

# Lead exposure in scavengers in relation to the hunting of wild ungulates



PARK  
NAZIONALE  
DELLO  
STELVIO  
  
NATIONAL  
PARK  
STILFSER  
JOCH



Provincia di  
Sondrio

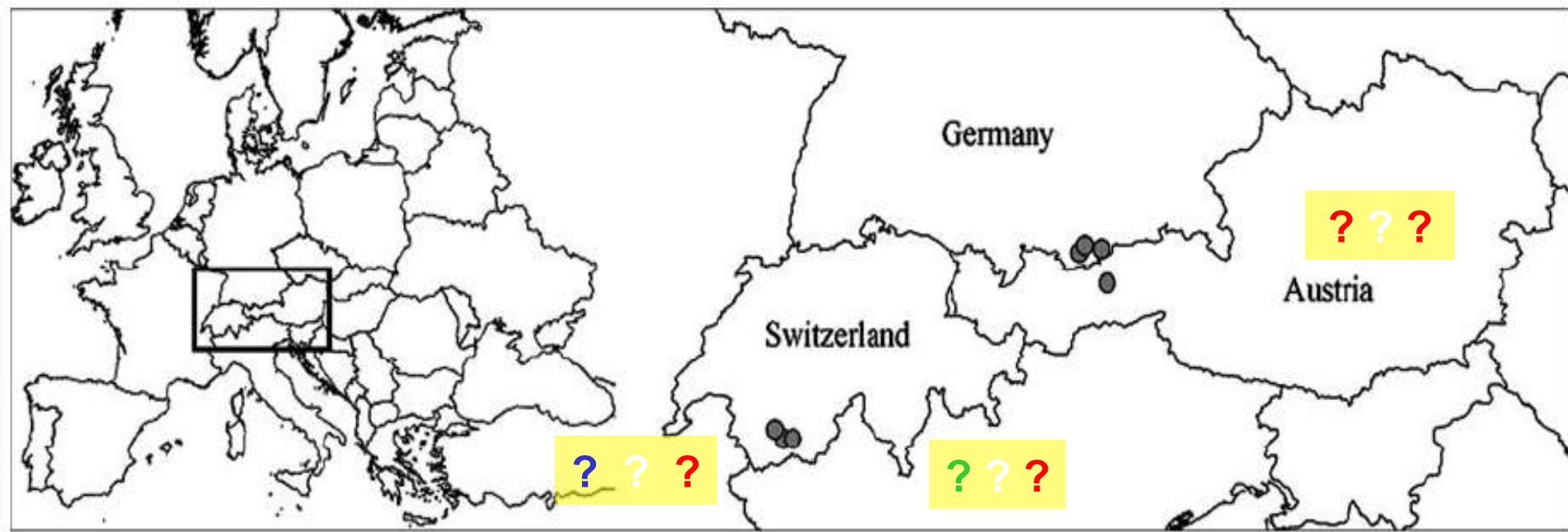
Christian Siegenthaler



**Enrico BASSI, Maria FERLONI, Mauro DI GIANCAMILLO  
Guido GRILLI, Alessandro GUGIATTI & Luca PEDROTTI**

## Starting Point

### Golden Eagle: very few info for Alps



**Lead poisoning and heavy metal exposure of golden eagles  
(*Aquila chrysaetos*) from the European Alps**

Norbert Kenntner · Yvon Crettenand ·  
Hans-Joachim Fünfstück · Martin Janovsky ·  
Frieda Tataruch

