



# gypaète barbu



## Life GypHelp



# International symposium on lead poisoning

## 28 September 2015

### Annecy, Haute-Savoie, France

#### This event is jointly organised by

- Asters** – *Conservatoire d'espaces naturels de Haute-Savoie*, coordinator of the LIFE GypHelp project and of the national action plan for the bearded vultures in the French Alps,
- VCF** – *Vulture Conservation Foundation*, the European leader in vulture conservation and coordinator of the bearded vulture reintroduction project in the Alps,
- FDC 74** – *Hunting federation for the department of Haute-Savoie*, combining all hunters and hunting societies of the area, actively participating in wildlife and environmental management, such as the LIFE GypHelp project.

Life GypHelp

#### Financial and technical partners



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## EN - Preface

Welcome to the **international symposium** on lead poisoning in Annecy, France.

Lead poisoning has become a known threat for the bearded vulture population and other rare scavengers in the French Alps. Previous studies have shown that the presence of lead in the alpine environment may be either natural or due to human implication, such as air pollution or hunting ammunition. This event aims at presenting current knowledge and best practices on the issue of lead poisoning, while essentially discussing the risk of lead poisoning by hunting ammunition as one of the possible sources and how to mitigate it, and developing recommendations for conservation actions against lead poisoning.

The symposium gathers European experts working on this issue, stakeholders of the bearded vulture and other raptors' conservation, including hunting organizations and members of the French poisoning surveillance plan, as well as decision-makers.

The symposium will be held in three sessions with talks by invited speakers from France and Europe followed by questions and discussion:

Session 1: Lead effects on wildlife

Session 2: Lead origins

Session 3: International experience

The symposium will be followed by a **workshop** on 29<sup>th</sup> September. This workshop is restricted to invited stakeholders and experts who will discuss potential solutions and elaborate an action plan for reducing lead poisoning risks within the LIFE GypHelp project area located in the French Alps.

## FR - Préface

Bienvenue au **symposium international** sur le saturnisme à Annecy, France.

Le saturnisme, ou intoxication au plomb, est devenu une nouvelle menace pour les populations de Gypaètes barbus et pour les charognards dans les Alpes françaises. Des études ont montré que la présence de plomb dans l'environnement alpin pouvait être d'origine naturelle ou anthropique, comme la pollution de l'air ou les munitions de chasse. Ce symposium vise à présenter l'état des connaissances sur cette problématique et les orientations recherchées pour préciser les risques et améliorer les pratiques. Par l'exemple des munitions de chasse, il abordera les pistes de travail permettant d'atténuer ce risque et de développer des recommandations conformes aux actions de conservation.

Le symposium réunira des experts européens travaillant sur cette question, les responsables des programmes de conservation du Gypaète barbu et d'autres rapaces, les organisations de chasse et les membres du Plan national vigilance poison et de surveillance de l'empoisonnement français, ainsi que les décideurs.

Le symposium consiste en trois sessions avec des communications d'experts français et internationaux. Des questions et discussions suivront les communications.

Session 1: Les effets du plomb sur la faune sauvage

Session 2: Les origines du plomb

Session 3: Expérience internationale

Un **groupe de travail** restreint, composé d'experts et de parties prenantes concernés par la question, se réunira le 29 septembre à la suite du symposium. L'objectif sera d'élaborer un plan d'actions pour réduire l'intoxication au plomb dans le cadre du projet LIFE GypHelp dans les Alpes françaises.

## Opening

- 11:30-12:00 **Welcoming and introduction to the symposium on lead poisoning by:**  
 ASTERS – *Conservatoire d’Espaces Naturels de Haute-Savoie* **Christian Schwoehrer** (director)  
 FDC 74 – *Hunting Federation of Haute-Savoie* **André Mugnier** (president)  
 VCF – *Vulture Conservation Foundation* **Dr. José Tavares** (director)
- 12:00-13:00 **Lunch buffet** (offered by Asters)

