisoning.

When it comes to measures for preventing wildlife poisoning, respondents are in agreement in recognizing the importance of the following measures: *raising awareness among key stakeholders* (livestock breeders, farmers, hunters, institutions) as well as the *general public*, *imposing a stricter control of the trade of legal poisoning substances* (pesticides, rodenticides, etc.), *financial compensation from the state/government for the damages to livestock breeders and farmers caused by wild animals*, *creating more supplementary feeding sites for vultures, and better protection of wild ungulate populations.*

Respondents are in favour of enforcing the most severe forms of punishment for all forms of mass and non-discriminative killing of animals (trapping, poisoning, explosives et al.), and they believe that higher fines are needed for every type of poaching/illegal shooting. The majority of them also believe that the possession of poison baits should be considered a separate offence, regardless of whether it has been proven that an animal was killed. Officials mostly agree that rangers of protected areas should have the authority to arrest persons who poison animals, if caught in the act, and that the concessionaire should be deprived of the concession if poisoning of wild animals occurs in a commercial hunting area. They also consider that poisoning of animals should not only be a criminal offense if it occurs in a protected area (nature park or national park) and that the sentences should correspondingly include imprisonment (as opposed to solely administrative sentences) for not only affecting the humans but also endangering the animals.

The vast majority of representatives for governmental institutions from Serbia believe that plants and animals have an equal right to exist just like humans and that the natural balance is very delicate and easy to disturb. Majority of respondents also perceive the Earth to be like a spaceship, with very limited space and resources. Close to three fourths of the sample believe that humans aren't destined to rule over the rest of nature.

Conclusions

Poisoning of wildlife continues to be a common occurrence in Serbia, having the worst effect on species who often resort to scavenging as a potential food source, such as the White-tailed Eagle, Common Buzzard and Marsh Harrier, which are the usual victims of poisoning in the country. Unlike all the other countries from the region, wildlife poisoning currently does not appear to be a serious threatening factor for the national vulture population. Incidents with vulture mortality are rarely recorded, and with vulture poisoning even rarer, with the last one being recorded in 2008. However, apart from the existing protected areas which were created primarily for the purpose of protecting the remaining population of Griffon Vultures in Serbia, very little efforts have been invested to assess the scope of wildlife poisoning in the

rest of the country and to determine to what extent it potentially threatens the country's vultures. Therefore, future conservation efforts should focus on investigating the scope of human-wildlife conflicts, especially conflicts with predators, such as wolves and jackals, which often inflict damages to livestock and game animals. These conflicts are currently the biggest known drivers of poison use in Serbia, followed by the misuse of plant protection products in intensively farmed landscapes in the country's northern province.

Conservation efforts invested by CSOs during the last decade into diminishing the threat of wildlife poisoning in Serbia have resulted in better engagement of relevant governmental authorities with this specific type of environmental crime. During the last 5 years, for every third poisoning event toxicological analysis was conducted, which is a significant step forward towards better management of potential poisoning events. Designating additional toxicological laboratories with sufficient capacities for conducting forensic analysis on wildlife would further improve this situation. Additionally, these invested efforts also resulted in somewhat better engagement of relevant law enforcement institutions in Serbia. Although this engagement mainly relates to investigation of incidents which involve mortality of emblematic species which are of a higher conservation concern, such as eagles, it is a significant progress, which resulted in several investigated cases being brought to court. Further specific training of law enforcement agents, public prosecutors and other relevant stakeholders is necessary in order to improve the overall management of poisoning incidents.

Wildlife poisoning is perceived as the biggest threat to the vulture population in Serbia by people from rural areas. The majority of them believes that wildlife poisoning happens intentionally, equally through the abuse of legal poisoning substances such as pesticides and insecticides, or through the intentional use of illegal poisoning substances from the black market. They perceive farmers, livestock breeders and hunters as the groups most responsible for wildlife poisoning in Serbia. The same groups are identified by the representatives of relevant governmental institutions, who believe that wildlife poisoning happens accidentally by misuse of legal poisoning substances and negligence, while the other half believes that wildlife poisoning happens mostly intentionally, by using illegal poisons from the black market or through abuse of legal poisoning substances.

CONCLUSIONS

Status of wildlife poisoning in the Balkan Peninsula

Wildlife poisoning continues to represent one the most dominant threats for many wild species in the Balkan Peninsula. It also affects numerous domestic animals, and because of its common and frequent use in various forms it represents a severe threat to human health as well. The analysis of effects of poisoning on domestic animals was not the subject of this study, although it is important to mention that poisoning events with domestic animals, primarily dogs (hunting, shepherd dogs, stray dogs and pets) are more common, especially in urban environments, and are more frequently reported to the authorities.

The most common type of wildlife poisoning in the Balkan Peninsula is the intentional placement of poison baits for the purpose of killing wild, feral or in some cases domestic animals. Poison baits in the Balkans come in all shapes and sizes, from entire carcasses of dead animals (mostly livestock, but also game animals, poultry), individual body parts, pieces of meat of various sizes, sausages, boiled eggs, fish, honey laced with toxic compounds, and also wax capsules with Cyanide. Presently, the use of poison baits or poisoning of animals in general is illegal in each country of the Balkan Peninsula, but it is a deeply rooted practice, still commonly practiced by people as a quick and relatively affordable method for resolving conflicts with wildlife.

Within the period of 2000-2020 a total of 1048 poisoning and presumable poisoning wildlife poisoning events have been recorded throughout the Balkan Peninsula. More than half (55%) of all events that occurred in the region during this period originate from Greece. The diversity of poison baits and toxic compounds used for poisoning of animals additionally contribute to the perception that this type of environmental crime is indeed much more frequent in Greece than in other countries of the Balkan region. On the other hand, the issue of illegal use of poison baits has been the focus of conservation efforts of national CSOs in Greece for the past 10 years, which have invested significant efforts and resources in documenting this illegal practice compared to other countries. The reality of wildlife poisoning is that if more efforts are invested into research of its scope, more poisoning incidents will be detected. This is true as well for spatial distribution of poisoning incidents, and therefore those areas in which more efforts were invested in monitoring usually show a higher number of poisoning incidents. Therefore, it is highly likely that the current status of wildlife poisoning in the Balkan region and in each country individually, which was the subject of this study, does not reflect the realistic situation and that a great number of potential poisoning events remains unrecorded.

Apart from Greece, high numbers of poisoning incidents can be found in Serbia, where more than a quarter (28%) of all poisoning and presumable wildlife poisoning events that have been recorded in the region originate from. Similar to the situation in Greece, CSOs from Serbia have invested significant efforts in monitoring the phenomenon of wildlife poisoning, although almost exclusively in the northern regions of the country where they have more people on the ground for active and preventive searches for potential poisoning incidents. Other target countries from the region show significantly lower numbers of recorded incidents, which can mostly be attributed to the fact that systematic monitoring and documentation of wildlife poisoning has been conducted primarily in areas that are important for certain species of conservation concern at the national level (vul-

ture species, Imperial Eagles or Saker Falcons). Additionally, apart from Bulgaria, in the remaining countries wildlife poisoning only became a focus of active research and monitoring since 2018.

Data about wildlife poisoning used to produce this study originates from internal databases on CSOs which are active in combating this environmental crime. There are no official databases among relevant governmental institutions from the Balkan countries where information about poisoning and potential poisoning incidents are stored. Most of the relevant institutions store only information about those incidents which were fully investigated by law enforcement officials and that made it to court. Less than 1% of poisoning incidents in the Balkans ever make it to court trials, and even less get officially sanctioned, as charges are usually brought up against unknown perpetrators. All of this indicates that wildlife poisoning is very low on the list of priorities of relevant governmental authorities and that their overall engagement with this type of environmental crime is also minimal.

Based on the available information about poisoning and potential poisoning incidents that occurred from 2000-2020 in the Balkan Peninsula it is evident that the **Griffon Vulture** population inhabiting this region suffered the worst from the illegal practice of wildlife poisoning (Figure 27). These vultures appear as casualties in every fifth poisoning event in the Balkans, and a total of 400 individuals perished within 233 separate poisoning or presumable poisoning incidents. **Common Buzzard** and **Red Fox** closely follow, with 392 individuals within 190 separate incidents and 389 individuals within 141 separate incidents respectively. Other more frequent victims of this illegal practice include **White-tailed Eagle**, which was recorded as a casualty in 75 separate incidents where 111 individuals got poisoned, **Marsh Harrier**, recorded in 31 separate incidents with 89 poisoned individuals and **Eurasian Wolf**, recorded in 40 separate incidents with 75 individuals found poisoned or presumably poisoned.