**2000-2001:  
7 GE intoxicated in  
only 2 years**

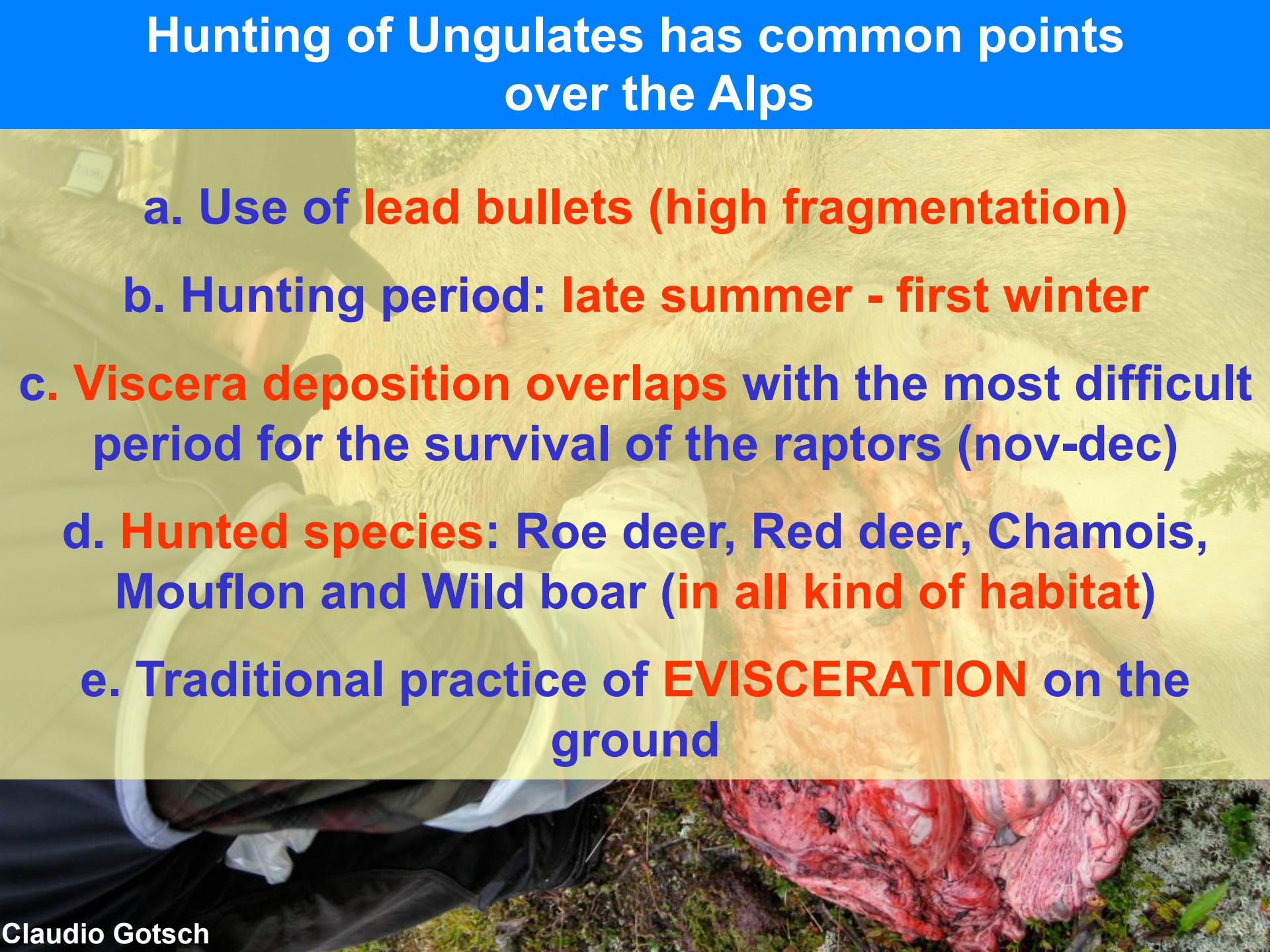
Received: 29 March 2006 / Revised: 29 October 2006 / Accepted: 31 October 2006 / Published online: 21 December 2006  
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# *IS THERE THE SAME RISK OVER THE WHOLE ALPINE ARCH?*

Michele Mendi



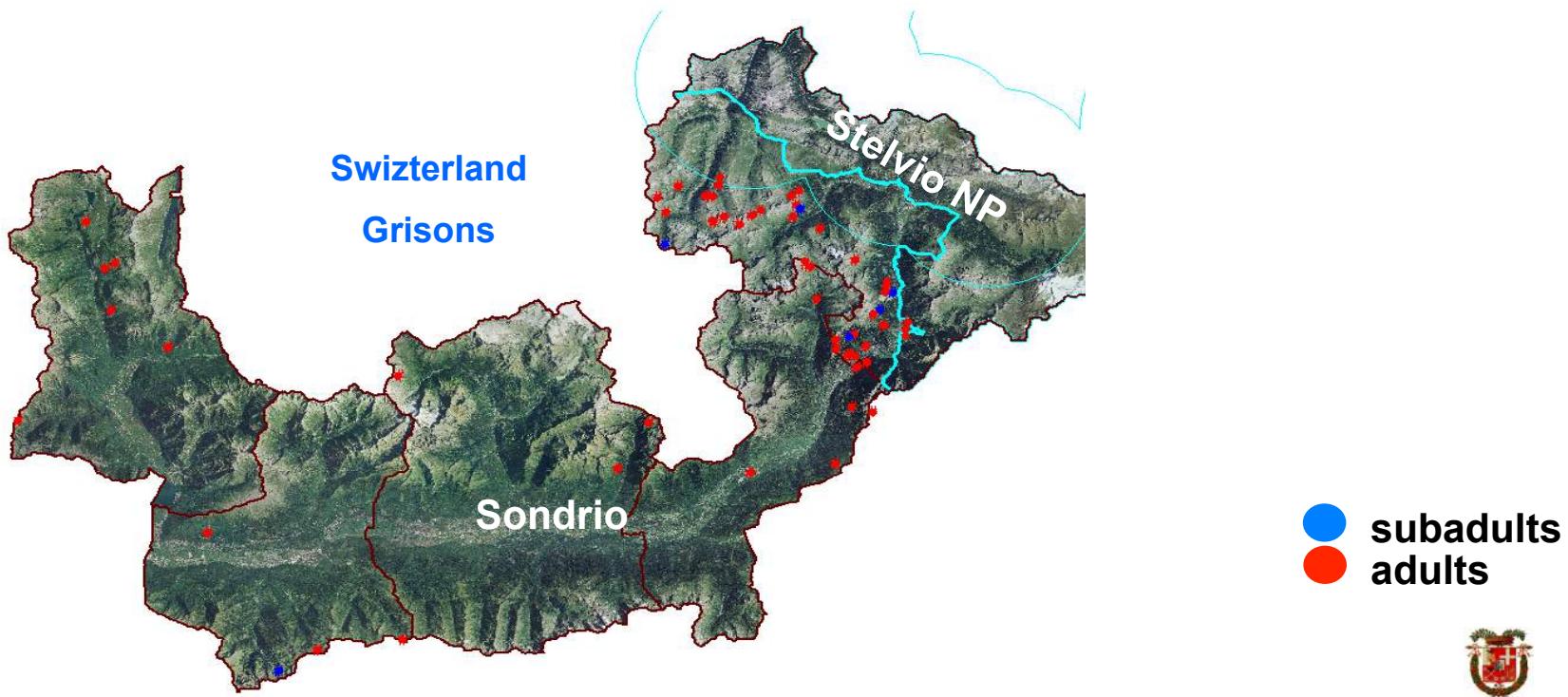
# Hunting of Ungulates has common points over the Alps

