European Raptor Biomonitoring Facility
Advice Hub

Assessing causes of death and threats

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ASSESSING CAUSES OF DEATH & THREATS

As raptors are at the top of the food chain, they are especially exposed to changes in ecosystems and environmental threats. Therefore, raptors are one of the most threatened groups of avifauna in the modern world, being constant subjects of conservation efforts as priority species. If their populations decline, it is often a consequence of a cumulative, simultaneous impact of different factors. It is important to determine drivers of change/threats to populations - so that other drivers can be considered/dismissed when assessing the impacts of contaminants on a raptor population. Similarly, to other bird groups, European raptors are subjected to immediate, non-habitat related threats that cause an increase in mortality, as well as being affected by large-scale loss or degradation of suitable habitat. Migratory birds of prey are particularly vulnerable because they range over large areas during migration and face many environmental changes and threats along the way. For centuries, raptors have been exposed to persecution such as shooting, poisoning and trapping because they may prey on domestic livestock or on small-game populations, or because they are traditionally utilized for falconry. Although the historical level of raptor shooting and trapping probably decreased significantly in the last decades of the 20th century, due to stricter nature protection regulations, it is still a widespread problem in the European breeding areas and on migration routes, especially at bottlenecks.

Probably the commonest method of persecution is poisoning, which may or may not be targeted at raptors. In most European countries, the main targets for deliberate poisoning are mammals such as foxes, wolves, feral dogs and cats, but carrion-eating raptors are suffering a lot from accidental poisoning, too. In addition, incidental secondary poisoning can affect all raptor species through the food chain. Today, most European raptor populations have recovered from the former widespread and detrimental effects of dichlorodiphenyltrichloroethane (DDT), polychlorinated biphenyl (PCB) and other organochlorines on their fertility. Deliberate poisoning of raptors such as Golden Eagle and Eastern Imperial Eagle by other agrochemicals, such as organophosphate and carbamate pesticides, remains a burning conservation issue across Europe, from Scotland to Russia. In Asia, Gyps vultures populations have declined by >95% due to poisoning by the veterinary drug diclofenac. The density and viability of raptor populations depend on the amount and quality of available habitats. Although the deliberate and unintentional killing of raptors has a great negative impact on their populations, the decline of many species is driven mainly by the loss or degradation of suitable habitats. The distribution of raptors, as all wildlife, is affected by man-induced changes in their environment and their living conditions. These include the availability of nesting sites, food resources and safe open areas. Raptors breed successfully, thrive or decline and even go extinct, in many cases, as a result of anthropogenic changes in their habitat. A full hierarchical structure of threat types has been provided by the IUCN Red List assessments (https://www.iucnredlist.org/resources/threat-classification-scheme) but a list of threats exerting known and potential impacts upon the populations of birds of prey may include the following:

1. Agriculture (intensification, abandonment, expansion)
2. Hunting and persecution (trapping, poisoning, shooting)
3. Wetland drainage and land reclamation
4. Human disturbance (intentional or unintentional)

5. Pesticides & pollution (direct or indirect effects)
6. Forestry (intensification, deforestation, selective logging)
7. Predation
8. Forest and tree loss and degradation
9. Hydrological changes
10. Overgrazing
11. Human impact outside National or Regional boundary
12. Electrocution on electric poles
13. Climate change and extreme weather
14. Building and infrastructure development
15. Collision (windfarms, power lines, rail/road kills, aircrafts)
16. Loss of nest sites (e.g. in old buildings)
17. Egg-collecting and taking of young, exploitation
18. Competition for limited resources
19. Fire, including changes to existing burning regimes
20. Fisheries & aquaculture
21. Illegal trade
22. Natural events
23. Infectious and zoonotic diseases
24. Other

The death causes of raptors are of crucial importance to their population dynamics (Table 1), thus there is a great need to identify them in the field or the lab. Assessing the cause of man-induced injuries or death of raptors first needs a close physical examination of the bird found. In many cases, however, the cause of death cannot be determined by a physical examination and it requires lab toxicological analysis. We often observe only the proximate cause of injury or death while the ultimate cause is invisible (e.g., when a sub-lethally poisoned raptor with a coordination disorder gets electrocuted or hit by a car).

Different causes may have similar symptoms but there are specific signs, symptoms and circumstances that may help in the identification of the cause of injury or death. A specific location such as roadsides, railways and the vicinity of power lines may provide an obvious cause of injuries or death of the birds (i.e., roadkill or electrocution). Raptors with serious wounds on the body and with fractured legs or wings may have been shot, hit by a vehicle or collided with power lines, windmills or buildings. Cut feathers and those with holes may refer to shots. Burnt feathers on wings and blackish, burnt cramped legs refer to electrocution on power poles. Raptors in bad physical condition or dead without apparent injuries may have digested contaminated or poisoned food (i.e., in secondary or deliberate poisoning). Live individuals may be unable to fly and even stand, heavily ventilating with partially open beaks. Their wings may be droopy with the wingtips touching the ground. Other signs such as clenched toes, rolling eyes, vomiting, discharge of bloody fluids from the beak and greenish diarrhoea may all refer to poisoning. If the bird can be caught, it should be taken to a veterinarian urgently as it should receive adequate medical care within two hours from the exposure to contaminants or poisons. Raptors in the catabolic state with no injuries or signs of poisoning might have suffered severe shocks (e.g., collision), dehydration or emaciation. Live but injured or weakened raptors should be handled with caution as they have powerful and dangerous beaks

and talons with which they can cause injuries. Both live and dead raptors should be examined using protocols (e.g., using appropriate personal protective equipment such as protective gloves and mask) to avoid the transfer of infections and possible exposure to poisoning.