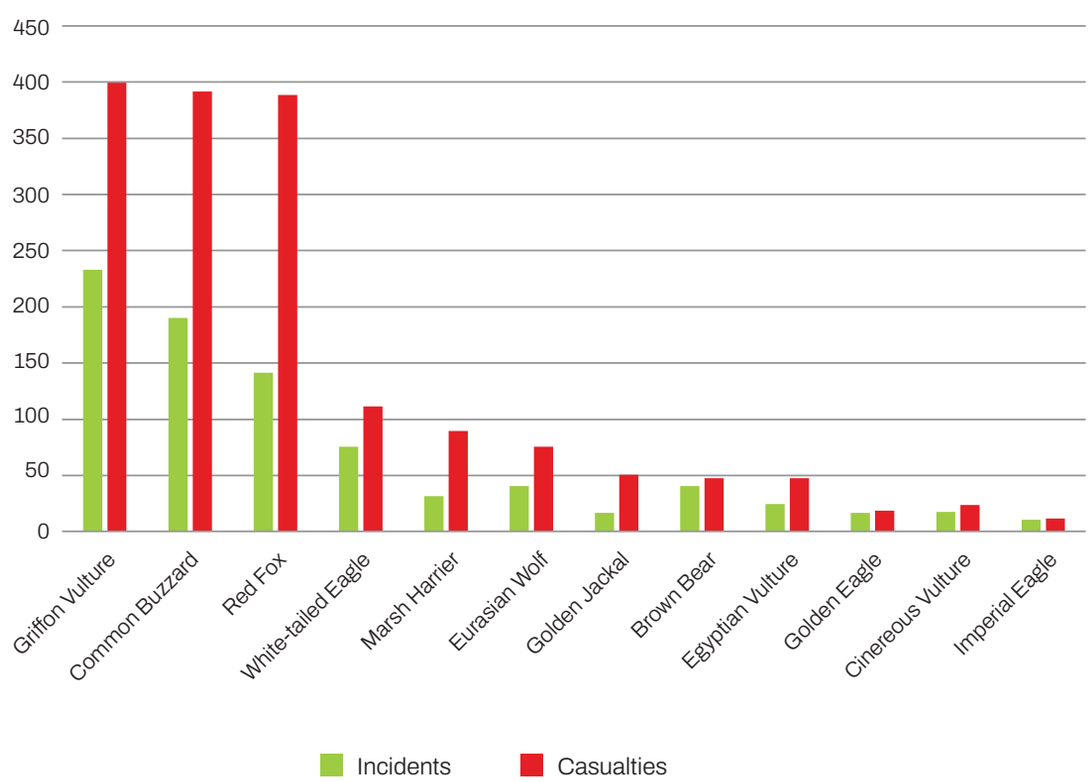


Figure 27. Common victims of wildlife poisoning in the Balkan Peninsula

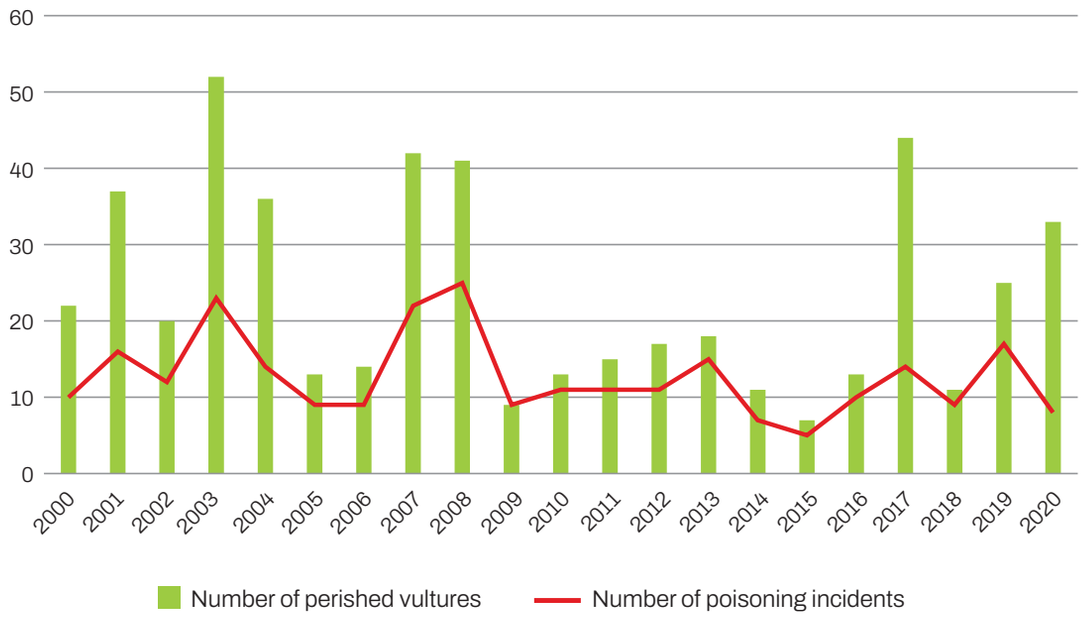


Figure 28. Vulture poisoning in the Balkan Peninsula from 2000-2020

Avian scavengers in general are a group of species which suffers the most from illegal wildlife poisoning, non-more so than vultures, which are recorded as casualties in every forth incident. From the year 2000 to 2020 a total of 468 vultures perished in the Balkan Peninsula, including 47 Egyptian Vultures, 23 Cinereous Vultures and one Bearded Vulture. These data are not estimates, but concrete data obtained from poisoning and presumable poisoning events that occurred in the region, from which we can conclude that an average of 22 vultures are poisoned annually on the Balkan peninsula. If we take into account that approximately only 20 % of poisoning incidents are ever discovered and documented, we can estimate that about 112 vultures are potentially being poisoned annually throughout the Balkans. Such losses exert a heavy toll on the vulture populations of the region. Therefore, it is evident that wildlife poisoning continues to be the single most important threat to vultures in the Balkan Peninsula and current limiting factor for their recovery. This factor has to be taken into account when planning any conservation initiatives regarding vultures, especially re-stocking and reintroduction initiatives.

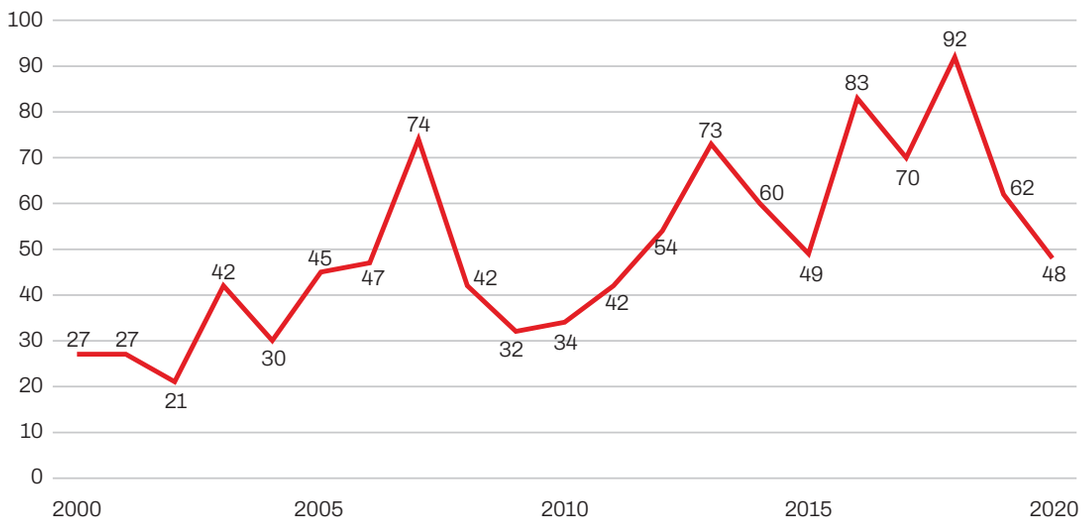


Figure 29. Number of poisoning events in the Balkan Peninsula within the research period

From the data analyzed for the purpose of this study we can conclude that wildlife poisoning generally shows an upward trend within this research period of 20 years, with highest peaks recorded in 2007 and 2018. In 2018 this practice reached its highest value, with 92 separate incidents recorded. This perceived increasing trend could be attributed to greater efforts being invested by national CSOs from the Balkans during the last 5 years in combating this illegal practice primarily through implementation of conservation projects and initiatives aimed on assessing its scope, spatial distribution, and actively combating this threat, which in turn results in more poisoning incidents being recorded. Further systematic monitoring on a regional level is recommended in order to be able to determine the actual trend of wildlife poisoning in the Balkans and the effect of conservation measures implemented in the region.

The steep drop in numbers of recorded poisoning events in the years that followed could be associated with the onset of the Covid19 pandemic and could be attributed to an overall reduction of activities in the field from many relevant stakeholders, but this can only be validated with new data in the years to come.

Motives behind wildlife poisoning in the Balkan Peninsula

Although the motives behind most of these incidents remain undiscovered, the majority of better documented and investigated poisoning events indicate that the main driver of poison use in the region are conflicts with mammalian predators (mainly wolves, foxes, jackals, but also bears, martens) and the damages they cause to livestock practices, agricultural production and to game animals in commercial hunting areas. Conflicts with mammalian predators are responsible for 164 individual poisoning events, which represents 16% of all recorded incidents in the region (Figure 30).

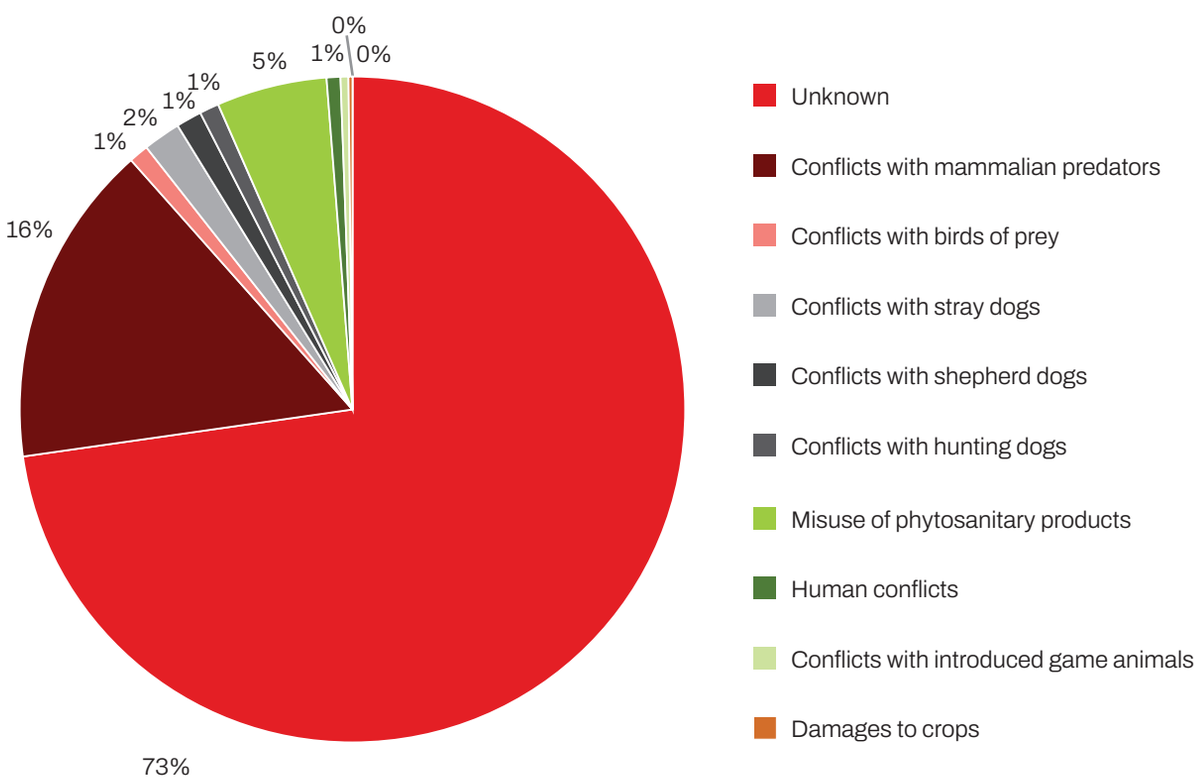


Figure 30. Drivers of wildlife poisoning in the Balkans

Poisons

The most used substances for wildlife poisoning in the Balkan peninsula by far are pesticides from the group of Carbamates, especially ***Carbofuran***, which was detected in almost every second poisoning event (46%) for which forensic toxicological analysis was conducted (Figure 31). This banned pesticide was mostly used to prepare poison baits in Serbia, Croatia, followed by Greece and Bulgaria. The second compound from this group most commonly used for poisoning is ***Methomyl***, detected in every fifth poisoning event 21%), and is mostly used for wildlife poisoning in Greece. The use of these banned substances closely relates with illegal trafficking. These illegal substances are frequently advertised on the internet and occasionally sold publicly on markets in rural areas, indicating that a significant stockpile still exists, and that control of illegal trade of these substances does not represent a priority for relevant governmental enforcement agencies. ***Potassium cyanide*** also has a significant contribution in this practice, being responsible for 11% of the total number of poisoning events. The use of cyanide has so far only been recorded in Greece.

