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# Causes of human induced mortality of Golden Eagles (*Aquila chrysaetos*) in N. Greece for the period 1991 – 2016.

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**ABSTRACT:** The Golden Eagle (*Aquila chrysaetos*) is a large raptor with no natural predators, low breeding rates, deferred maturity, long life expectancy and is a protected species in Greece and the EU. To better understand the threats facing the species' populations we collected all available information for mortality (and admission in wildlife hospitals) from the regions of Macedonia and Thrace for the period of 1991-2016. From a total of 31 cases, >60% were caused by poisoning incidents. Noteworthy are also a few cases of electrocution and the only recorded case of collision with a wind turbine in Greece. Due to the extensive use of illegal poisoned baits in the country, targeted action is urgently required against the practice at a national level. The European Commission has already initiated preliminary proceedings against Greece after the mass poisoning of Golden Eagles and Griffon Vultures in Nestos gorge. Special consideration is also required in planning, construction and monitoring of Wind Farms and electricity networks, where they coincide with the species distribution, as their apparent expansion may add considerable pressure to an already strained population.

## INTRODUCTION – METHODS:

Understanding the main human induced mortality causes for large raptors like the Golden Eagle (with no natural predators, low breeding rates, deferred sexual maturity and long life expectancy) is necessary for their conservation as this information contains the major population pressures. The Golden Eagle is the only large raptor that maintains relatively intact its distribution and population in Greece with an estimated 125-170 pairs. In the Macedonia and Thrace Divisions, >60 Golden Eagle territories have been recently identified (**HOS unpublished data, Sidiropoulos 2012**) and it is estimated that the area holds >50 % of the national population. The species has been classified as endangered (EN) in the Greek Red Data Book (**Xirouchakis 2009**) although internationally its populations are considered secure (**BirdLife International 2015**). Main reported threats for the country are the illegal use of poisoned baits and shooting (**Xirouchakis 2009**).

Here we collected all known cases from the regions of Macedonia and Thrace for the past 25 years. We included every eagle that required rehabilitation as mortality even if it was subsequently released. Our main sources were:

- The Antipoison Task Force incidents data base (**Korbeti and Politis 2012, Ntemiri and Saravia 2016**) - 8 cases.
- The entry database of the Action for Wildlife rehabilitation centre (**2016**) – 7 Cases
- Field interviews in central and eastern Macedonia and Thrace, mostly of hunters and shepherds – 8 cases.
- Information from the forestry services, national park authorities, NGOs and hunting associations – 9 cases.

The causes were classified according to the main known threats for the species (**Watson 2010**), namely poisoning (verified by toxicological results, recovery of birds next to poisoned baits and clinical evidence), shooting, electrocution, collision with wind turbines and unknown / other causes.

**Table 1: Totals of Golden Eagle mortality causes (1991-2016) in N Greece.**

Poisoning	Shooting	Electrocution	Collision with WT	Unknown
<b>20</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>2</b>