### Session 1:

#### Lead effects on wildlife

Chair person: Dr. José Tavares, director of the VCF

- 13:00-13:20 « Presentation of lead poisoning effects on wildlife and birds of prey and impact on population viability »  
**Dr. Rafael Mateo** (*Consejo Superior de Investigaciones Científicas - CSIC - Spain*)
- 13:20-13:40 « Lead poisoning effects on the reintroduced Bearded Vulture population in the Alps »  
**Dr. Hans Frey** (*Coordinator of the bearded vulture EEP - European population management, scientific director the owl and raptor station in Haringsee, Austria and member of the VCF management board*)
- 13:40-14:00 « Lead poisoning in avian scavengers in the French Pyrenees »  
**Martine Razin** (*LPO - League for Bird Protection / BirdLife - France*)
- 14:00-14:20 « Lead effects and origins in wildlife »  
**Prof. Philippe Berny** (*VETAGRO-SUP Campus Vétérinaire de Lyon – France*)
- 14:20-14:35 Questions and discussion
- 14:35-15:00 **Coffee break**

### Session 2:

#### Lead origins

Chair person: : Jean Pierre Arnauduc, technical director of the FNC  
 - National Hunting Federation of France

- 15:00-15:20 « Hunting activities and lead poisoning »  
**Dr. Julien Portier** (*Scientific adviser for sciences and fauna, national hunting federation , Paris, France*)
- 15:20-15:40 « Excessive lead burden among Golden eagles and the search for the source of lead »  
**Dr. David Jenny** (*Swiss Ornithological Institute (Vogelwarte) Sempach, Switzerland*)
- 15:40-16:00 « Lead exposure in scavengers in relation to the hunting of wild ungulates »  
**Dr. Enrico Bassi** (*Stelvio National Park/Province of Sondrio - Italy*)
- 16:00-16:20 Questions and discussion
- 16:20-16:40 **Coffee break**

### Session 3:

#### International experience

Chair person: Enrico Bassi Présidence : Dr. Enrico Bassi, ornithologist and consultant of Stelvio National Park and Sondrio Province

- 16:40-17:00 « International experience and legal background of the lead poisoning problem in Europe »  
**Dr. Alessandro Andreotti** (*ISPRA – Istituto Superiore per la Ricerca e la Protezione Ambientale - Italy*)
- 17:00-17:20 « Hunting efficiency with non-toxic ammunition »  
**Dr. Ettore Zanon** (*Edmund Mach Foundation - Training and Education Centre- Italy*)
- 17:20-17:40 « Transition to lead free bullets in hunting - Status of Science and Policy proceedings in Germany »  
**M. Sc. Carl Gremse** (*Eberswalde University of Applied Sciences, Germany, Department of Wildlife Biology, -Management & Hunting Practices*)
- 17:40-18:00 Questions, discussion and closing words – **Dr. José Tavares**

## Ouverture

- 11:30-12:00 **Accueil et introduction du symposium sur le saturnisme** par:  
 Asters – *Conservatoire d'espaces naturels de Haute-Savoie*, **Christian Schwoehrer** (directeur)  
 FDC 74 – *Fédération des chasseurs de Haute-Savoie*, **André Mugnier** (président)  
 VCF – *Vulture Conservation Foundation*, **Dr. José Tavares** (directeur)
- 12:00-13:00 **Buffet** (offert par Asters)

### Session 1 :

## Les effets du plomb sur la faune sauvage

Présidence : Dr. José Tavares, directeur de la VCF

- 13:00-13:20 « Les effets de l'intoxication au plomb sur la faune sauvage, notamment des rapaces, et l'impact sur la viabilité de la population »  
**Dr. Rafael Mateo** (*Consejo Superior de Investigaciones Cientificas - CSIC - Espagne*)
- 13:20-13:40 « Les effets de l'intoxication au plomb sur la population de Gypaètes barbus dans les Alpes »  
**Dr. Hans Frey** (*Coordinateur du Gypaète barbu EEP – Gestion européen des populations, directeur scientifique de la station des rapaces à Haringsee, Autriche, et membre du directoire de la VCF*)
- 13:40-14:00 « Le saturnisme chez les rapaces nécrophages des Pyrénées françaises »  
**Martine Razin** (*LPO - Ligue pour la Protection des Oiseaux / BirdLife - France*)
- 14:00-14:20 « Les effets et les origines du plomb sur la faune sauvage »  
**Prof. Philippe Berny** (*VETAGRO-SUP Campus Vétérinaire de Lyon – France*)
- 14:20-14:35 Questions et discussion
- 14:35-15:00 **Pause café**

### Session 2 :

## Les origines du plomb

Présidence : Jean Pierre Arnauduc, directeur technique de la FNC  
 - Fédération Nationale des Chasseurs en France