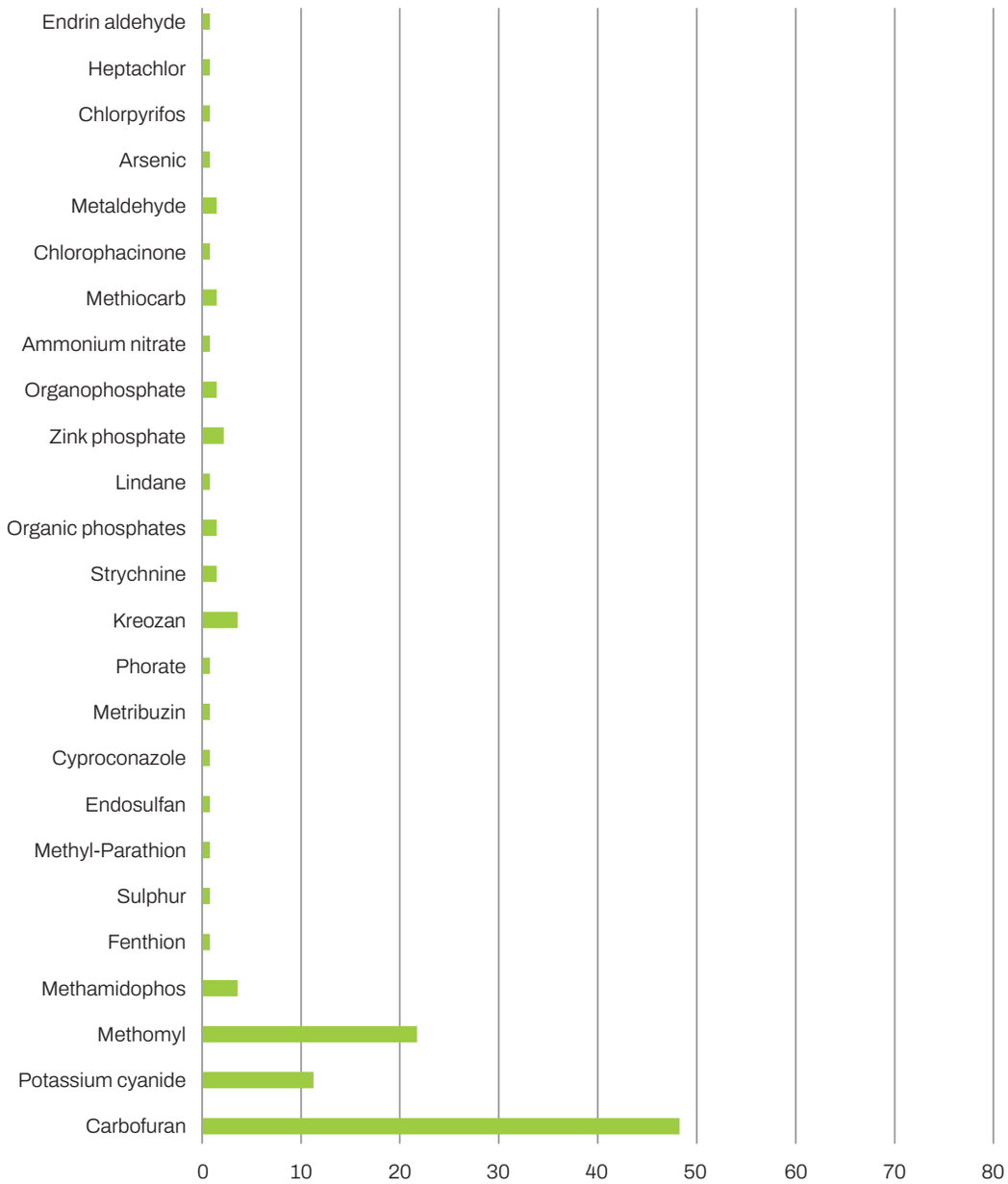


Figure 31. Toxic substances used for wildlife poisoning in the Balkan Peninsula

Why is wildlife poisoning difficult to tackle in the Balkans?

The main problems and difficulties in the struggle to reduce scope and frequency of occurrence of poisoning incidents (and the resulting casualties) in the Balkan Peninsula can mainly be attributed to:

- **Low awareness**

There is an evident lack of knowledge and awareness about the severity of wildlife poisoning and the threat that this type of environmental crime represents not only to wildlife (vultures in particular) and the fact that it is not only a nature conservation issue, but also a serious hazard for human health, and that it requires a multidisciplinary approach and joint efforts by multiple stakeholders in order to combat it. Low awareness is present not only amongst governmental institutions responsible for management of wildlife poisoning incidents, but also general public, which is why in many countries it has a low priority for enforcement agencies, judiciary system and consequently often inadequate penal consequences if any. In Albania for example, wildlife poisoning has just recently (2019) been recognized as a conservation issue and included in relevant national legislation as a prohibited activity.

Continuous awareness raising of general public, but also of governmental authorities is crucial for successful implementation of specific actions for detection of poison baits and poisoned animals in the field. These are the very first steps that need to be taken in order to address this most significant conservation issue for many wild species. Awareness raising actions should focus on highlighting the detrimental effects that this illegal practice has on endangered species and human health, importance of reporting potential poisoning events to the right authorities, deterrent measures and legal consequences that perpetrators face if they resort to this indiscriminate method of killing animals, and alternatives to the use of poison for sorting out conflicts with wildlife. From the survey about the perception of wildlife poisoning in rural communities in the different Balkan countries, it is evident that citizens are mostly unaware or uncertain to whom they should report potential poisoning incidents to. Additionally, it is evident that the majority of common citizens are reluctant to report potential poisoning incident for fear of conflicts within their own communities.

Even though this is not a problem affecting only the vulture guild, it is evident that vultures are perfect indicators for wildlife poisoning in the natural environment, especially Griffon Vultures (the most common vulture species in the region). Therefore, vulture conservation entities (Nature Conservation CSOs) have a key role in identification of the problem and awareness raising among all relevant decision makers and stakeholders.

- **Insufficient engagement of the relevant governmental authorities**

Having low awareness of the problem that wildlife poisoning represents, it is not surprising that relevant governmental authorities are poorly engaged in detection and prevention of this type of environmental crime. In most of the Balkan countries wildlife poisoning is regarded as a serious threat for wildlife and human health mainly by CSOs. On the other hand, the use of poison baits as an indiscriminate method of extirpating animals is well defined in the existing national legislation in all Balkan countries as strictly forbidden and punishable according to the criminal or penal code of the country. Also, the use and proper procedures related to acquisition and application of various pesticides used in agriculture, which can be a significant source of unintentional poisoning, are well defined within the existing legislation. Therefore, much effort needs to be invested in engaging with relevant authorities and decision makers towards much stricter law enforcement.

One of the key stakeholders, especially in pre-investigation procedures, are police and environmental inspectorates and efforts need to be invested in engaging with them. Broadening the issue of poison use in the natural environment: associating it with the danger to the human health, the illegal traffic of banned substances or the illegal use of the allowed substances (pesticides) could help in raising the interest of the governmental institutions towards better law enforcement. Also, organizing specific training courses and educational seminars for investigation of wildlife poisoning in order to exchange best practice experience from countries which have a long tradition in effectively combating wildlife poi-

soning should be regarded as a priority. These training programmes, such as the Wildlife Crime Academy, which was established under the framework of the BalkanDetox LIFE project and with partnership with the Regional government of the Junta de Andalucía from Spain, are an excellent awareness raising and capacity building tool.

It is safe to say that enforcement of environmental laws has very low priority for the judiciary system in all the Balkan countries, which is why there are almost no convictions for wildlife poisoning or minimal sentences are carried out. Therefore, it is necessary that much more educational work, training and exchange of best practices from other countries is directed at public prosecutors and judges.

- **Vague legislation**

Unclear legislation is also an important reason for the low engagement of relevant governmental authorities in most of the Balkan countries. This is mainly associated with unclear responsibilities and jurisdictions. Therefore, more efficient, clear-cut standard operational protocols for describing responsibilities in reporting, investigation and management of cases of wildlife poisoning need to be developed and put to use. Modification of the existing protocols in line with best practice examples from countries with significant experience regarding wildlife poisoning, and their official endorsement would be a good solution for this. Also, communication and information exchange between responsible institutions and sectors related to jurisdiction, responsibilities need to be enhanced in order to facilitate further judiciary proceedings of wildlife poisoning incidents.

Despite the prohibition of the use of poison baits and substances for extirpation of animals, which is a fundamental decision, what is required first of all is the recognition of the extent and the severity of the problem. For this purpose, it is necessary to develop regional databases and unified national databases, containing information about all documented poisoning incidents. Furthermore, the designation of national anti-poisoning strategies will contribute to this direction. In this way, the existing prohibition will be accompanied by a context of actions with the necessary connection of relevant organizations and authorities.

- **Lack of resources and capacities**

It is evident that there is a significant lack of knowledge in the Balkan countries when it comes to dealing with poisoning incidents on several levels: detection (surveying for poison baits or dead animals), sampling, conduction of forensic necropsies and toxicological analysis, and finally judiciary process and legal proceedings of poisoning incidents.

Significant efforts need to be invested in improving pre-investigation procedures. Standard operational procedures for investigation, forensic necropsy and toxicology need to be developed, or existing ones improved, to facilitate the work of law enforcement agents in the field.

According to the legislation of most of the Balkan countries (North Macedonia, Croatia, Serbia, B&H), official toxicological analysis can only be conducted by designated governmental laboratories and their results are the only ones valid for court proceedings. Lack of resources is mainly associated with insufficient funds available from the government and lack of necessary equipment for conduction of a broader spectrum of toxicological analysis, which is a prerequisite for further official legal proceedings of wildlife poisoning cases. In some countries (North Macedonia, Bosnia and Herzegovina, Albania) there isn't a referent national laboratory officially designated by the government for these purposes which complicates the issue. Therefore, additional referent laboratories need to be established either by creating new ones or accrediting existing laboratories. Also, in some countries, such as Greece, Bosnia and Herzegovina, recruitment of additional staff is a priority as existing capacities are not sufficient for covering the needed toxicological analysis. On the other hand, it is important to note that in most countries there is sufficient staff expertise within these institutions for conducting basic necropsies and toxicological analysis, but additional training and exchange of best practice experience from other countries would be beneficial. Toxicological analysis should be performed promptly in order to diagnose poisoning. Without the results of these tests, which are the soundest evidence that the animal died of poisoning or any other cause, even if the poisoning incidents end up to court, they cannot be finally prosecuted.

RECOMMENDATIONS

Albania

Increase and improve relevant information about wildlife poisoning:

- Wildlife poisoning became a focus of conservation work in Albania in 2018. Since then, efforts have been invested into documentation of the current scope, as well as research into the historical scope of this practice in the country. Further efforts are needed for monitoring and documenting all potential drivers of wildlife poisoning in order to ascertain the realistic scope of this environmental crime in Albania, its effect on wild species, and potential new hotspots for this illegal practice. Data from Albania have been integrated into the regional Poison Incident Database which significantly facilitates this process.

Advocate for adaptation and improvement of current national legal framework:

- Wildlife poisoning has officially been defined as an illegal activity in Albania only in 2019, with the amendments made to the national Law on Fauna Protection by the Albanian Ornithological Society. Further efforts are needed to precisely define this type of environmental crime in the Penal or Criminal code of the country.
- Adoption of the National Anti-poisoning Road Map, which is relevant to the specific issues occurring in the country, and its incorporation into the newly amended national legislation relevant for wildlife poisoning.
- Standard operational protocols for investigation procedures, conduction of forensic necropsy and toxicological analysis of poisoning incidents are needed for facilitating the work or relevant governmental authorities responsible for dealing with this type of environmental crime.
- Designate a referent laboratory, within existing institutions, for processing cases of wildlife poisoning and conduction of forensic toxicological analysis.

Awareness raising activities:

- Additional efforts need to be made to raise awareness of the general public and governmental authorities of the problem doing so by means of media campaigns and promotional work. Awareness raising activities should focus on the importance of reporting potential poisoning events to the relevant authorities and the harmful effects that this illegal practice has on numerous species and human health.
- Continue with conducting environmental campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators and scavengers in the ecosystem.

Capacity building and networking:

- Significant efforts need to be invested towards capacity building and provision of specific training of legal and technical personnel and law enforcement officers of the governmental authorities relevant for wildlife poisoning. Training ranging from detection of poison baits and poisoned

animals in the field, conduction of forensic necropsies and toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.

Bosnia and Hercegovina

Increase and improve relevant information about wildlife poisoning:

- Long-term monitoring regarding the frequency and nature of occurrence of wildlife poisoning incidents needs to be set up in order to be able to adequately assess the actual impact of this illegal practice on the countries' wildlife, identify the most common drivers behind poison use and groups responsible. Priority should be given to those areas of the country where predator populations are abundant and where livestock losses are most frequent, because in such areas intentional poisoning most often occurs.
- Data from Bosnia and Herzegovina have been integrated into the regional Poison Incident Database which enables the user to assess the scope and severity of wildlife poisoning, as well as to define potential hotspots for these illegal activities and plan appropriate conservation actions. Efforts need to be invested into collection of any available data about poisoning and documentation of potential poisoning events.

Awareness raising activities:

- Additional efforts need to be made to raise awareness of the general public and governmental authorities of the problem doing so by means of media campaigns and promotional work. Awareness raising activities should focus on the importance of reporting potential poisoning events to the relevant authorities and the harmful effects that this illegal practice has on numerous species and human health.
- Continue with conducting environmental campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators and scavengers in the ecosystem.

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Adoption of the National Anti-poisoning Road Map, which is relevant to the specific issues occurring in the country, and its incorporation into national legislation relevant for wildlife poisoning.
- Standard operational protocols for investigation procedures, conduction of forensic necropsy and toxicological analysis of poisoning incidents are needed for facilitating the work or relevant governmental authorities responsible for dealing with this type of environmental crime. An additional and specific difficulty in B&H is the complicated bureaucratic apparatus, involving federal, entity-level and cantonal governments with often conflicting legislation and unclear jurisdiction.
- Establish better cooperation and information exchange between relevant governmental institutions and NGOs in order to ensure more efficient enforcement of relevant national legislation.
- Designate a referent laboratory, within existing institutions, for processing cases of wildlife poisoning and conduction of forensic toxicological analysis.