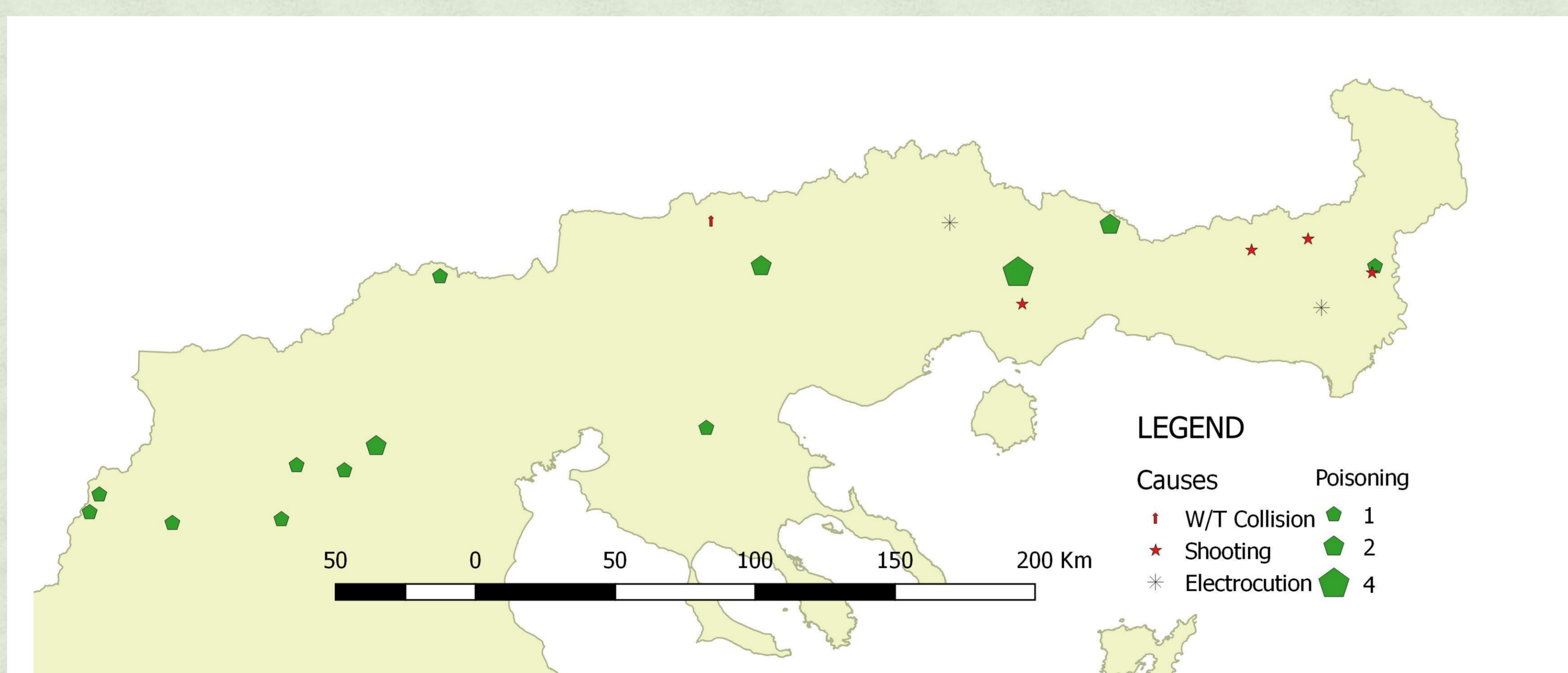


Fig. 1: Distribution of Mortality Incidents in Macedonia and Thrace Divisions



Fig 2: Adult Male, Lekanis Mts, Jul 2016 (Upper), Adult and Immature poisoned in Nestos Gorge, flanked by dead griffons, Feb 2012 (Lower)

## DISCUSSION - CONCLUSIONS:

In total, 31 cases of dead or injured Golden Eagles were collected with >60% caused by poisoning (20). From the poisoned birds, only five were a result of interviews (2 pairs and one single bird). 10 cases in total were birds found in pairs, while 15 were in winter months, 2 in Autumn and 2 not reported exact time ( $\chi^2 = 36.9, P < 0.001$  compared to a random seasonal distribution). Despite the eagles' diet that can include carrion even in the summer (**Sanchez-Zapata et al 2010**), in the study area the species seems to be by far more vulnerable in winter probably due to the absence of tortoises, its main prey (**Handrinos 1996**), during that time.

One remarkable case is the record of an individual at the base of a wind turbine in Mt Agkistrion, the only recorded wind farm collision in Greece (Kerkini Lake National Park Authority 2011) and one of the few in Europe (<20, **LAG VSW 2015**). The apparent

expansion of wind farms and the accompanying infrastructure (e.g. overhead cable grid networks) may increase additive pressure to an already strained by poisoned baits population.

The illegal use of poisoned baits is the most important threat for scavenging raptors in N. Greece (**Skartsi et al 2008; 2014**). The entire Golden Eagle population of the Nestos gorge (2 pairs) was eliminated in a mass poison incident that resulted in the up to date largest Griffon Vulture colony in mainland Greece to be abandoned. This incident was the trigger for the European Commission's preliminary proceedings against Greece for the illegal use of poisoned baits.

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[In Greek] **Korbeti, M. and Politis, N. 2012:** Environmental NGOs and agencies proposals for the illegal use of poisoned baits in Greece. HOS, HSPN., WWF Greece, Anima, Arcturos, Callisto and NHMC **Xirouchakis, S. 2009:** pp 267-268 in Maragkou et al: The Red Data Book of Threatened Animals of Greece. Athens **Lake Kerkini National Park Authority 2011:** Environmental Data Monitoring Program. Yearly Report