- 15:00-15:20 « Activités de chasse et intoxication au plomb »  
**Dr. Julien Portier** (*Conseiller scientifique pour Sciences et Faune de la Fédération Nationale des Chasseurs, Paris, France*)
- 15:20-15:40 « Les origines du plomb dans l'environnement et les méthodes pour leur identification »  
**Dr. David Jenny** (*Suisse Institut pour Ornithologie (Vogelwarte), Sempach, Suisse*)
- 15:40-16:00 « L'exposition des charognards au plomb en relation avec la chasse des ongulés sauvages »  
**Dr. Enrico Bassi** (*Parc National du Stelvio / Province de Sondrio - Italie*)
- 16:00-16:20 Questions et discussion
- 16:20-16:40 **Pause café**

### Session 3 :

## Expérience internationale

Présidence : Dr. Enrico Bassi,  
 ornithologue et consultant du Parc National de Stelvio / Province de Sondrio

- 16:40-17:00 « Expérience internationale et contexte législatif du problème d'intoxication au plomb en Europe »  
**Dr. Alessandro Andreotti** (*ISPRA – Istituto Superiore per la Ricerca e la Protezione Ambientale - Italie*)
- 17:00-17:20 « Efficacité des munitions non-toxiques pour la pratique de la chasse (meilleure expérience des pratiques en Italie) »  
**Dr. Ettore Zanon** (*Edmund Mach Foundation – Centre d'entraînement et de l'éducation - Italie*)
- 17:20-17:40 « Transition vers les balles sans plomb dans la chasse – Statut scientifique et démarches législatives en Allemagne »  
**M. Sc. Carl Gremse** (*FWWJ Institut du développement durable, Département de Biologie de la Faune sauvage, - Gestion et Chasse, Eberswalde – Allemagne*)
- 17:40-18:00 Questions, discussion et conclusion – **Dr. José Tavares**

# Symposium Abstracts

## SESSION 1

### **EN Presentation of lead poisoning effects on wildlife and birds of prey and impact on population viability**

Dr. Rafael Mateo - [Rafael.Mateo@uclm.es](mailto:Rafael.Mateo@uclm.es)

*Spanish Institute of Game and Wildlife Research, IREC (CSIC-UCLM-JCCM), Ciudad Real (Spain)*

Birds of prey, especially obligatory and occasional scavengers, are at high risk of lead poisoning when they feed on carcasses or prey with embedded lead ammunition in their flesh. Although in many cases, the lead shot or bullet fragments are regurgitated with undigested material such as hair and feathers in the form of pellets, the absorption of lead during food digestion can be enough to kill the raptors. Cases of lead poisoning by shot or bullet ingestion have been described in at least 14 species of diurnal birds of prey and three species of nocturnal raptors in Europe, some of which have endangered or near-threatened populations, such as the White-tailed Eagle (*Haliaeetus albicilla*), the Spanish Imperial Eagle (*Aquila adalberti*) or the Bearded vulture (*Gypaetus barbatus*). In the case of the White-tailed Eagle, lead poisoning has been identified as the cause of mortality in 25% of the studied cases. The Golden Eagle (*Aquila chrysaetos*) is another of the large eagles with cases of lead poisoning reported in several countries across Europe. Species inhabiting wetlands and feeding on crippled waterfowl, such as the Spanish Imperial Eagle or the Marsh harrier (*Circus aeruginosus*) were especially at risk before the ban of lead shot adopted in many countries, but there is limited information about the effect of this regulation on birds of prey. All the four vulture species in Europe have shown cases of lead poisoning. High prevalences of elevated blood lead levels are found in the Griffon vulture (*Gyps fulvus*) in Spain, although other sources apart of lead ammunition may exist. The sedentary population of Egyptian vulture (*Neophron percnopterus*) of the Canary Islands also suffers an important Pb exposure during the hunting season and some adverse effects on bone mineralization have been associated with bone lead levels. Bearded vulture is another species at risk and its feeding behaviour on the tissue with higher lead level (i.e. bones) can represent an extra risk of exposure to this toxic metal. In addition to the observed mortality, lead can produce adverse effects on the reproduction and the immune function of the sub-lethally exposed birds, so the monitoring studies of the breeding success and mortality of the endangered raptors should consider lead exposure, as well as other toxicants, as drivers of their population dynamics.