- 
- a. Use of lead bullets (high fragmentation)
  - b. Hunting period: late summer - first winter
  - c. Viscera deposition overlaps with the most difficult period for the survival of the raptors (nov-dec)
  - d. Hunted species: Roe deer, Red deer, Chamois, Mouflon and Wild boar (in all kind of habitat)
  - e. Traditional practice of EVISCERATION on the ground

Since 1998 to now, 4 BV breeding pairs only in Stelvio NP (no hunting-area).  
None outside despite an increase of observations.

*A so slow growth could also be hindered by lead contamination?*

*'Lead' such one of Limiting factor for the increase of alpine population?*



Provincia di Sondrio

Period 2010-2012

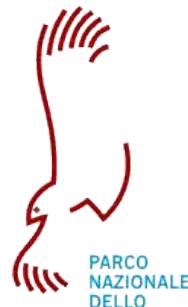
1<sup>st</sup> experimental survey. Evaluation of the lead accumulation in viscera

**150 viscera of shot Ungulates**

**... 15.000 euro**



*Provincia di Sondrio*



PARCO  
NAZIONALE  
DELLO  
STELVIO



NATIONAL  
PARK  
STILFSER  
JOCH

**fondazione  
c a r i p l o**

**PARTNER**



*University of Milano*

# AIMS

Development of an experimental methodology  
for lead detection in shot ungulates (random sampling)

FREQUENCY and WEIGHT of the lead fragments  
related to hunted species and to the type of the firearm and  
ammunition



Analysis of INCIDENCE of evisceration on the hunting spot

More sustainable hunting practices:  
no left viscera on the ground + not toxic shots

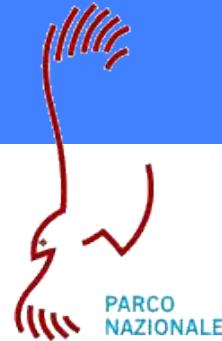
# REGISTRATION DATA SHEETS

*Full collaboration with local hunters*



*Ricerca sull'accumulo di piombo nei visceri degli ungulati selvatici abbattuti*

## SCHEDA PER LA RACCOLTA DEI VISCERI



PARCO  
NAZIONALE  
DELLO  
STELVIO

NATIONAL  
PARK  
STILFSER  
JOCH

Nome operatore/i: .....

Nº contrassegno capo abbattuto ..... Codice visceri\*: .....

\* solo se capo NON abbattuto a caccia

**DATI RELATIVI ALL'ABBATTIMENTO:** Abbattuto  Recuperato con cane  ferito  morto

Comprensorio Alpino: ..... Settore di caccia: .....

Data abbattimento ..... Ora: ..... Data eviscerazione: ..... Ora: .....

Nome cacciatore e telefono: .....

Capo abbattuto da ignoti  Recuperato da ..... Nota: .....

### DATI BALISTICI

Calibro ..... Velocità di uscita ..... (come indicato su .....

Cartuccia commerciale: marca: ..... tipo palla: .....

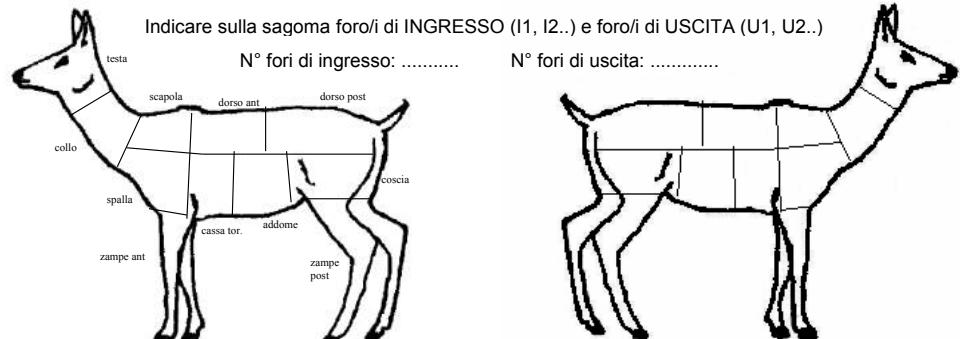
Ricarica: tipo palla: ..... peso (grani): .....

Distanza tiro: 0-100 m  100-200 m  200-300 m

Nº totale di colpi sparati: ..... Nº di colpi a segno: .....

### ESAME DEL CAPO ABBATTUTO

Camoscio  Cervo  Capriolo  Cinghiale  Sesso: M  F  Età: ..... Peso visceri kg .....



Regione/i colpita/e (barrare con 1/più crocette): Testa  Collo  Spalla  Scapola  Cassa toracica  Petto  Dorso (parte anteriore)  Dorso (parte posteriore)  Coscia  Zampe anteriori  Zampe posteriori  Addome

Organi colpiti: Cuore  Polmoni  Fegato  Stomaco  Intestino  Reni  Non noto

Ossa colpite: NO  SI  quali? .....