Capacity building and networking:

- Significant efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter, as well as the personnel of relevant CSOs. Training ranging from detection of poison baits and poisoned animals in the field, conduction of

toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Encourage cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental CSOs, hunting associations, farming associations and the media on all levels (federal, entity-level, cantonal).
- Set up channels for fluid exchange of information with the law enforcement officials, Public Prosecutors' Office with other relevant governmental authorities and CSOs to coordinate joint action.

Bulgaria

Nature conservation organizations in Bulgaria have been very active in the field of vulture conservation for the past 20 years, including the struggle with illegal poisoning as the most important conservation issues for these scavengers. The course of implementation of projects and initiatives related to vulture conservation in Bulgaria have defined the following activities as priority actions to be developed and implemented in the future in order to combat wildlife poisoning more effectively on a national scale.

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Improve the legislation related to wildlife poisoning and vulture conservation towards stricter penalties and legal ramifications.
- Develop a commonly agreed and legal protocol for responsible authorities related to legal processing of wildlife poisoning cases, responsibilities and jurisdiction of all responsible governmental institutions.
- Enforcement of the recently endorsed National Action plan against wildlife poisoning in Bulgaria.

Capacity building and networking:

- Significant efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter. Training ranging from detection of poison baits and poisoned animals in the field, conduction of toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Encourage cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental CSOs, hunting associations, farming associations and the media on all levels (federal, entity-level, cantonal).

Awareness raising activities:

- Continue to raise awareness of the general public and governmental authorities of the problem doing so by means of media campaigns and promotional work.
- Continue to conduct environmental education campaigns about the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators in the ecosystem, targeting livestock breeders, hunters, gamekeepers and other stakeholders relevant to potential use of poison baits in the environment.

Active conservation measures:

- Continue with the introduction and reinforcement of wild ungulates species (Ibex, Fallow Deer, Chamois, Red deer) to provide natural prey for the predators and vultures and to decrease losses of livestock.
- Advocate for shifting from sheep and goats to cattle raising in certain areas, which would further decrease losses of livestock due to predation by mammalian predators.

- Establish a network of Permanent safe supplementary feeding sites for avian scavengers in the country.
- Continue with active detection and surveillance of the use of poison baits in the environment using Canine Teams and GPS tracked vultures.

Croatia

Awareness raising activities:

- Significant efforts need to be made towards raising awareness of the general public and governmental authorities of the magnitude of the problem with illegal poisoning and addressing the conflict between social groups involved is a way to prevent poisoning. If the specific drivers for the use of poison baits are eliminated, then the incidents of poisoning will be reduced. Awareness raising activities should also focus on the importance of reporting potential poisoning events to the relevant authorities.
- Conduct environmental education campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators and scavengers in the ecosystem.

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Adopt National Anti-poisoning Road Map, relevant to the specific issues occurring in the country, and advocate for its incorporation into the national legislation.
- Standard operational protocols for investigation procedures, conduction of forensic necropsy and toxicological analysis of poisoning incidents are needed for facilitating the work or relevant governmental authorities responsible for dealing with this type of environmental crime.
- Advocate for the enforcement of the ministerial decision to eradicate introduced and invasive game animals on island ecosystems, as conflicts with those animals are the main reason for the use of poison, which threatens the remaining Griffon Vulture population in the country.

Increase and improve relevant information about wildlife poisoning:

- Data from Croatia have been integrated into the regional Poison Incident Database which enables the user to assess the scope and severity of wildlife poisoning, as well as to define potential hotspots for these illegal activities and plan appropriate conservation actions. Efforts need to be invested into collection of any available data about poisoning and documentation of potential poisoning events.

Capacity building and networking:

- Efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter. Training ranging from detection of poison baits and poisoned animals in the field, conduction of toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Encourage improvement of cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental CSOs, hunting associations, farming associations and the media.
- Set up channels for fluid exchange of information with the law enforcement officials, Public Prosecutors' Office with other relevant governmental authorities and CSOs to coordinate joint action.

Greece

Nature conservation organizations in Greece have been very active in combating wildlife poisoning, including the use of several Canine Teams, establishment of a national Task Force devoted to combating wildlife poisoning and a centralized database for wildlife poisoning, which has been expanded to other countries from the region. They have also lobbied and advocated for the endorsement of laws and species actions plans that address the problem of poison bait use. The course of implementation of projects and conservation initiatives related to reducing the threat of poisoning for vultures and other affected species have defined the following activities as priority actions to be developed and implemented in the future.

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Develop operational protocols for responsible authorities related to management of wildlife poisoning cases, responsibilities and jurisdiction of all responsible governmental institutions and advocate for their official endorsement by relevant governmental authorities.
- Advocate for improvement and upgrade of the MD for Local Action Plans against wildlife poisoning to JMD as well as the official governmental endorsement of a National Anti-poisoning strategy.
- Advocate for more efficient management of poisoning incidents by governmental authorities: In most cases, the competent authorities do not deal with poisoning events due to lack of staff, expertise, and awareness of the problem.
- Advocate for introduction of stricter and heftier fines and penal sanctions for perpetrators found guilty of wildlife poisoning into the existing national legislation as an important deterrent measure against this illegal practice.

Capacity building and networking:

- Efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter. Training ranging from detection of poison baits and poisoned animals in the field, conduction of necropsies and toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Improvement of existing human resources, infrastructures and equipment of the referent national toxicological laboratory, recruiting additional staff, particularly for forensic necropsies. Establish a new, second, referent toxicological laboratory in the north of Greece to be able to process more poisoning incidents.
- Encourage improvement of cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental CSOs, hunting associations, farming associations and the media.
- Set up channels for fluid exchange of information with the law enforcement officials, Public Prosecutors' Office with other relevant governmental authorities and CSOs to coordinate joint action.

Active conservation measures:

- Increase efforts to promote and enforce application of preventive measures: granting subsidies for electric fences is recommended in order to protect livestock capital from wildlife predation, as well as for usage of Greek shepherd dogs as livestock guards.
- Improve the compensation system for damages to crop production and livestock.
- Increase efforts towards warding: In poison hotspot areas or those that host species vulnerable to poisoning joint patrols should be carried out systematically by wardens, gamekeepers and rangers of

the management bodies of protected areas in order to deter people from using them as well as to increase chances of locating poison baits or poisoned animals.

Awareness raising activities:

- Significant efforts need to be made towards raising awareness of the general public and governmental authorities of the magnitude of the problem with illegal poisoning and addressing the conflict between social groups involved is a way to prevent poisoning. If the drivers for the use of poison baits are eliminated, then the incidents of poisoning will be reduced.
- Conduct environmental education campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators and scavengers in the ecosystem.

North Macedonia

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Adoption of the National Anti-poisoning Road Map, relevant to the specific issues occurring in the country, and advocate for its incorporation in the national legislation.
- Standard operational protocols for investigation procedures, conduction of forensic necropsy and toxicological analysis of poisoning incidents are needed for facilitating the work of relevant governmental authorities responsible for dealing with this type of environmental crime.
- Develop Accredited protocols/Standard Operational Procedures (SOP) and security measures in sampling and processing poisoned animals.
- Development of organized systems and protocols related to reporting, collecting and disposal of dead animals is needed.
- Designate a referent laboratory, within existing institutions, for processing cases of wildlife poisoning and conduction of forensic toxicological analysis.

Awareness raising activities:

- Significant efforts need to be made towards raising awareness of the general public and governmental authorities of the magnitude of the problem with illegal poisoning and addressing the conflict between social groups involved is a way to prevent poisoning. If the drivers for the use of poison baits are eliminated, then the incidents of poisoning will be reduced.
- Conduct environmental education campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, the importance of reporting potential poisoning events to the relevant authorities, deterrent measures foreseen under the national legislation, as well as the benefits of the presence of predators and scavengers in the ecosystem.

Capacity building and networking:

- Efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter. Training ranging from detection of poison baits and poisoned animals in the field, conduction of toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Encourage improvement of cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental NGOs, hunting associations, farming associations and the media.

- Set up channels for fluid exchange of information with the law enforcement officials, Public Prosecutors' Office with other relevant governmental authorities and NGOs to coordinate joint action.

Serbia

Advocate better law enforcement, adaptation and improvement of current national legal framework:

- Adoption of the National Anti-poisoning Road Map, relevant to the specific issues occurring in the country, and advocate for its incorporation in the national legislation.
- Standard operational protocols for investigation procedures, conduction of forensic necropsy and toxicological analysis of poisoning incidents are needed for facilitating the work or relevant governmental authorities responsible for dealing with this type of environmental crime.
- Advocate for enforcement of stricter deterrence measures, such as higher penal and criminal penalties.
- Advocate for more efficient management of poisoning incidents by governmental authorities: In most cases, the competent authorities do not deal with poisoning events due to lack of staff, expertise, and awareness of the problem.

Awareness raising activities:

- Continue with conducting awareness raising activities and media campaigns towards the general public and governmental authorities of the magnitude of the problem with illegal poisoning and the importance of reporting potential poisoning event to the relevant authorities.
- Conduct environmental education campaigns targeting all stakeholders relevant to potential use of poison baits and substances in the environment. These campaigns should stress the impact of poisons on threatened species and human health risks, plus the penalties which can apply, as well as the benefits of the presence of predators and scavengers in the ecosystem.

Capacity building and networking:

- Efforts are needed towards capacity building and training of legal and technical personnel and law enforcement officers of the governmental authorities related to this matter. Training ranging from detection of poison baits and poisoned animals in the field, conduction of toxicological analysis to prosecution and legal proceeding of poisoning incidents are essential.
- Encourage improvement of cooperation and coordination between various sectors involved, including experts of the Environmental authorities, public prosecutors, law enforcement officers, environmental NGOs, hunting associations, farming associations and the media.
- Set up channels for fluid exchange of information with the law enforcement officials, Public Prosecutors' Office with other relevant governmental authorities and NGOs to coordinate joint action.

Active conservation measures:

- Increase efforts towards warding: In poison hot spot areas or those that host species vulnerable to poisoning joint patrols should be carried out systematically by wardens, gamekeepers and rangers of the management bodies of protected areas in order to deter people from using them as well as to increase chances of locating poison baits or poisoned animals.

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ANNEXES

Annex I. Overview of poisoning incidents in Albania confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/Period	Location	Type of poisoning	Main driver	Substance
Eurasian Wolf	6	2007*	Kukes	intentional	conflict with predators/protection of livestock	Strychnine
Eurasian Wolf	3	2018*	Tepelene	unknown	unknown	Organic phosphates
Eurasian Brown bear	4	2019*	Puke	intentional	conflict with predators/protection of beehives	Organic phosphates
Red Fox; Cats	1; 4	08.06.2020.	Kavajë	intentional	conflict with foxes	Methomyl 90 sp
Red Fox; Pet dogs; Cats	1; 1; 1	14.06.2020.	Kavajë	intentional	conflict with foxes	Methomyl 90 sp

* number of poisoned animals relates to the period of the entire year, not just one single poisoning incident;

Annex II. Overview of poisoning incidents in Bulgaria confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/Period	Location	Type of poisoning	Main driver	Substance
Wolf, Wild boar, Raven	1, 1, 4	2001	Tserovo, Blagoevgrad	intentional	Conflicts with wolves	Lindane
Wolf	8	2003	Krandjilitsa, Petrich	intentional	Conflicts with wolves	Strychnine
Griffon Vulture	2	16.04.2003	Studen Kladenets, Krumovgrad	Unknown	Conflicts with wolves	Zink phosphate
Griffon Vulture	1	05.05.2003	Letovnik, Momchilgrad	unknown	conflicts with wolves	Organophosphate
Partridge	1	22.06.2004	Blagoevgrad	incidental	agriculture	Organophosphate

Annex II. cont.