### **EN Lead poisoning effects on the reintroduced Bearded Vulture population in the Alps**

OR. Dr. med. vet. Hans Frey - [h.frey@4vultures.org](mailto:h.frey@4vultures.org)

*Coordinator of the bearded vulture EEP (European population management), scientific director the owl and raptor station in Haringsee, Austria and member of the VCF (Vulture Conservation Foundation) management board*

After a short overview about the Alpine bearded vulture project including history, methods and goals and the recent population the impact of lead poisoning on the new established Alpine subpopulation is analysed. Nevertheless lead poisoning is playing an important role also in the captive breeding network. An analysis of the reasons of deaths in captive birds demonstrates the influence of lead within the EEP. Symptoms of bearded vultures contaminated with lead are described and the reasons of the high sensibility of this species regarding lead are discussed.

 **FR Le saturnisme chez les grands rapaces des Pyrénées françaises**

Martine Razin - [martine.razin@lpo.fr](mailto:martine.razin@lpo.fr)

LPO - Ligue pour la Protection des Oiseaux / BirdLife - France

Le gypaète barbu, le vautour percnoptère, le milan royal et le vautour fauve représentent respectivement 72%, 77%, 15-20% et 57% des effectifs français. Les trois premières espèces sont menacées et bénéficient de plans de conservation officiels; le vautour fauve plus abondant localement est un bon indicateur des causes de mortalité pour le gypaète barbu. Au total 170 oiseaux (8 gypaètes barbus, 9 vautours percnoptères, 34 milans royaux et 119 vautours fauves) ont été étudiés entre 2005 et 2012 dans les Pyrénées. Les causes de mortalité sont souvent multifactorielles mais l'intoxication est de loin la plus fréquente des causes de mortalité. Le saturnisme a été identifié comme un problème toxique significatif : des expositions positives ont été détectées dans 25% des oiseaux et les intoxications aiguës au plomb représentent 17% de tous les cas d'empoisonnement. Les corps non ramassés des oiseaux migrateurs ainsi que ceux du gibier local tels que ceux des ongulés sauvages, peuvent représenter une ressource alimentaire saisonnière importante pour ces rapaces nécrophages qui peuvent ainsi être victimes d'exposition accidentelle au plomb. Le choix de munitions alternatives serait un geste fort en faveur de leur conservation.

**EN Lead poisoning in avian scavengers in the French Pyrenees**

Martine Razin - [martine.razin@lpo.fr](mailto:martine.razin@lpo.fr)

LPO - League for Bird Protection / BirdLife, France

The Bearded Vulture, the Egyptian Vulture, the Red kite, and the Griffon Vulture represent 72%, 77%, 15-20% et 57% of the French populations respectively. The three first species are endangered and benefit from official conservation plans; the Griffon Vulture, being locally more abundant, is a well adapted indicator species for mortality events of the Bearded Vulture. In total 170 birds (8 Bearded Vultures, 9 Egyptian Vultures, 34 Red kites and 119 Griffon Vultures) were studied in the Pyrenees between 2005 and 2012. Mortality events were often multifactorial but poisoning was by far the most common cause of death. Saturnism was identified as a significant toxicant issue: positive expositions were detected in 25% of birds and acute lead intoxications represented 17% of all poisoning cases. Unrecovered bodies of migratory birds as well as bodies of local game species not collected such as wild ungulates may represent an important seasonal food source for scavenging bird species who may then become accidentally exposed victims to lead. The choice of alternatives to lead ammunition in hunting would be an important gesture in favor of these birds' conservation.

 **EN Lead effects and origins in wildlife**

Prof. Philippe Berny - [philippe.berny@vetagro-sup.fr](mailto:philippe.berny@vetagro-sup.fr)

Toxicology, VETAGRO-SUP, Campus Vétérinaire de Lyon, France

Lead poisoning has long been described as a major pathological concern in wildlife, in many different species and in many places around the world. Thousands of birds are killed every year, as a result of lead poisoning. Its significance has been recognized in waterfowl for decades, as a result of the presence of lead bullets and ammunitions in the crop or gizzard. Prevalence of exposure may be as high as 45% in some places. More recently, lead exposure has also been described in birds of prey and is now considered as a major issue in many species, including the bearded vulture, griffon vultures or red kites in Europe.

Lead poisoning result in neurological and digestive signs associated. Birds display weakness, blindness, limb weakness, behavioral disorders green diarrhea and weight loss. The definite diagnosis relies on measurement of lead in tissues or fluids.