Raccolta visceri: Intestino  Stomaci e milza  Cuore  Polmone  Fegato  Reni  altro: .....

Proiettile ritrovato: NO  SI \*, in quale regione: ..... \* (NB: allegare alla scheda tutti i frammenti del proiettile)

# Practical PROBLEMS: 153 viscera to analyse

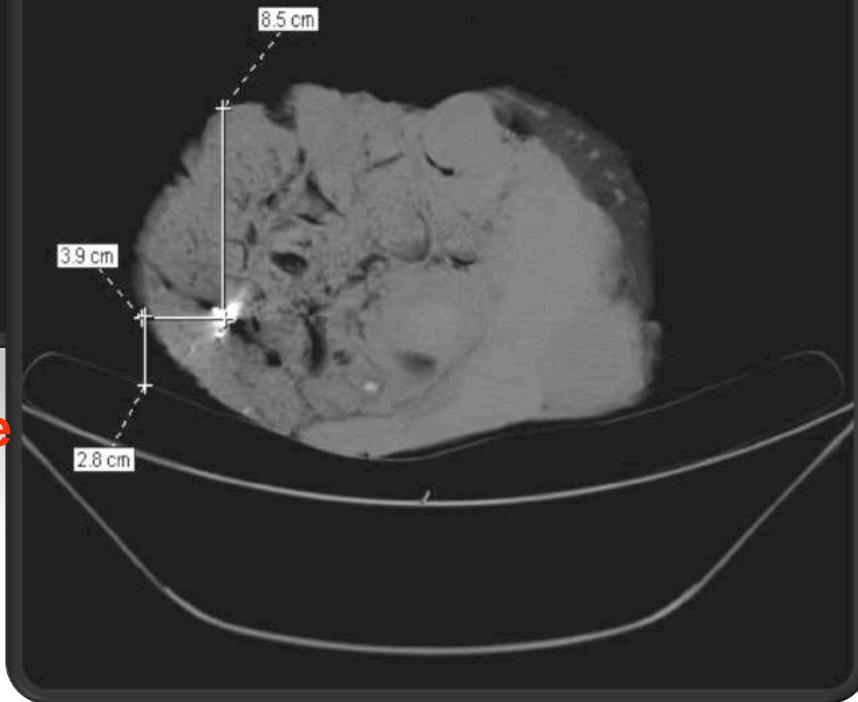


# CT INVESTIGATION of the FROZEN VISCERA

CT →