Species	No. of poisoned individuals	Date/Period	Location	Type of poisoning	Main driver	Substance
Common Starling	12	15.11.2004	Stara Zagora	incidental	agriculture	Carbofuran
Common Buzzard	2	11.12.2004	Topolovgrad	incidental	agriculture	Zink phosphate
Goshawk	1	15.12.2004	Topolovgrad	incidental	agriculture	Carbamate/ Organophosphate
Egyptian Vulture	2	2004	Jenda, Kardzhali	unknown	Conflicts with wolves	Carbamate/ Organophosphate
Imperial Eagle	1	2004	Yambol, Bolyarovo	unknown	unknown	Organophosphate
Hen harrier	1	15.01.2005	Topolovgrad	incidental	agriculture	Carbamate/ Organophosphate
Common Buzzard	1	16.01.2005	Durankulak, Dobrich	incidental	agriculture	Carbamate
Common Starling	8	15.02.2005	Plovdiv	incidental	agriculture	Carbamate/ Organophosphate
Golden Eagle	2	14.12.2005	Pirdop	intentional	Conflicts with wolves	Zink phosphate
Griffon Vulture	1	14.01.2006	Studen Kladenets, Krumovgrad	unknown	Conflict with wolves	Carbamate/ Organophosphate
Black Stork	2	March, 2006	Katina, Sofia	incidental	agriculture	Carbamate/ Organophosphate
Imperial Eagle	1	05.06.2006	Topolovgrad	incidental	agriculture	rodenticide
White Stork	1	June, 2006	Simitli	incidental	agriculture	Carbamate/ Organophosphate
Common Buzzard	1	December, 2006	Pazardjik	incidental	agriculture	Carbamate/ Organophosphate
Common Buzzard	15	19.01.2007	Belozem	incidental	agriculture	rodenticides
Common Buzzard, Barn Owl, Tawny Owl	5, 3, 3	February , 2007	Along Trakia Highway, near Plovdiv	incidental	agriculture	Carbamate/ Organophosphate
Golden Eagle, Raven, Golden Jackal	1, 1, 9	17.03.2007	Shilkovtsii, Elena	intentional	Killing of Jackals	Carbamate/ Organophosphate
Partridge, Common Buzzrad, Peregrine	20, 12, 1	April, 2007	near Pazardjik	intentional	Killing of Jackals	Lannate/ Methomyl
Brown Bear	1	June, 2007	Rozino	intentional	Killing of bear, with contaminated bee honey	Carbamate/ Organophosphate
Egyptian Vulture	1	26.07.2007	Madzharovo, Haskovo	incidental	Most probably have eaten at rubbish dump	Carbamate/ Organophosphate
Brown Bear	1	July, 2007	Klisoura	intentional	Killing of bear, with contaminated bee honey	Ammonium nitrate
Egyptian Vulture	1	16.10.2007	Madzharovo, Haskovo	unknown	Unknown, dry corpse found quite late under the nest	Carbamate/ Organophosphate
Wild Boar	1	09.05.2010	Gradevo, Simitli	intentional	Killing of wild boar in potato field	Carbamate/ Organophosphate

Annex II. cont.

Species	No. of poisoned individuals	Date/Period	Location	Type of poisoning	Main driver	Substance
Griffon Vulture	3	10.05.2010	Rakitna, Simitli	incidental	Poisoned Wild boar served on feeding site for vultures	Carbamate/ Organophosphate
Griffon Vulture	1	March, 2011	Kotel	incidental	Vultures fed in aviary with pig carcass, that appears to has been poisoned	Carbamate/ Organophosphate
Goshawk, Jackal, fox, Hare, Dog	1, 4, 2, 1, 6	07.04.2011	Koshov, Ruse	intentional	Killing of predators	Carbamate/ Organophosphate
Imperial Eagle	1	2011	Plovdiv	intentional	losses from pigeon fanciers	Methomyl
Griffon Vulture	1	27.11. 2011	Kotel	incidental	unknown	Carbamate/ Organophosphate
Griffon Vulture	1	07.12. 2011	Dolno Ozirovo, Varshets	incidental	unknown	Carbamate/ Organophosphate
Peregrine	1	30.12.2011	Stara Zagora	incidental	unknown	Carbamate/ Organophosphate
Griffon Vulture	1	28.02. 2012	Kotel	incidental	unknown	Carbamate/ Organophosphate
Golden Eagle, Dog	2, 3	12.04.2012	Lilyanovo, Sandanski	intentional	A whole donkey carcass poisoned as bait to kill wolves17	Carbamate
Egyptian Vulture	1	01.12.2013	Rakitna, Simitli	incidental	A goat killed by wolves given as food for vultures in the cage	Carbamate/ Organophosphate
Cinereous Vulture	1	01.12.2013	Rakitna, Simitli	Incidental	A goat killed by wolves given as food for vultures in the cage	Carbamate/ Organophosphate
Fox, dog	1, 4	12.03.2015	Vlahi, Kresna	intentional	Killing of predators, pieces of meat used as a bait	Carbamate
Common Buzzard, Dog,	1, 3	15.03.2016	Kresna	intentional	Killing of predators, dead calves used as a bait	Lannate/ Methomyl
Griffon Vulture	1	10.10.2016	Strazhets village, Krumovgrad municipality	incidental	conflicts with wolves	Lannate/ Methomyl
Golden Jackal, Wolf	?	2016	Kardzali, Krumovgrad	intentional	livestock losses	Methomyl
Griffon Vulture, Wolf, Dog, Raven, Wild boar	30+ (40), 3, 5, 20, 1	12.03.2017	Tserovo, Blagoevgrad, Kresna gorge, Simitli	intentional	conflicts with wolves	Carbofuran
Dog, Fox, Common Buzzard	3, 2, 1	12.10.2017	Tserovo, Blagoevgrad	intentional	conflicts with wolves	Carbofuran
Griffon Vulture, Golden Jackal, Red Fox	3	2017	Blagoevgrad, Kresna	intentional	livestock losses	Carbamate
Saker Falcon	1	June, 2018	Sofia	intentional	Pigeon keepers conflict with birds of prey	Carbamate/ Organophosphate
Griffon Vulture	3	2020	Haskovo, Madzharovo	intentional	livestock losses	Carbofuran

Annex III. Overview of poisoning incidents in Croatia confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/Period	Location	Main driver	Substance
Griffon Vulture	1	October 2004	Island of Cres	conflict with introduced game animals	Methomyl
Griffon Vulture	1	October 2004	Island of Krk	unknown	Methomyl
Griffon Vulture	17	December 2004	Island of Rab	conflict with introduced game animals	Carbofuran
Common Buzzard	2	December 2004	Island of Rab	Human-human conflict; human-wildlife conflict	Carbofuran
Eurasian Brown bear	1	April 2010	Svetobrdo	conflicts with predators (jackal/fox)	Carbofuran
Eurasian Otter	1	2014	unknown	unknown	Carbofuran
Griffon Vulture	2	April 2016	Island of Krk	conflicts with predators (jackals)	Carbofuran
Griffon Vulture	1	October 2016	Island of Krk	conflicts with predators (jackals)	Carbofuran
Griffon Vulture	1	October 2017	Island of Krk	conflicts with predators (jackals)	Carbofuran
Common Buzzard	9	January 2018	Lonjsko polje	conflicts with predators (jackals)	Carbofuran
Golden Jackal	11	January 2018	Lonjsko polje	conflicts with predators (jackals)	Methiocarb
Feral pigeon	70	February 2018	Osijek	intentional	Methiocarb
Common Buzzard	1	February 2019	Rastovac, Vodice	non-intentional	Carbofuran
Common Buzzard	2	April 2019	Šibenik	conflicts with predators	Carbofuran
White Stork	1	June 2019	Đakovo	non-intentional	Metaldehyde
White Stork	1	2019	Osječko-Baranjska županija	non-intentional	Metaldehyde
Griffon Vulture	1	2019	Cres	unknown	Carbofuran
White Stork	1	2019		unknown	Carbofuran
Griffon Vulture	1	2019	Cres	unknown	Carbofuran, Chlorophacinone
Griffon Vulture	1	2019	Cres	unknown	Carbofuran
Griffon Vulture	1	2019	Cres	unknown	Carbofuran
Griffon Vulture	1	2019	Cres	unknown	Carbofuran
Griffon Vulture	1	2019	Cres	unknown	Carbofuran
Eurasian Wolf	1	January 2020	Mazin	conflicts with predators	Carbofuran
Red Fox	1	January 2020	Mazin	conflicts with predators	Carbofuran

Annex IV. Overview of poisoning incidents in Greece confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/Period	Location	Main driver	Substance
Red Fox	3	01.01.2000	Volos	unknown	Potassium cyanide
Cinereous Vulture	3	27.02.2000	Soufli	unknown	Metamidophos
Red Fox	1	30.06.2000	Almyros	Conflicts with predators/ damages to game animals	Potassium cyanide
Bearded Vulture	1	04.09.2000	Siteia	Conflicts with predators/ damages to livestock	Fenthion
Corvidae spp.	3	01.08.2001	Irakleio	unknown	Methomyl
Red Fox	3	01.01.2003	Grevena	unknown	Methomyl
Red Fox	1	21.03.2003	Grevena	unknown	Metamidophos
Cinereous Vulture	1	04.07.2003	Soufli	Conflicts with shepherd dogs	Methomyl
Cinereous Vulture	1	25.07.2003	Soufli	Damages to agricultural production	Metamidophos
Red Fox, European Badger	1, 1	28.07.2003	Lokroi	unknown	Sulphur
Griffon Vulture	1	22.04.2204	Soufli	unknown	Methyl-Parathion
Cinereous Vulture	1	27.09.2004	Soufli	Conflicts with shepherd dogs	Carbofuran
Red Fox	7	31.12.2004	Grevena	unknown	Carbofuran
Corvidae spp.	1	01.01.2005	Kos	unknown	Methomyl
Red Fox	1	28.02.2005	Grevena	unknown	Methomyl
Raptor spp.	2	15.09.2005	Irakleio (Kritis)	unknown	Methomyl
Red Fox	2	01.01.2006	Grevena	unknown	Methomyl
Corvidae spp.	2	01.01.2006	Kos	unknown	Methomyl
Red Fox, Griffon Vulture, Golden Eagle	14	01.03.2006	Aktio-Vonitsa	Conflicts with predators/ damages to game animals	Potassium cyanide
Raptor spp.	1	30.09.2006	Irakleio (Kritis)	unknown	Methomyl
Red Fox	3	31.03.2007	Grevena	unknown	Methomyl
Brown Bear	1	29.04.2011	Prespes	Conflicts with predators/ damages to livestock	Methomyl
Red Fox	8	16.01.2012	Makrakomi	unknown	Potassium cyanide
Red Fox	8	18.02.2021	Domokos	Conflicts with predators/ damages to game animals	Potassium cyanide

Annex IV. cont.