In the case of dead raptors and following the country-specific due permits (http://www.eurapmon.net/sites/default/files/pdf-s/sampling_and_contaminant_monitoring_protocol_for_raptors_eurapmon_12_2014.pdf), the carcass should be put in a plastic bag with human health precautions, transported and properly stored in a freezer if the lab analysis was not possible in the first 24 hours. It should be taken to a lab within two days of discovery to analyze the ultimate cause of death (However, in some cases an avian pathologist is needed if it is supposed that the bird has died due to disease or a toxicologist in cases of suspected poisoning). If the close environment of the raptor found suspects in wildlife crimes, the police and the responsible state nature conservation body or authorized personnel should be contacted immediately. Suspicious signs may include other dead or weak animals, as well as pieces of meat and other baits such as marked eggs on the scene. In addition, a crime scene may have sharp items scattered around, traps and even weapons. Removal and handling of weapons from the crime scene require a special permit; in most cases, it is best to wait for the law enforcement authorities. Raptor conservation can achieve its objectives only if the timing, scope and severity of threats are properly assessed, root causes are correctly identified, and conservation measures are carefully planned and implemented. Threats often act in a synergistic way and may have a cumulative effect. If gaps in knowledge are likely to affect the understanding of the impact of threats, these should be reflected as research actions. A measure of the level of uncertainty involved with each threat should be indicated in its description. Common sense and the best available information should guide the decision-making process when ranking threats. Ideally, threats should be ranked using a quantitative system describing the speed and the magnitude of the (likely) cause of the decline. However, if precise data on the threat magnitude are not readily available, a decision should be taken based on the best available data and expert judgement, ensuring the ranking is consistent and correct in relative terms of the important point (Figure 1).

TABLE 1 – Main causes of raptor death and drivers affecting raptor population dynamics

	Range size	Population size	Territory occupancy	Breeding success	Productivity	Mate age composition	Survival rate	Recruitment rate
Habitat loss	●	●						
Food scarcity				●	●		●	●
Poisoning	●	●	●	●	●		●	
Persecution	●		●		●	●		
Collision/ electrocution	●		●					

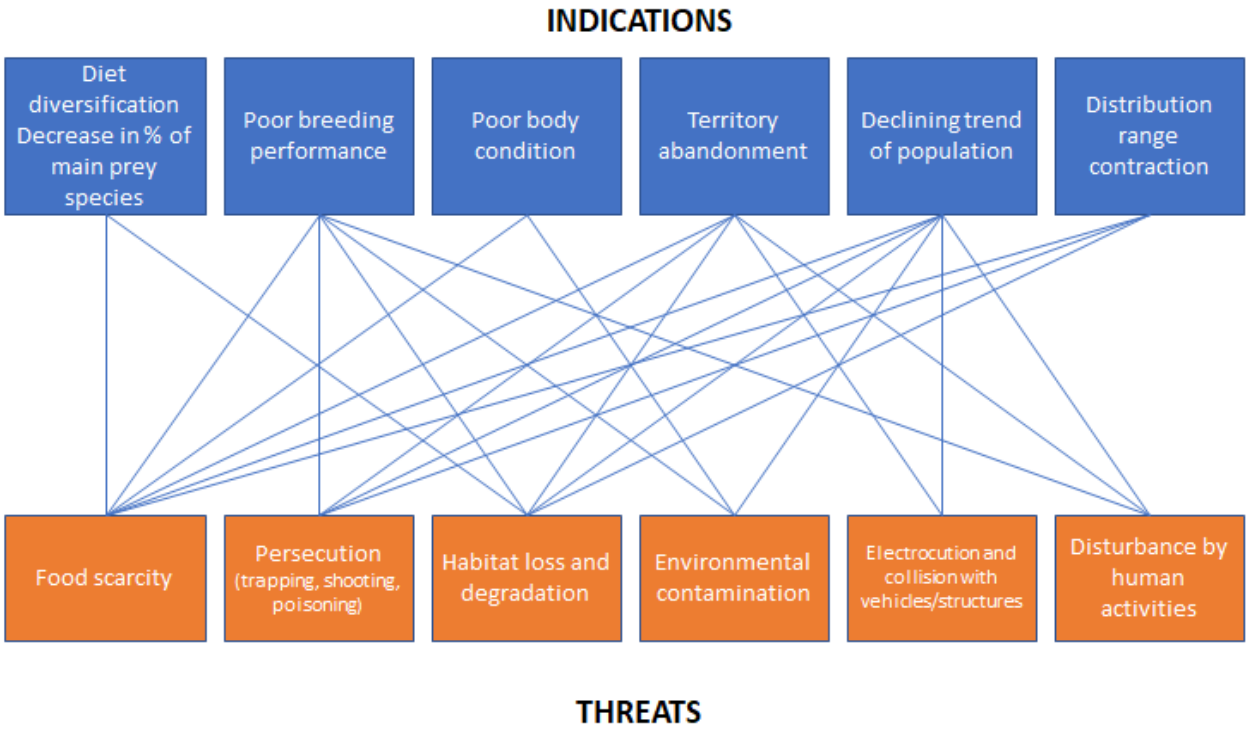

Figure 1– Main raptor threats and parameters used as indicators for population declines

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