Densitometer

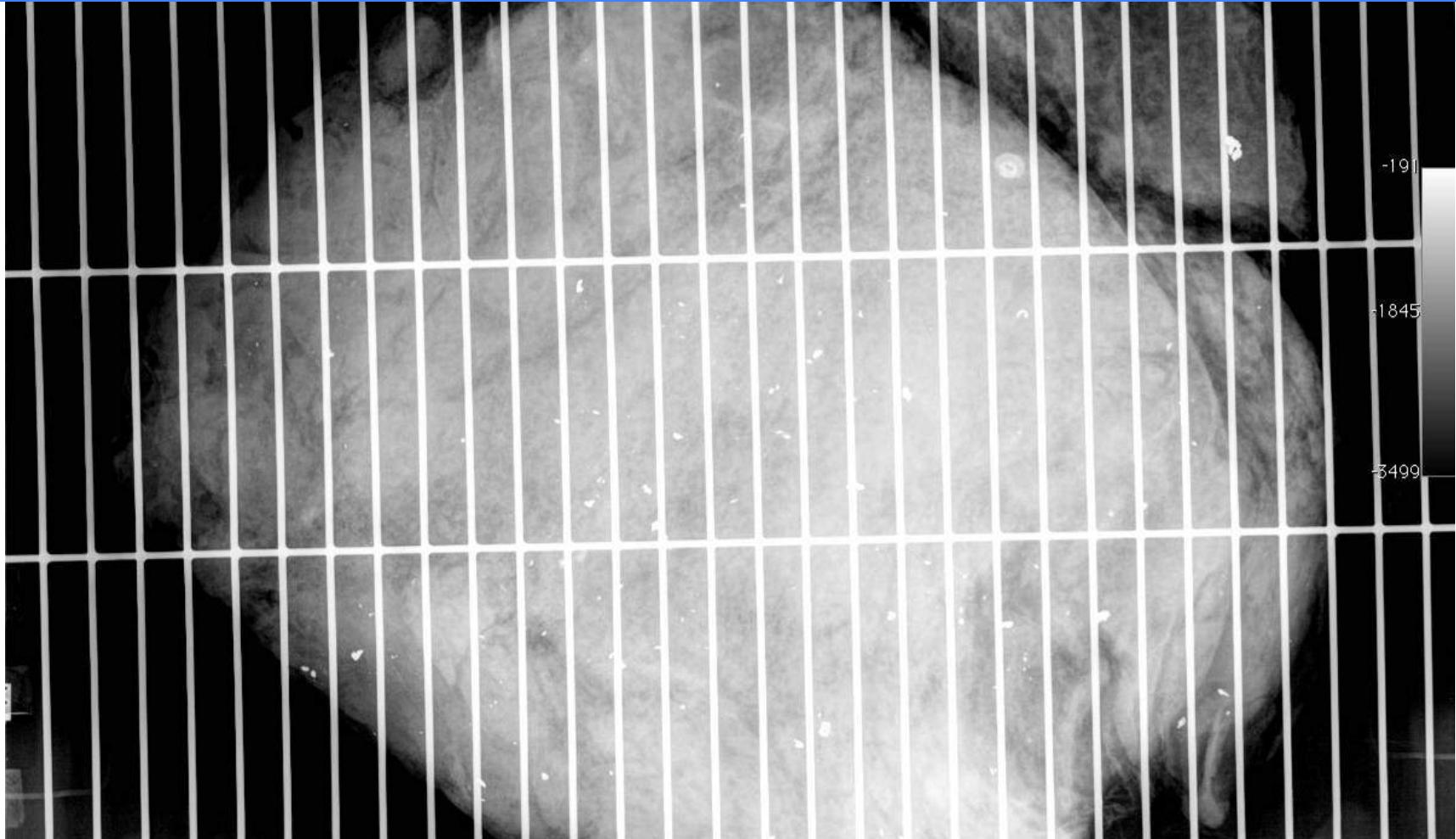
(136,346) = 5085.0 HU



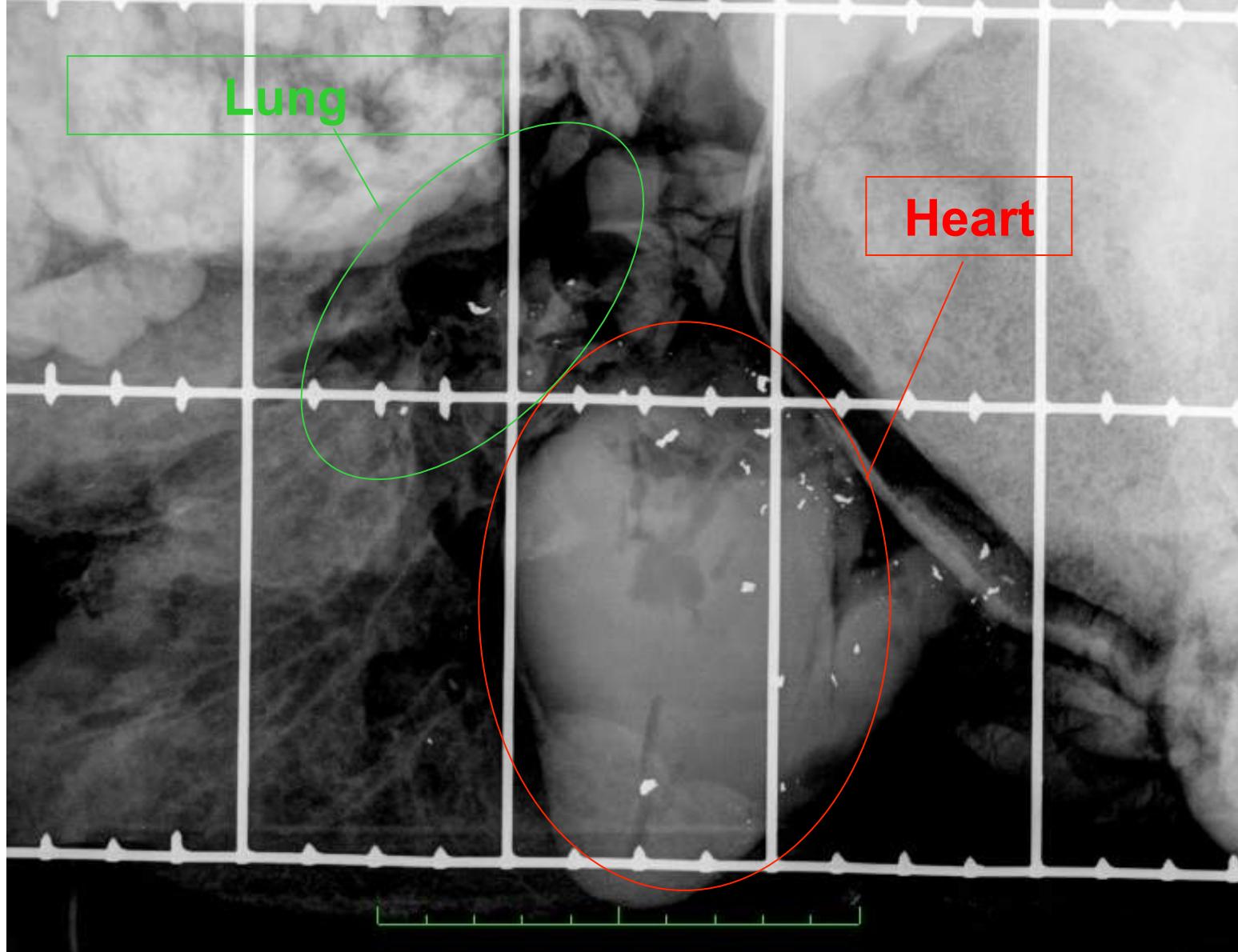
Computed Tomography distinguishes the density of the different tissues

- a. 3D
- b. Avoids lead underestimation (from overlapping)
- c. Distinguishes lead from metals and other inorganic components