Lead sources are difficult to identify in wildlife. Lead may be found in soil (geological lead), in paints (breeding units), in batteries, water pipes etc. The single most common source of lead is related to hunting. Lead released in the environment can be found in soil, sediments and be ingested as grinding material in waterfowl. In birds of prey, lead contamination may occur via ingestion of preys, which survived shooting and contain lead fragments. Because birds of prey have a very acidic gastric environment, lead particles will dissolve rapidly and lead can accumulate in soft tissues. Another, poorly recognized, source of lead could be related to shooting of birds of prey. It is usually considered that embedded lead shots should not release lead, but some clinical cases and epidemiological results suggest that this may happen in many instances. Locally, geological sources may be considered (old mines), as well as chronic exposure from water, but these two instances are quite uncommon in Europe nowadays.

## SESSION 2



### **FR Activités de chasse et intoxication au plomb**

Dr. Julien Portier - [jul\\_portier@hotmail.fr](mailto:jul_portier@hotmail.fr)

*Conseiller scientifique pour Sciences et Faune de la FNC - Fédération Nationale des Chasseurs, Paris, France*

- Présentation du projet mené depuis juin par un expert indépendant. En raison des questions nationales et européennes sur ce sujet, la FNC a souhaité entreprendre une évaluation la plus complète possible des risques, afin d'identifier et de caractériser les impacts potentiels du plomb cynégétique sur les oiseaux terrestres, ainsi que les éventuels travaux complémentaires à mener pour atteindre cet objectif
- Dans le cadre de ce projet, présentation de la démarche d'évaluation, une première identification des oiseaux exposés et de ceux qui sont particulièrement à risque (à priori, en attente de résultats) de par leurs structures de population et leur statut menacé en France
- 1ère évaluation des apports de plomb cynégétique (ou de leur variation) à partir de cas concrets soit départementaux soit plus locaux si disponibles d'ici là
- Explication sur l'importance de caractériser correctement un impact potentiel, qui correspond à des expositions généralement très contextualisées, notamment en matière cynégétique, et difficilement généralisables.

### **EN Hunting activities and lead poisoning**

Dr. Julien Portier - [jul\\_portier@hotmail.fr](mailto:jul_portier@hotmail.fr)

*Scientific adviser for sciences and fauna of the FNC - National hunting federation, Paris, France*

- Presentation of a project on the evaluation of lead poisoning risks for terrestrial birds in France, initiated by an independent expert in June 2015 in France. As a consequence of national and European queries concerning saturnism, the national hunting federation of France (FNC) required to conduct an evaluation of lead poisoning risks, as complete as possible, in order to identify and characterize the potential impacts of lead in hunting ammunition on terrestrial birds as well as eventual complementary work to conduct to accomplish this objective.
- In the context of this project, the evaluation approaches will be presented as well as a first identification of exposed bird species and those being particularly at risk depending on their population structure and the degree of exposure to this risk in France (although still waiting for result confirmation).
- If already accessible the day of the symposium, presentation of a first evaluation of the presence of lead from hunting ammunition (or of their variation), derived from concrete cases on the most local level.
- Explanation of the importance to correctly characterize a potential impact, which corresponds on generally very contextual expositions, in particular in hunting, being difficult to generalize.

## EN Excessive lead burden among golden eagles and the search for the source of lead

Dr. David Jenny - [jenny.d@compunet.ch](mailto:jenny.d@compunet.ch)

Swiss Ornithological Institute, Sempach, Switzerland

In eastern Switzerland dead found golden eagles *Aquila chrysaetos* which are frequent scavengers were analysed for lead in liver, kidney, feathers and bones. Three golden eagles were found with acute lead poisoning. Bones of the golden eagles contained 10 times more lead than bones of eagle owls *Bubo bubo* which feed only on live-caught prey. In order to investigate whether the sublethal lead of golden eagle originates from ammunition or from generic environmental contamination, lead isotope ratios were examined. Lead isotope signatures of golden eagle bones were very similar to those of hunting ammunition, but differed significantly from the signatures of bones of their prey, eagle owls and soil. These findings indicate that in the Alps, most golden eagles take up lead from spent ammunition in carcasses or their offal in sublethal quantities throughout their life and a few in lethal quantities leading to acute lead poisoning. In order to examine the patterns of lead intake, the segments of flight feathers were segmented and analysed. In 22% of the golden eagles, one segment had a high lead concentration, while the other two segments had a low concentration. This indicates an episodic intake of lead that may be immediately fatal or sublethal. Such an episodic lead uptake can be explained by ingestion of lead particles from carcasses or offal left behind by hunters. Surveys using camera traps during the ibex hunting in Grisons showed that golden eagles systematically consume the offals of the hunted ungulates: at 4 locations 4 different golden eagles were photo trapped within a few hours after the ibex were shot.