Species	No. of poisoned individuals	Date/Period	Location	Main driver	Substance
Red fox	7	21.02.2012	Domokos	unknown	Potassium cyanide
Griffon Vulture, Golden Eagle, Common Buzzard	7	22.02.2012	Topeiros	Conflicts with predators/ damages to livestock	Carbofuran
Red Fox	1	17.03.2012	Prespes	unknown	Methomyl
Red Fox	1	17.03.2012	Prespes	Conflicts with predators/ damages to livestock	Methomyl
Common Buzzard, Pine Martin	8	23.10.2012	Mylopotamos	unknown	Carbofuran
Pine Martin	2	28.10.2012	Irakleio (Kritis)	unknown	Methomyl
Egyptian Vulture	2	02.04.2013	Amfipoli	Conflicts with predators/ damages to livestock	Aldehyde, Carbofuran
Griffon Vulture	1	15.09.2013	Almopia	unknown	Carbofuran
Griffon Vulture	2	16.09.2013	Almopia	Conflicts with predators/ damages to livestock	Carbofuran
Red Fox	2	26.05.2014	Alexandroupoli	Conflicts with predators/ damages to game animals	Potassium cyanide
Red Fox	1	28.08.2014	Arriana	Conflicts with predators/ damages to game animals	Endosulfan
Common Buzzard	2	07.11.2014	Gortyna	Conflicts with predators/ damages to game animals	Methomyl
Red Fox	1	20.03.2015	Pyli	Conflicts with predators/ damages to game animals	Potassium cyanide
Griffon Vulture	2	24.04.2015	Arriana	Conflicts with predators/ damages to livestock	Carbofuran
Egyptian Vulture	2	16.07.2015	Kalampaka	unknown	Chlorpyrifos
Red Fox	4	27.09.2015	Soufli	Conflicts with predators/ damages to game animals	Potassium cyanide
Red Fox	2	10.01.2016	Kalampaka	Conflicts with hunting dogs	Methomyl
Red Fox	4	01.04.2016	Trikala	Conflicts with predators/ damages to game animals	Potassium cyanide
Red Fox	1	04.04.2016	Zagori	unknown	Potassium cyanide
Eurasian Wolf, Red Fox	2, 3	03.06.2016	Kalampaka	Conflicts with shepherd dogs	Methomyl
Red Fox	1	14.12.2016	Kalampaka	Conflicts with predators/ damages to game animals	Potassium cyanide
Common Buzzard	4	28.02.2017	Kalampaka	Conflicts with shepherd dogs	Carbofuran

Annex IV. cont.

Species	No. of poisoned individuals	Date/Period	Location	Main driver	Substance
Red Fox, Pine Martin	2, 2	30.03.2017	Kalampaka	Conflicts with predators/ damages to livestock	Methomyl
Red Fox	1	10.04.2017	Komotini	Conflicts with predators/ damages to game animals	Potassium cyanide
Red Fox	1	26.04.2017	Xanthi	Conflicts with predators/ damages to game animals	Methomyl
Griffon Vulture	1	11.09.2017	Agios Nikolaos	unknown	Cyproconazole
European Hedgehog	2	17.09.2017	Kalampaka	Conflicts with hunting dogs	Methomyl
Red Fox	1	01.12.2017	Maroneia-Sapes	unknown	Potassium cyanide
Common Buzzard	1	07.12.2017	Malevizi	Conflicts with predators/ damages to game animals	Metribuzin
Griffon Vulture	1	07.12.2017	Viannos	unknown	Methomyl
Cinereous Vulture	1	05.03.2018	Alexandroupoli	unknown	Phorate
Red Fox	2	24.03.2018	Kalampaka	Local disputes among land users	Potassium cyanide
Golden Eagle	1	22.02.2019	Soufli	Conflicts with predators/ damages to livestock	Potassium cyanide

Annex V. Overview of poisoning incidents in North Macedonia confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/Period	Location	Type of poisoning	Main driver	Substance
Egyptian Vulture, Griffon Vulture	3, 1	2011	Vitacevo	unknown	unknown	Methomyl
Common Buzzard	1	April 2011	Vitacevo	unknown	conflicts with predators	Methomyl

Annex VI. Overview of poisoning incidents in Serbia confirmed by toxicological analysis.

Species	No. of poisoned individuals	Date/ Period	Location	Type of poisoning	Main driver	Substance
Peregrine Falcon	2	2005	Ovčar banja, Čačak	intentional	conflicts with birds of prey	Kreozan
Griffon Vulture	1	13.11.2005.	Goveđak, Sjenica	unintentional	conflicts with stray and feral dogs	Kreozan
Rook	1	24.06.2005.	Odžaci	unintentional	misuse of pesticides in agriculture	Carbofuran
White-tailed Eagle	1	2008	Stapar, Sombor	unknown	unknown	Carbofuran
Griffon Vulture	2	20.06.2008.	Trešnjica gorge, Ljubovija	unintentional	conflicts with stray and feral dogs	Kreozan
Roe deer, Common Pheasant, Wild boar	30, 1000, 3	2010	Kać, Novi Sad	unintentional	Misuse of pesticides	Carbofuran
Black-headed Gull, Mallard	70, 9	15.04.2011.	Ludaško jezero, Subotica	unknown	unknown	Carbofuran
White-tailed Eagle, Common Buzzard	1, 2	07.03.2012.	Farkaždin, Zrenjanin	intentional	conflicts with stray dogs	substance with traces of Arsenic
White-tailed Eagle	5	13.05.2012.	Vajska, Bač	unknown	unknown	Carbofuran
Common Buzzard, Raven, Magpie	6, 8, 2	01.12.2013.	Dobrodol, Irig	intentional	conflicts with predators	Carbofuran
Common Buzzard, Raven, Magpie	6, 7, 1	05.12.2013.	Dobrodol, Irig	intentional	conflicts with predators	Carbofuran
White-tailed Eagle, Common Buzzard, Magpie	8, 3, 7	21.02.2014.	Svilojevo, Apatin	unknown	unknown	Carbofuran
Feral pigeon	1	15.04.2014.	Bela Palanka	intentional	conflicts with birds of prey	Kreozan*
Common Crane	19	24.04.2014.	Sanad, Čoka	unintentional	misuse of pesticides in agriculture	Carbofuran
White-tailed Eagle, Mallard	1, 1	29.04.2014.	Svilojevo, Apatin	unknown	unknown	Carbofuran*
Feral pigeon	1	15.05.2014.	Ram, Veliko Gradište	intentional	conflicts with birds of prey	Carbofuran*
Song Thrush	1	07.10.2014.	Miljakovac, Rakovica	unintentional	conflicts with stray dogs	Kreozan
White-tailed Eagle, Common Buzzard, Magpie	3, 3, 7	14.03.2015.	Svilojevo, Apatin	unknown	unknown	Carbofuran

Annex VI. cont.

Species	No. of poisoned individuals	Date/ Period	Location	Type of poisoning	Main driver	Substance
White-tailed Eagle	1	27.01.2016.	Mošorin, Titel	unknown	unknown	Carbofuran
Common Buzzard	6	22.02.2016.	*Čantavir, Subotica*	intentional	conflicts with predators	Carbofuran
White-tailed Eagle	2	19.02.2016.	Tovariševo, Bačka Palanka	unknown	unknown	Carbofuran
Common Buzzard	3	03.03.2016.	Sl. Aradac, Zrenjanin	unknown	unknown	Carbofuran
Marsh Harrier, Common Buzzard	3, 1	15.03.2016.	Hajdukovo, Subotica	intentional	conflicts with predators	Carbofuran
White-tailed Eagle	2	26.03.2016.	Erdevik, Šid	intentional	conflicts with predators	Carbofuran
Common Buzzard, Marsh Harrier, Raven	1, 1, 1	06.04.2016.	Temerin	unknown	unknown	Carbofuran*
Common Crane	5	21.04.2016.	Novi Kneževac	unintentional	misuse of pesticides in agriculture	Carbofuran
Common Buzzard	1	27.12.2016.	Bačka Topola	unknown	unknown	Carbofuran
Red Kite	1	02.11.2017.	Ritiševo	intentional	conflicts with predators	Carbofuran
Peregrine Falcon	1	29.11.2017.	NoviSad, Grbavica	intentional	conflicts with birds of prey	Carbofuran
White-tailed Eagle, Common Buzzard, Raven	2, 4, 3	17.12.2017.	Vitijevci, Ruma	unintentional	conflicts with predators	Carbofuran
Common Buzzard	1	18.12.2017.	Bačka Palanka	unknown	unknown	Carbofuran
White-tailed Eagle, Common Buzzard	2, 1	21.12.2017.	Vitojevci	unknown	unknown	Carbofuran
Imperial Eagle	1	08.01.2018.	Svilojevo, Apatin	unintentional	conflicts with predators	Carbofuran
Common Buzzard, Magpie	5, 2	11.01.2018.	Svilojevo, Apatin	unintentional	conflicts with predators	Carbofuran
White-tailed Eagle, Common Buzzard, Magpie	2, 1, 1	14.01.2018.	Svilojevo, Apatin	intentional	conflicts with predators	Carbofuran
White-tailed Eagle	2	01.02.2018.	Vitojevci	unknown	conflicts with predators	Carbofuran

Annex VI. cont.

Species	No. of poisoned individuals	Date/ Period	Location	Type of poisoning	Main driver	Substance
Marsh Harrier	1	23.05.2019.	Novo Orahovo	unknown	unknown	Carbofuran
Common Starling, Collared dove, Feral pigeon	22, 10, 55	16.10.2018.	Vršac	unintentional	misuse of pesticides in agriculture	Carbofuran
Magpie	2	17.07.2019.	Srbobran	intentional	conflicts with stray dogs	Carbofuran
Common Buzzard	1	25.10.2019.	Novo Orahovo	unknown	unknown	Carbofuran
White-tailed Eagle	1	25.02.2020.	unknown	unknown	unknown	Carbofuran
Marsh Harrier	2	13.4.2020.	Bačka Topola	unknown	unknown	Carbofuran
Common Crane	5	21.4.2020	Novi Kneževac	unintentional	misuse of pesticides in agriculture	Carbofuran
Golden Jackal	1	13.1.2021.	Dobanovci	intentional	conflicts with predators	Carbofuran

* Poison detected in the bait;

Annex VII. Questionnaire about recorded wildlife poisoning and presumable poisoning events.

QUESTIONNAIRE

CONTRIBUTOR INFORMATION	
Country:	
Organisation:	
Address:	
Telephone:	
E- mail:	
Webpage:	
Name and position of person providing the information:	
E-mail of the person providing the information:	

Q1. Please specify to the best of your knowledge how many wildlife poisoning incidents (WPI) are you aware of that have occurred in your country, their location, species affected, and other relevant information presented in the table below.

WPI	Date/Period	Location *(GPS coordinates if available)*	Species affected	No. of poisoned individuals	Type of poisoning *(intentional, incidental, unknown)*	Main driver *(conflict with predators, stray dogs, other wildlife, etc.)*	Substance used
1							
2							
3							
4							
5							

** please add new rows for more WPIs if needed;*

Q2. Please specify to the best of your knowledge for how many wildlife poisoning incidents in your country have official necropsies been conducted on wild animals which were suspected to have died from poisoning or ingesting poison baits. (please use the same numbering for the incidents as in the table above)

WPI	Species	Cause of death/ necropsy results	Name of referent institution

** please add new rows for more WPIs if needed;*

Q3. Please specify to the best of your knowledge for how many wildlife poisoning incidents in your country have toxicological analysis been conducted, either on dead animals or on poison baits. (please use the same numbering for the incidents as in the table under Q2.)

WPI	Sample (animal species or poison bait)	Tested substances	Confirmed substances	Name of referent laboratory

** please add new rows for more WPIs if needed;*

Q4. Please specify to the best of your knowledge how many wildlife poisoning incidents in your country have officially been prosecuted by the public prosecutor's office and have reached court trials. (please use the same numbering for the incidents as in the table under Q2.)

Q5. Please specify to the best of your knowledge for how many wildlife poisoning incidents in your country have court rulings been delivered. (please use the same numbering for the incidents as in the table under Q2.)

Contributor information for relevant governmental institutions	
Country:	
Institution:	
Address:	
Telephone:	
E- mail:	
Webpage:	
Name and position of person providing the information:	
E-mail of the person providing the information:	

Annex VIII. Questionnaire for target audiences in local communities.

QUESTIONNAIRE

P1. **Based on your knowledge, do the following vulture species breed in … country…? Please answer with yes, no or I don't know.**	**1. Yes**	**2. No**	**3. I do not know, I am not informed**
1. Griffon Vulture			
2. Turkey Vulture			
3. Cinereous Vulture			
4. King Vulture			
5. Egyptian Vulture			

P2. **Do you know which types of food do vultures in …country… use from the types listed below? Please answer with yes, no or I don't know.**	**1. Yes**	**2. No**	**3. I do not know, I am not informed**
1. Carcasses of wild animals			
2. Carcasses of domestic animals			
3. Hunted large mammals			
4. Hunted rodents			
5. Hunted domestic animals			
6. Hunted insects			

What is endangering the vulture populations in …country.. the most?
Read the answers from 1-6. Rotate the answers from 1-6. When you read the list say: or some other cause which we haven't stated?