# Positive freeze viscera submission to CR (Computed Radiography)



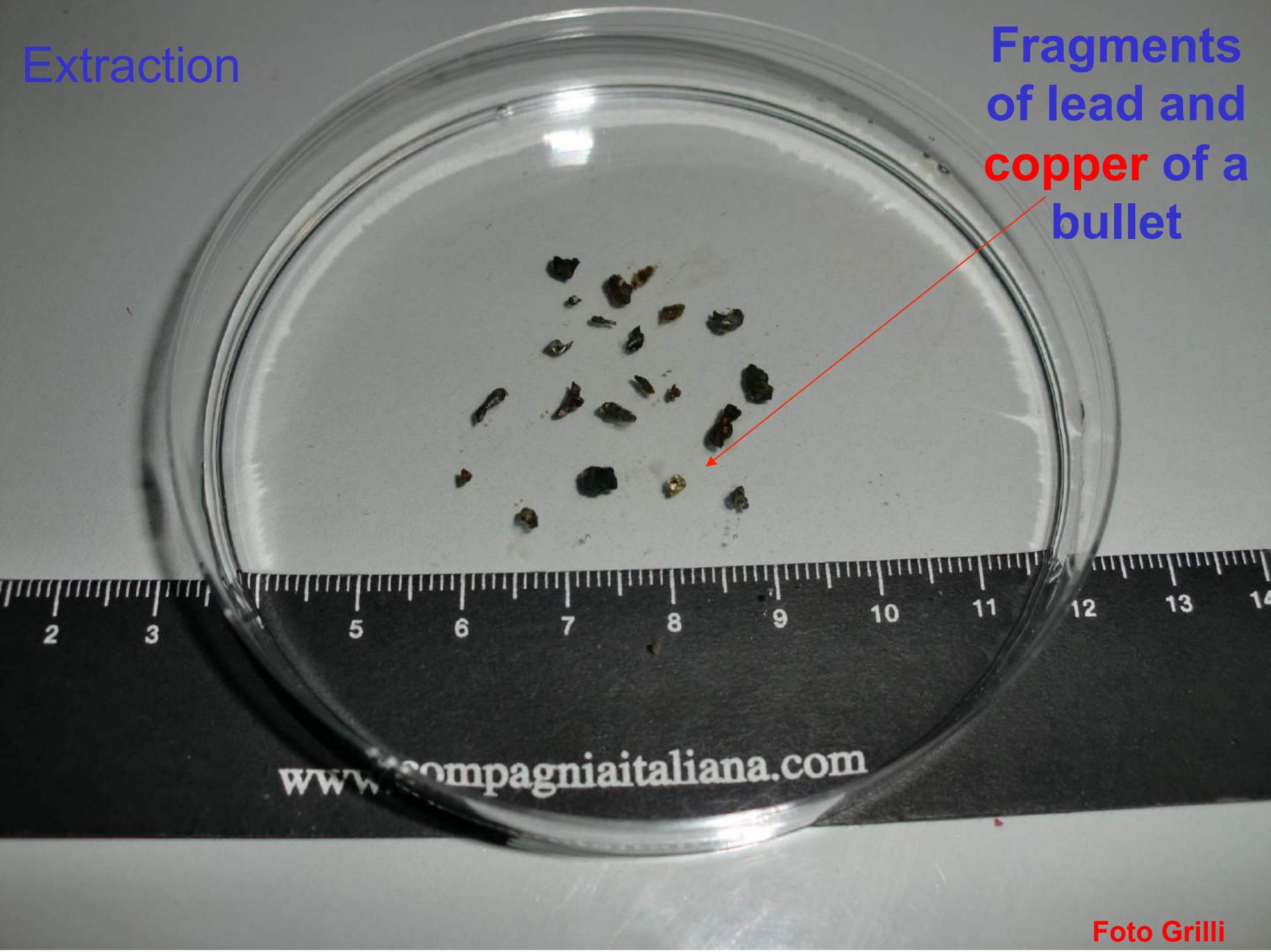
**Lattice grid to make easier the detection and  
quantify the number of the fragments**



**Computed Radiography: lead fragments  
in heart and lung**

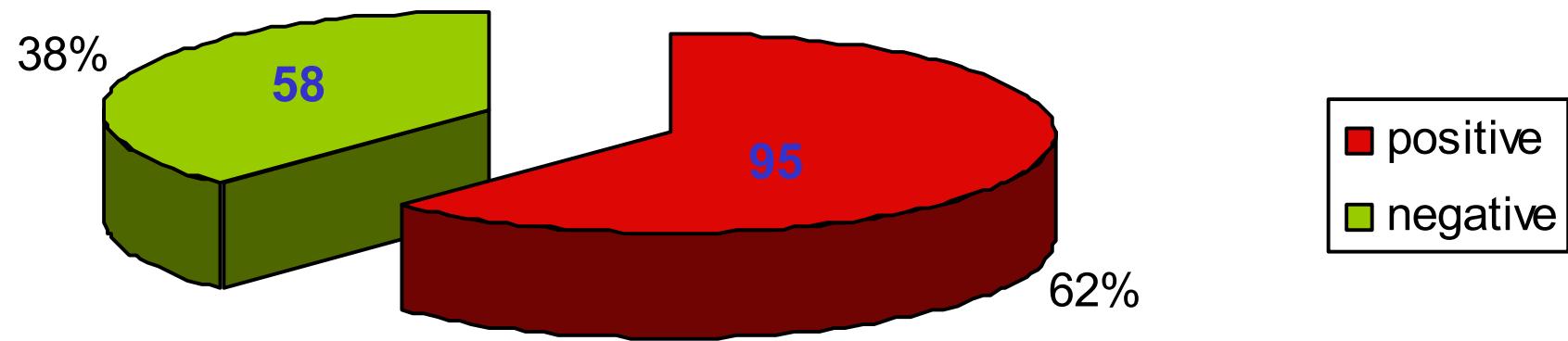
Extraction

Fragments  
of lead and  
**copper** of a  
bullet



[www.compagniaitaliana.com](http://www.compagniaitaliana.com)