These findings in golden eagles underlines the importance of lead poisoning by hunting ammunition also for other scavengers, notably for the bearded vulture *Gypaetus barbatus* for which several cases of acute lead poisoning and high levels of lead in bones are documented.

<http://iopscience.iop.org/1748-9326/10/3/034003/article>

<http://link.springer.com/article/10.1007/s10336-015-1220-7#page-1>

The studies were carried out by the Swiss Ornithological Institute in cooperation with the Fish and Game Department of the Canton of Grisons, the Department of Forensic Pharmacology and Toxicology at the University of Zurich and the Institute of Veterinary Pharmacology and Toxicology at the University of Zurich.

## EN Lead exposure in scavengers in relation to ungulates hunting

**Relator:** Enrico Bassi (*Stelvio National Park/Province of Sondrio, Italy*) - [enrico.bassi76@gmail.com](mailto:enrico.bassi76@gmail.com)

**Other authors:** Maria Ferloni, Mauro Di Giancamillo, Guido Grilli, Alessandro Gugiatti & Luca Pedrotti

Wildlife may be exposed to lead contamination as a consequence of hunting activities. Waterfowls and grouses may directly assume lead from the ground (primary assumption), while in raptors lead intoxication may be due to the ingestion of preys with elevated lead concentrations in the tissues (secondary assumption). Recent studies demonstrate that viscera of shot ungulates are quite often directly contaminated with lead, due to bullet fragmentation after the shot. If released on the ground, viscera represent a serious threat for scavenger species. The viscera of 153 ungulates shot in Sondrio Province during hunting seasons 2009 and 2010 have been collected and examined, to detect and quantify lead presence. Information regarding the hunted animal, the type of ammunition, the condition and outcome of the shot have been collected as ancillary data. Lead fragments in the samples have been investigated through CAT (computed axial tomography) and digital radiography and subsequently manually collected. Overall, in 62.1% of samples, lead fragments have been detected. Higher frequencies have been recorded in roe deer (77.7%), chamois (69.6%) while lower in red deer (50%). These preliminary outcomes confirm the high risk of lead intoxication for large raptors in areas where ungulates are commonly hunted and demonstrate the need of more sustainable hunting practices, such as the substitution of lead ammunition with non-toxic bullets (made in copper).

## SESSION 3

### **EN International experience and legal background of the lead poisoning problem in Europe**

Dr. Alessandro Andreotti - [alessandro.andreotti@isprambiente.it](mailto:alessandro.andreotti@isprambiente.it)

ISPRA - Istituto Superiore per la Ricerca e la Protezione Ambientale - Italy

The first concern about the use of lead ammunition arose many decades ago, when it was proved that waterbirds are used to swallow shot pellets intentionally to facilitate the grinding of food in their muscular gizzard. To prevent the death of many thousands of ducks, geese, swans, and shorebirds, in the '80s and '90s some western countries banned the use of lead ammunition for the hunting in wetlands. Later, the necessity of a coordinated action to avoid lead poisoning in waterbirds was recognised at the international level, when the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) was ratified under the umbrella of the Bonn Convention for the Conservation of Migratory Species (CMS-UNEP) (<http://www.unep-aewa.org/>). As a consequence, more States, signatory parties of AEWA, introduced specific legislations to ban lead ammunition in wetlands, in order to comply their obligations.

Conversely, the negative impact of lead ammunition on terrestrial ecosystem was recognised only recently, thus the awareness of the relevant effects on both terrestrial birds and the human health is not yet widespread. Until now only few countries have introduced a total ban of lead ammunition, but an important step forward has been taken in 2014, when the Conference of the Parties of CMS approved a resolution to prevent the poisoning of migratory birds. This resolution urges Parties to create legislative processes to restrict sale, possession and/or use of lead ammunition to ensure lead ammunition is not left un-retrieved within the environment <http://www.cms.int/en/document/preventing-poisoning-migratory-birds>.

Furthermore, new evidences of lead toxicity are inducing the European authorities to introduce a stricter regulation on the use of this substance, in order to avoid the risks related to the assumption of lead by humans. This circumstance will facilitate the substitution of toxic to non-toxic ammunition.