1. Lack of food
2. Disturbance
3. Wildlife poisoning
4. Poaching
5. Accidental electrocution of collision with power cables
6. Extensive use of legal toxic compounds (pesticides, insecticides, rodenticides)
7. Other, what?_____
98. Doesn't know (don't read)
99. Refuses to answer (don't read)

P3. **How would you evaluate your own knowledge about the issue of wildlife poisoning on a scale from 1 to 5, 5 being excellent knowledge.**

1 2 3 4 5 6 (Don't know / can not evaluate)

P4. **What do you think, from which of the causes listed below do vultures get poisoned the most?**

1. from poison baits intended for vultures
2. from poison baits intended for other animals
3. because they consume poisoned animals
4. because they get poisoned by pesticide
5. Some other cause, which?
98. Doesn't know
99. Refuses to answer

P5. **Do you agree with the following statements? Express your personal attitude towards each statement using the following scale: (1) I disagree completely, (2) I mostly disagree, (3) I neither agree nor disagree, (4) I mostly agree, (5) I completely agree**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**	**98. I don't know (do not read)**
1. Vultures have important roles for human activities	1	2	3	4	5	98
2. The greatest value of vultures such as the Griffon Vulture is the fact that it is a tourist attraction	1	2	3	4	5	98
3. Vulture numbers would increase if we would simply leave them alone.	1	2	3	4	5	98
4. Vultures have an important role in the ecosystem	1	2	3	4	5	98
5. Wild animals have/play an important role for human activities	1	2	3	4	5	98
6. Poisoning wild animals is sometimes justified	1	2	3	4	5	98
7. Governments/Countries should conduct controlled poisoning of wild animals on their own	1	2	3	4	5	98
8. Wildlife poisoning is only a problem when it poses a threat for people/humans	1	2	3	4	5	98

P6. **Wildlife poisoning/Poisoning of wild animals in ...country... can occur intentionally or unintentionally, with legal or illegal poisoning substances. According to your opinion, how does wildlife poisoning most commonly occur?**

1. Intentionally, with illegal poisons from the black market
2. Intentionally, by misuse of legal poisoning substances (pesticides, insecticides...)
3. Accidently, by misuse of legal poisoning substances out of negligence/ignorance

P7. **What do you think, how often are people from the following groups responsible for wildlife poisoning in ..country..? Please evaluate using a scale of 1-4, where 1 means „often“, 2 „occasionally“, 3 „rarely“, and 4 „never“.**	**1. often**	**2. occasionally**	**3. rarely**	**4. never**	**98. I don't know (do not read)**
1. Livestock breeders	1	2	3	4	98
2. Hunters	1	2	3	4	98
3. Farmers	1	2	3	4	98
4. Beekeepers	1	2	3	4	98
5. Pigeon fanciers/breeders	1	2	3	4	98
6. Individuals who deliberately poison animals simply because they like killing things	1	2	3	4	98

P8. **According to your assessment, how often is each of the below listed motives behind the poisoning of wild animals in...country..? Please evaluate using a scale of 1-4, where 1 means „often“, 2 „occasionally“, 3 „rarely“, and 4 „never“.**	**1. often**	**2.occasionally**	**3. rarely**	**4. never**	**98. I don't know (do not read)**
1. Protection of pastures and livestock from wild animals (wolves, bears, etc.)	1	2	3	4	98
2. Protection of agricultural land from wild animals	1	2	3	4	98
3. Protection of agricultural land from birds of prey	1	2	3	4	98
4. Protection of pigeons from birds of prey	1	2	3	4	98
5. Protection of apiaries from bears	1	2	3	4	98
6. Conflicts among people about land use (pastures, hunting areas)	1	2	3	4	98
7. Protection of hunting activities	1	2	3	4	98
8. Protection from stray dogs and cats	1	2	3	4	98
9. Protection from pests (rats, insects et at.)	1	2	3	4	98

P9. **According to your assessment, in which regions of .,,country,,,, are wild animals most frequently poisoned?**
(Please choose one of the answers below)

1. Vojvodina
2. East and South Serbia
3. West Serbia and **Š**umadija
4. Belgrade
98. Doesn't know (do not read)
99. Refuses to answer (don't read)

P10. **According to your assessment, in what period of the year does wildlife poisoning mostly occur in ...country...? Please choose one or more seasons.**

1. Spring
2. Summer
3. Autumn
4. Winter
98. Doesn't know (do not read)
99. Refuses to answer (don't read)

P11. **To what extent do you agree with the following statements related to reporting poisoning incidents to the relevant authorities? Please express your personal attitude towards each statement using the following scale: (1) I disagree completely, (2) I mostly disagree, (3) I neither agree nor disagree, (4) I mostly agree, (5) I completely agree**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**	**98.I don't know (do not read)**
1. People/citizens do not know who to report animal poisoning incidents to	1	2	3	4	5	98
2. It is known which individuals poison animals in this area, it is a „public secret"	1	2	3	4	5	98
3. Every person should report to the police any information/knowledge about wildlife poisoning	1	2	3	4	5	98
4. Hunters should report to the police information/knowledge about wildlife poisoning more often	1	2	3	4	5	98
5. Veterinarians should report to the police information/knowledge about wildlife poisoning more often	1	2	3	4	5	98
6. People who report someone from their community for poisoning wild animals risk altercations and conflicts in their community	1	2	3	4	5	98
7. Poisoning mostly takes place in remote locations and therefore the perpetrators are rarely identified	1	2	3	4	5	98

P12. **What of the following would you do if you had information about poisoning?** ***Read the answers 1-3. Rotate the answers 1-3.***

1. I wouldn't report it to the police
2. I would report it to the police but only if it it would not have any negative consequences for me
3. I would report it to the police even if I knew that i might have negative consequences for me

98. Doesn't know (do not read)
99. Refuses to answer (don't read)

Question only asked if P13 is answered 1 or 2

P13a. If you would not report it, which of the following would be the main reason?
Read the answers 1- 3. Rotate the answers 1- 3. When you read the list say: **or some other reason which we haven't stated.**

1. Because there are enough other people worrying about that
2. Not to come into conflict with people from my environment/community
3. Because there is nothing in it for me
4. From some other reason, which_____

99. Refuses to answer (don't read)

P13. **Do you know for at least one poisoning incidents with animals in your environment/ community for the past 10 years, apart from deration:**

1. Yes
2. No

Question asked only of P14 answered „Yes"

P14a. What was it about? /instruction: don't read the answers, let the respondent say it on his own and mark /	**Mark**
1. Mass poisoning of birds from pesticides	
2. Using explosives for fishing	
3. Someone intentionally poisoned wild animals outside of settlements because they bothered them in some way	
4. Someone intentionally poisoned any type of animal (wild animals, stray dogs or cats, birds of prey) in settlements/ inhabited areas because they bothered them in some way	
5. Any protected species accidentally poisoned	
6. One or more vultures accidentally poisoned	
7. Other. What?_____	

Question asked only of P14 answered „Yes"

P14b. Have you personally or anyone from your community had an animal poisoned? If so, which? / instruction: don't read the answers, let the respondent say it on his own and mark /	**Mark**
8. Pet	
9. Guard dog or shepherd dog	
10. Hunting dog	
11. Domestic animal (pigs, poultry et al.)	
12. Bees	
13. Pigeons	
14. Some other animals. Which?	
15. No, I never had such an experience.	

P14. **In which group of people is it most important to raise awareness about wildlife poisoning?** Please, choose one answer. *Read the answers 1-5. Rotate the answers 1-5. When you read the list say:* **or some other group which we haven't stated.**

1. Citizens in general
2. Hunters
3. Game wardens
4. Livestock breeders
5. Farmers
6. Other groups. Which?_____

98. Doesn't know (do not read)
99. Refuses to answer (don't read)

P15. **How important would you rate wildlife poisoning investigations, compared to other police work? Express your personal attitude using the following scale: (1) completely irrelevant, (2) mostly irrelevant, (3) neither irrelevant nor important, (4) mostly important, (5) extremely important.**

1. Completely irrelevant
2. Mostly irrelevant
3. Neither irrelevant nor important
4. Mostly important
5. Extremely important
6. Doesn't know (do not read)

99. Refuses to answer (don't read)

P16. **Do you know of a specific case of a police investigation for a wildlife poisoning incident in …country…, for example a case that was in the media?**

1. Yes
2. No

P17. **According to your opinion, how important would it be to undertake some of the following measures? Please express your personal attitude by using the following scale:(1) completely irrelevant, (2) mostly irrelevant, (3) neither irrelevant nor important, (4) mostly important, (5) extremely important**	**1. Entirely irrelevant**	**2. Mostly unimportant**	**3.Neither important nor important**	**4. Mostly important**	**5.Extremely important**	**98. I don't know (do not read)**
1. That the state/government financially compensates the damage to livestock breeders and farmers, caused by wild animals	1	2	3	4	5	98
2. Create more supplementary feeding sites for vultures	1	2	3	4	5	98
3. Ensure free electric fences	1	2	3	4	5	98
4. Resolve issues of the ownership of pastures and rights to use them	1	2	3	4	5	98
5. Work more on informing the general public about the problem of wildlife poisoning	1	2	3	4	5	98
6. Increase administrative fines for wildlife poisoning	1	2	3	4	5	98
7. Enforce a stronger control of import and trade of legal poisoning substances (pesticides, insecticides, rodenticides)	1	2	3	4	5	98

P18. **To what extent do you agree with the following statements? Please express your personal attitude towards each statement using the following scale: (1) I disagree completely, (2) I mostly disagree, (3) I neither agree nor disagree, (4) I mostly agree, (5) I completely agree**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**	**98. I don't know (do not read)**
1. The natural balance is very delicate and easy to disturb	1	2	3	4	5	98
2. Earth is like a spaceship, with very limited space and resources	1	2	3	4	5	98
3. Plants and animals have an equal right to exist just like humans	1	2	3	4	5	98
4. Humans are destined to rule over the rest of nature	1	2	3	4	5	98

P19. **Mark the respondent's sex without asking the question:**

1. Female
2. Male

P20. **What is your age? (Age of the person at last birthday, expressed in complete solar years. Enter the number)**

_____

P21. **What is your highest level of education?**

1. Uncompleted elementary school
2. Completed elementary school
3. Completed secondary school with 3-years programme (e.g. 3-years vocational school)
4. Completed secondary school with 4-years or longer programme (e.g. grammar school/ gymnasium)
5. Completed higher education (professional or university degree, master of science degree, doctorate)

99. Declines to answer (don't read)

P22. **Is something from the list relevant to you:**

1. I am livestock/cattle farmer
2. I am agricultural production farmer
3. I am a hunter
4. I work as a ranger
5. I work in the Police Department
6. I work as a veterinarian
7. None of the above

99. Declines to answer (don't read)

/if the respondents is a hunter; P23=3/

P23a. Are you a member of hunter membership?

1. Yes
2. No

P23. **What is your employment status?**

1. Employed
2. Unemployed
3. Employed on maternity leave or other types of leave
4. Retired
5. A student in full-time education (school, university)
6. A full time homemaker (housewife/-men)
7. Unfit for work due to a long-term illness or disability

99. Declines to answer (don't read)

/IF P24 = 1/

24a. Are you employed:

1. Self-employed or assisting family member at family farm
2. Self-employed in own business (firm, craft, enterprise, etc.)
3. Assisting family member at family business (firm, craft, enterprise, etc.)
4. Employee who work for an employer
5. Something else. Please specify:_____

99. Declines to answer (don't read)

P25. What was the total income of your household in the previous month, regardless of the sources?

1. No income
2. Up to 400 EUR
3. 401-600 EUR
4. 601-800 EUR
5. 801-1.200 EUR
6. 1.201-1.600 EUR
7. 1.601-1.800 EUR
8. 1.801-2.400 EUR
9. Over 2.400 EUR
99. Declines to answer

Annex IX. Questionnaire for target audiences within relevant governmental institutions.

P1. **Based on your knowldge, which species of vultures currently breed in ...country...?** **Please mark all answers you believe to be correct** (Format: multiple choice)
1. Griffon Vulture
2. Turkey Vulture
3. Cinereous Vulture
4. King Vulture
5. Egyptian Vulture

P2. **Do you know with what from the listed below do vultures feed in ...country..?** **Please mark all answers you believe to be correct** (Format: multiple choice)
1. Carcasses of wild animals
2. Carcasses of domestic animals
3. Hunted large mammals
4. Hunted rodents
5. Hunted domestic animals
6. Hunted insects

P3. **What is endangering the vulture populations in ...country.. the most?**
Please choose one of the listed answers.
(Format: single choice)

1. Lack of food
2. Disturbance
3. Wildlife poisoining
4. Poaching
5. Accidental electrocution of collision with power cables
6. Extensive use of legal toxic compounds (pesticides, insecticides, rodenticides)
7. Other, what?

98. I don't know

P4. **What do you think, with what do vultures get mostly poisoned of?**
Please choose one of the listed answers.
(Format: single choice)

1. From poison baits intended for vultures
2. From poison bates intended for other animals
3. Because they eat poisoned animals/animals that died of poisoning
4. Because they get poisoned from pesticides
5. Other, what?

98. I don't know

P5. **Poisoning of wild animals in ...country.. can occur intentionally or unintentionally, with illegal or legal poisoning substances. According to your opinion, how does wildlife poisoning most commonly occur?**
Please choose one of the listed answers.
(Format: single choice)

1. Intentionally, with illegal poisons from the black market
2. Intentionally, by misuse of legal poisoning substances (pesticides, insecticides...)
3. Accidently, by misuse of legal poisoning substances out of negligence/ignorance

98. I don't know

P6. **What do you think, how often are people from the following groups responsible for wildlife poisoning in ..country..?**	**1. Often**	**2. Occasionally**	**3. Rarely**	**4. Never**
1. Livestock breeders				
2. Hunters				
3. Farmers				
4. Beekeepers				
5. Pigeon fanciers/breeders				
6. Individuals who deliberately poison animals simply because they like killing things				

P7. **According to your assessment, how often is each of the below listed motives behind the poisoning of wild animals in ..country..?**	**1. Often**	**2. Occasionally**	**3. Rarely**	**4. Never**
1. Protection of pastures and livestock from wild animals (wolves, bears, etc.)				
2. Protection of agricultural land from wild animals				
3. Protection of agricultural land from birds of prey				
4. Protection of pigeons from birds of prey				
5. Protection of apiaries from bears				
6. Conflicts among people about land use (pastures, hunting areas)				
7. Protection of hunting activities				
8. Protection from stray dogs and cats				
9. Protection from pests (rats, insects et at.)				

P8. **According to your assessment, in which regions of .,,country,,,, are wild animals most frequently poisoned?**

(Please choose up to 3)

(Format: multiple choice)

1. Krajina
2. Hercegovina
3. Posavina
4. Srednja Bosna
5. Tropolje
6. Podrinje

98. I don't know

P9. **According to your assessment, in what period of the year does wildlife poisoning mostly occur in ...country...?**

(Please choose one or more seasons)

(Format: multiple choice)

1. Spring
2. Summer
3. Autumn
4. Winter

98. I don't know

P10. **Individuals who intend to poison wild animals in ...country,, can be prevented and sanctioned by various means by the governmental institutions. According to your opinion, how important are some of the aggravating circumstances and obstacles?**	**1. Entirely irrelevant**	**2. Mostly unimportant**	**3. Neither important nor important**	**4. Mostly important**	**5. Extremely important**
1. Bad law enforcement					
2. Complexity of the investigation					
3. Difficulties with evidence procedures in court					
4. Expensive toxicological analysis					
5. Black market for banned poisons on Internet					
6. Lack of control over the prescribed use of legal poisons, such as pesticides, rodenticides et al.					
7. Low penalties for wildlife poisoning					
8. Inadequate and unclear protocols for police action					
9. Poor reporting of information from witnesses					

P11. **To what extent do you agree with the following statements related to reporting poisoning incidents to the relevant authorities?**	**1. I completely disagree**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. People/citizens do not know who to report animal poisoning incidents to					
2. It is known which individuals poison animals in this area, it is a „public secret“					
3. Every person should report to the police any information/knowledge about wildlife poisoning					
4. Hunters should report to the police information/knowledge about wildlife poisoning more often					
5. Veterinarians should report to the police information/knowledge about wildlife poisoning more often					
6. People who report someone from their community for poisoning wild animals risk altercations and conflicts in their community					
7. Poisoning mostly takes place in remote locations and therefore the perpetrators are rarely identified					

P12.**In which group of people is it most important to raise awareness about wildlife poisoning?**
(Please choose one answer)

1. Citizens in general
2. Hunters
3. Game wardens
4. Livestock breeders
5. Farmers
6. Other groups. Which?

P13. **Do you agree with the following statements, related to investigation of wildlife poisoning incidents?**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. Specialized police units for environmental crime, including wildlife poisoning, are needed					
2. More people are needed on the field (police, environmental inspectors, rangers etc.) for timely detection of poisoning incidents					
3. Game wardens to often tolerate unlawful practices in hunting areas					
4. Police should have specialized canine units for detecting poisonous substances used for wildlife poisoning					
5. Lack of coordination among relevant institutions is a bigger problem than lack of resources					
6. In ...country.. there are sufficient laboratories with enough capacities to conduct needed toxicological analyses					

P14. **Do you agree with the following statements, related to legislation and legal processing of poisoning incidents?**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. Public prosecutors are sufficiently educated for managing incidents related to poisoning of wild animals					
2. The legal framework for punishing the practice of poisoning animals is good, but the main problem is law enforcement					
3. Rarely are fines imposed under the Hunting Act					
4. Existing legislation regulates biodiversity protection well enough					

P15. **How would you evaluate the cooperation between governmental institutions and civil society organizations regarding data collection about poisoning incidents on a scale from 1 to 5, where 1 is "very bad", and 5 "excellent cooperation":**

1 2 3 4 5 (I do not know / I cannot evaluate)

P16. **The following next statements relate procedures and documentation related to wildlife poisoning. According to the best of your knowledge:**	**1. Yes**	**2. No**	**3. I do not know, I am not informed**
1. Is there a database for poisoning incidents of birds in ...country..			
2. Is there a National action plan for combating wildlife poisoning in place			
3. Is there a protocol defining procedures and jurisdictions for investigating wildlife poisoning			

/IF P17.1. = yes, P18 question opens/

P17. **Related to database for poisoning incidents:**	**1. Yes**	**2. No**	**3. I do not know, I am not informed**
1. Is there a clear protocol for documenting poisoning incidents in the database			
2. Do you ever use data from the existing database for carrying out work within your jurisdiction			
3. Do you consider that the existing database is adequately used for informing the public and raising their awareness about the problem of wildlife poisoning			

IF P17.3. = yes, P19 question opens/

P18. **Related to the protocol that defines procedures and protocols for investigating wildlife poisoning:**	**1. Yes**	**2. No**	**3. I do not know, I am not informed**
1. Is the existing protocol clear enough?			
2. According to the protocol, must the reports about poisoning incidents include an impact analysis of a single poisoning incident to the environment and biodiversity?			
3. Should the existing protocol be improved? If yes, how?_____			

P19. **To what extent do you agree with the following statements, related to punishment of various unlawful actions damaging to animals and the environment?**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. All forms of mass and non-discriminative killing of animals (trapping, poisoning, explosives et al.) should be punished as severely as possible					
2. Higher fines are needed for every type of poaching/illegal shooting					
3. Prison sentences should not be administered placing poison baits unless people are not put in danger, but only animals					
4. Rangers of protected areas should have the authority to arrest persons who poison animals, if they are caught in the act					
5. Sentences for poisoning of animals should be only administrative (financial), but not imprisonment					
6. Having poison baits should be a separate offense, regardless of whether it has been proven that an animal was killed					
7. Poisoning of animals should be a criminal offense only if it occurred in a protected area (nature park, national park)					
8. If poisoning of wild animals occurs in a commercial hunting area, the concessionaire should be deprived of the concession					

P20. **To what extent do you agree with the following statements, related to the capacities of the police.**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. Police investigations about wildlife poisoning need expensive and sophisticated technology					
2. The main is problem that incidents are not reported to the police					
3. The police is sufficiently equipped for investigating wildlife poisoning					
4. The police is sufficiently educated for investigating incidents with wild animals					
5. Police investigations about wildlife poisoning should include representatives of the civil society organizations					
6. The police has better things to do and should not waste resources on investigating wildlife poisoning incidents					
7. The police do not take seriously the need to launch investigations into wildlife poisoning					
8. Specialized police units should be introduced to deal with the crime of wildlife poisoning					

P21.**In police investigations of wildlife poisoning it is necessary to use:**
Please mark all the answers you believe to be correct

(Format: multiple choice)

1. Forensic entomology
2. Toxicological analysis
3. Fingerprint analysis
4. Forensic ballistics
5. Forensic psychology
6. Canine units
7. Records of sale of legal poisoning substances (pesticides, insecticides, rodenticides...)
8. Confirming time of death of the animals

P22. **Some of the means of preventing wildlife poisoning are listed below. According to your opinion, how important would it be to undertake some of the listed measures?**	**1. Enirely irrelevant**	**2. Mostly unimportant**	**3. Neither important nor important**	**4. Mostly important**	**5. Extremely important**
1. That the state/government financially compensates the damage to livestock breeders and farmers, caused by wild animals					
2. Create more supplementary feeding sites for vultures					
3. Better protect wild ungulate populations					
4. Ensure livestock breeders and farmers are provided with free shepherd and guard dogs					
5. Ensure free electric fences					
6. Resolve issues of the ownership of pastures and rights to use them					
7. Completely ban logging in ...country.. for some time					
8. Work of reducing the populations of allochthone animals					
9. Work more on awareness raising of the general public					
10. Work more on awareness raising among key stakeholders (livestock breeders, farmers, hunters, institutions)					
11. Impose a stricter control of the trade of legal poisoning substances (pesticides, rodenticides et al.)					

P23. **To what extent do you agree with the following statements?**	**1. I disagree completely**	**2. I mostly disagree**	**3. I neither agree nor disagree**	**4. I mostly agree**	**5. I completely agree**
1. The natural balance is very delicate and easy to disturb					
2. Earth is like a space ship, with very limited space and resources					
3. Plants and animals have an equal right to exist just like humans					
4. Humans are destined to rule over the rest of nature					

P24. **Do you work in**
- List of the institutions to which the questionnaire is sent

P25.**Do you directly deal with the issue of wildlife poisoning in your line of work?**

1. No
2. Yes, but only of domestic animals
3. Yes, both of wild and domestic animals

/IF P26 = No/

P26. **Have you in any way been involved in the issue of poisoning of animals in your line of work?**

1. No
2. Yes, but only of domestic animals
3. Yes, both of wild and domestic animals

P27. **How would you evaluate your own knowledge about the issue of wildlife poisoning on a scale from 1 to 5, where 1 is "very bad" and 5 "excellent knowledge".**

1 2 3 4 5 (I do not know / I cannot estimate)

P28.**Have you ever attended any educational programme related to detection and processing of wildlife poisoning incidents?**

1. No
2. Yes

/Only for those who answered yes/

P29a. **Who organized the educational programme? _____**

P29.**How many years of service do you have in the institution where you now work?**

_____

P30. **How many years of service do you have in the department you are currently working in?**

_____

P31. **Which of the following best describes your current job position?**

1. Employee
2. Lower management level
3. Middle management level
4. Upper management level
5. Highest management level (director of the institution, member of the management board, general director)
6. External associate
7. Other. What?


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