### **EN Hunting efficiency with non-toxic ammunition**

Dr. Ettore Zanon - [ettore.zanon@gmail.com](mailto:ettore.zanon@gmail.com)

*Coordinator of the AAFF (Accademia Ambiente Foreste e Fauna del Trentino, Edmund Mach Foundation) a lifelong learning school dedicated to environmental education & training and sustainable use of wildlife. Education manager of Obora Hunting Academy (CZ). Wildlife and hunting journalist.*

Non-toxic bullets are used for many years all over the world. They were initially created just to improve ballistic efficiency in hunting ammunition. But, many hunters remain skeptical on the effectiveness of these projectiles.

After some short information and definition on hunting bullets, are reported the experience with lead-free ammunition of some professional hunters in Europe and the data on animals culled (with or without lead-free ammo) collected by two Italian public authorities: Natural Regional Park of "Gola della Rossa e di Frasassi" and Stelvio National Park.

The efficiency of non-toxic hunting bullets is evident, and their use shows almost only positive aspects, including the environmental and conservational ones.

### **EN Transition to lead free bullets in hunting - Status of Science and Policy proceedings in Germany**

M. Sc. Carl Gremse - [Carl.Gremse@hnee.de](mailto:Carl.Gremse@hnee.de)

*Eberswalde University of Applied Sciences, Germany, Department of Wildlife Biology, -Management & Hunting Practices*

## **Studies regarding the use of rifle bullets in hunting – Killing effectivity and material deposit**

We summarize the present studies (Killing Effects of Hunting rifle bullets, 2014, Analysis of bullet performance PLOS ONE, 2014, Project "Food Safety of game meat", 2014) extending the FWWJ report to the Federal German Ministry for Food and Agriculture for the decision support project "Furthering studies on the killing effect of lead-free bullets" submitted on 30.11.2012.

These projects, extending investigations on behalf of the State of Brandenburg, examined the killing effect of lead-free bullets in hunting activities on ungulates, the methods used to analyze killing effectivity and material deposition into the meat of hunted animals.

- The game species distribution and the mass distribution in the monitoring of Brandenburg as well as in Federal monitoring are complementary and reflect German hunting conditions. Merging records from both studies therefore appears warranted. 11.371 records were obtained.
- The running distance from the point, where the animal was, when the bullet struck to where it succumbed, was analyzed. No escapes were observed for 53% of occurrences with lead-containing bullets and 44 % for lead-free bullets. Unwanted long escape routes of over 40 meters were observed in both groups of materials.
- The impact location is the generally most important variable for a satisfactory outcome of the engagement.
- The bigger / heavier the animal, the further it will generally run after being shot.
- High bullet impact energy and a vital impact location not necessarily guarantee a short escape distance.
- Different types of bullets distribute available impact energy differently efficient into the terminally relevant sections of the shooting channel. The study shows that a high efficiency can be achieved with both leaded and lead-free projectiles.
- The impact energy is not equal to the terminally effective energy. Without accurate information on the actually available, terminally relevant energy delivery, the impact energy is an inadequate measure for localization of a fast killing effect. The German Federal Hunting Act will be adapted to the state of knowledge.
- By linking terminal performance laboratory data with field data we show that with the use of rifle bullets in hunting activities within a distance range in which it is ensured that the bullet in ballistic soap achieves a power output of > 1500 joules in depth on Segment 1-3 (0 -15cm), escape distances remain on average below 30 meters. A relationship between measured values for bullet effectiveness and observations of shot effects has been established.
- Through the presented test methods a bullet specific lower border velocity can be determined and thereby caliber/cartridge specific lower border distances derived. The procedures can be used in bullet development. The current test projectiles are a representative cross section of possible designs and operating principles so that new types of bullets can be tested in future comparative of the proposed method in ballistic media.
- Focusing on the actual measurable ballistic performance gives the hunter the opportunity to select application specific products.
- For open land areas 12.8 %, for mountain areas over 40% of hunters indicated regular shooting distances of more than 200 m to 300 m. With the presented methods, bullet selection for these distances is possible. The bullets performance boundaries should be determined by the manufacturers, independently confirmed and made available to the user on the smallest commercially available packaging unit.
- Abandoning of lead as a bullet material for hunting bullets is possible. Quick and ethical kills of animal in hunting activities can be ensured by the presented methods – regardless of bullet material.