Foto Grilli

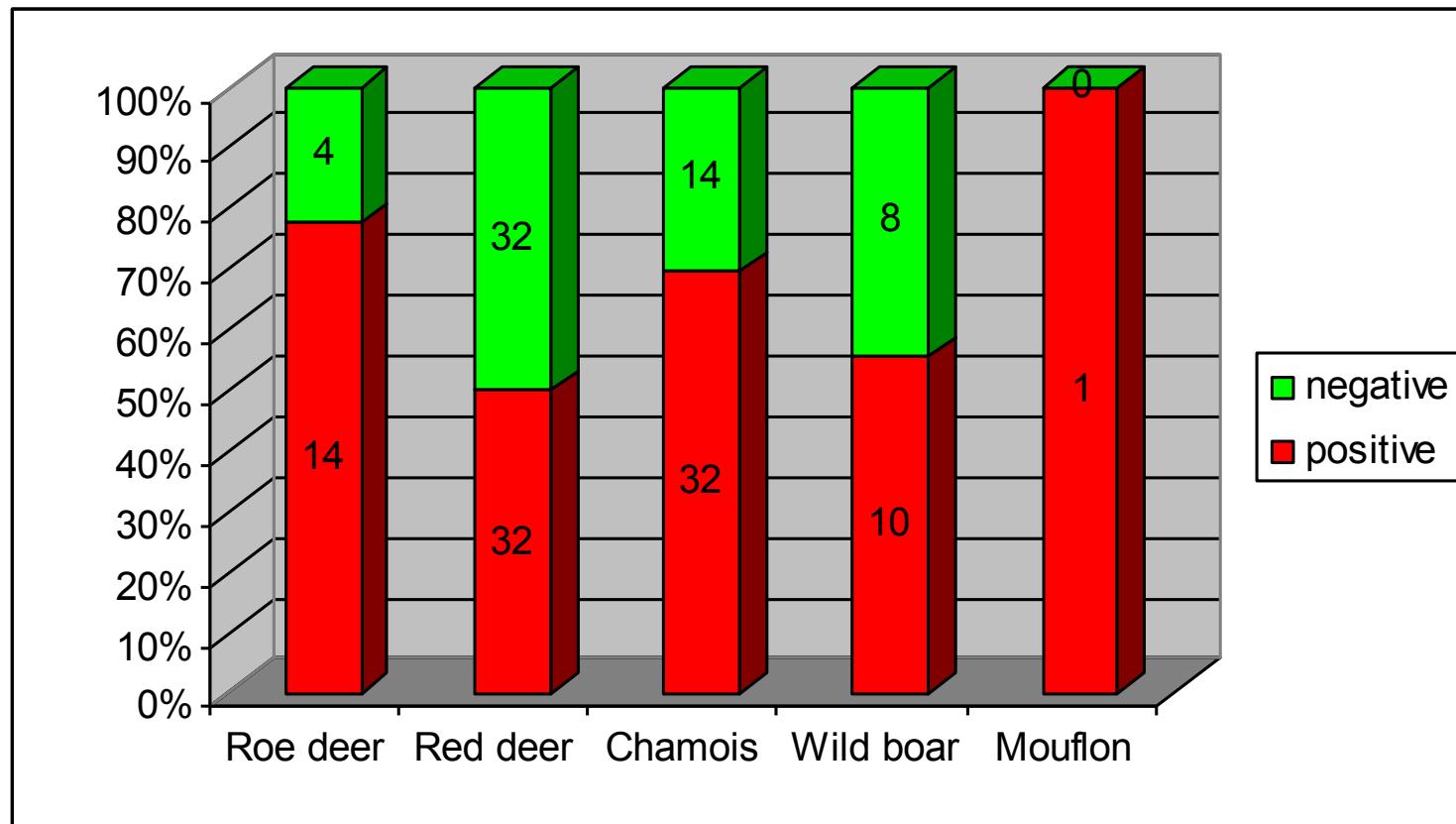


**Le 62,1% des viscères  
contient du plomb!**

N= 153

## Results

### Lead in the viscera (in % and Number)



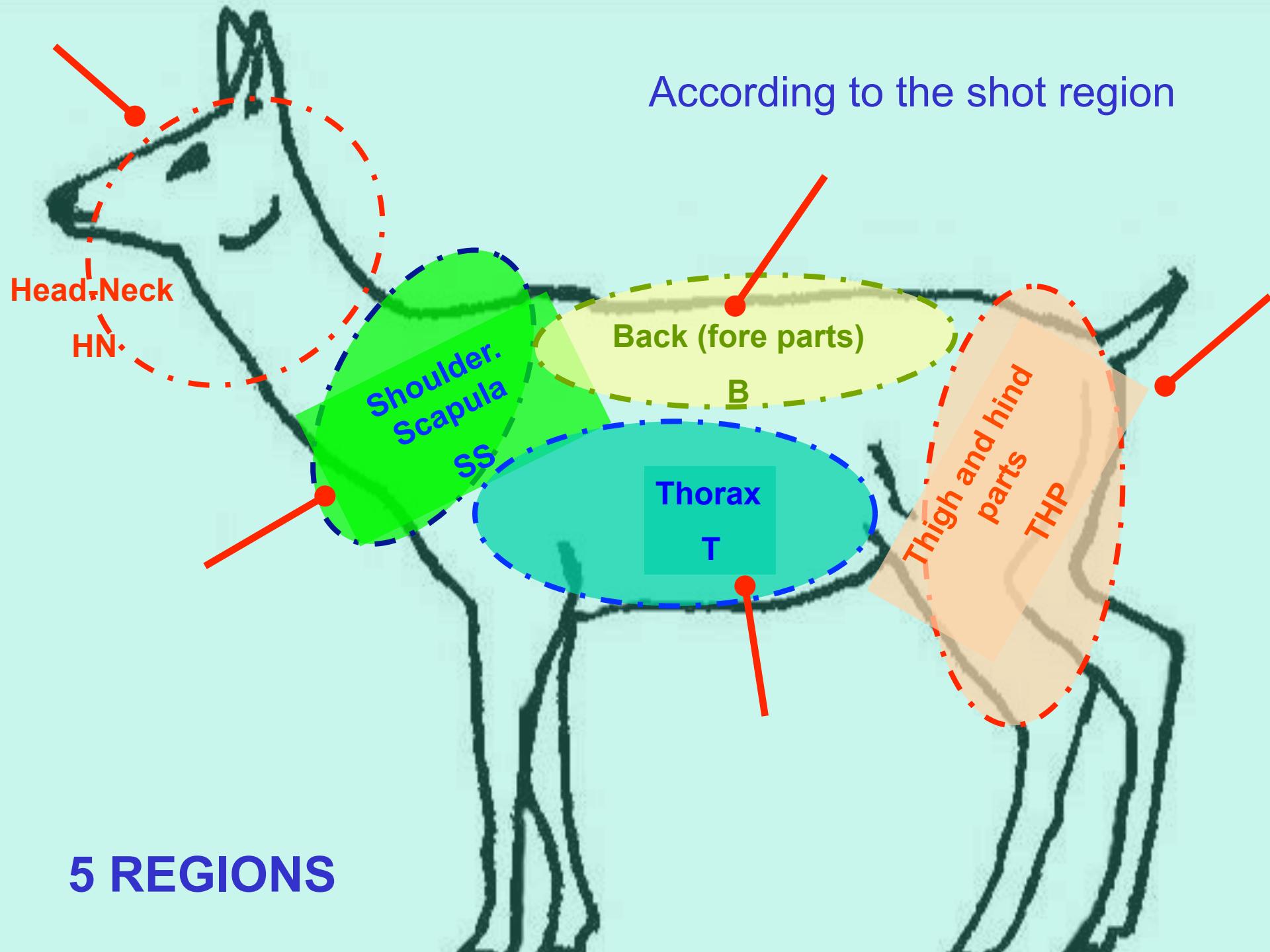
**Roe deer *C. capreolus* (77.7%, N= 18)**

**Chamois *R. rupicapra* (69.6%, N= 46)**

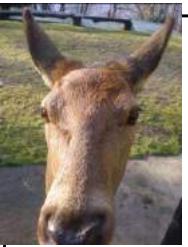
**Wild boar *S. scrofa* (55.6%, N= 18)**

**Red deer *C. elaphus* (50%, N= 64)**

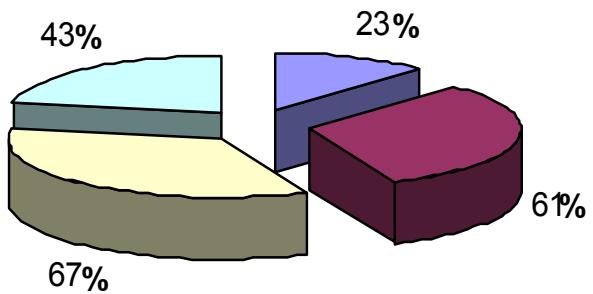
According to the shot region



5 REGIONS



Red deer - Positive viscera in % N= 32



- Shoulder Scapula (SS)
- Thorax (T)
- Thigh and hind parts (THP)
- Back 'fore parts' (B)

Positive frequencies are significantly different, among the species, in relation to the region crossed by the bullet (Chi square=13,1, 6 gl, p<0,05).

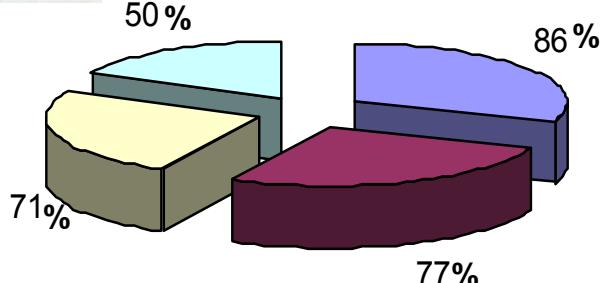
In two cases,

Lead in viscera despite  
bullet entered across  
the neck

There are no safe shots  
*a priori*

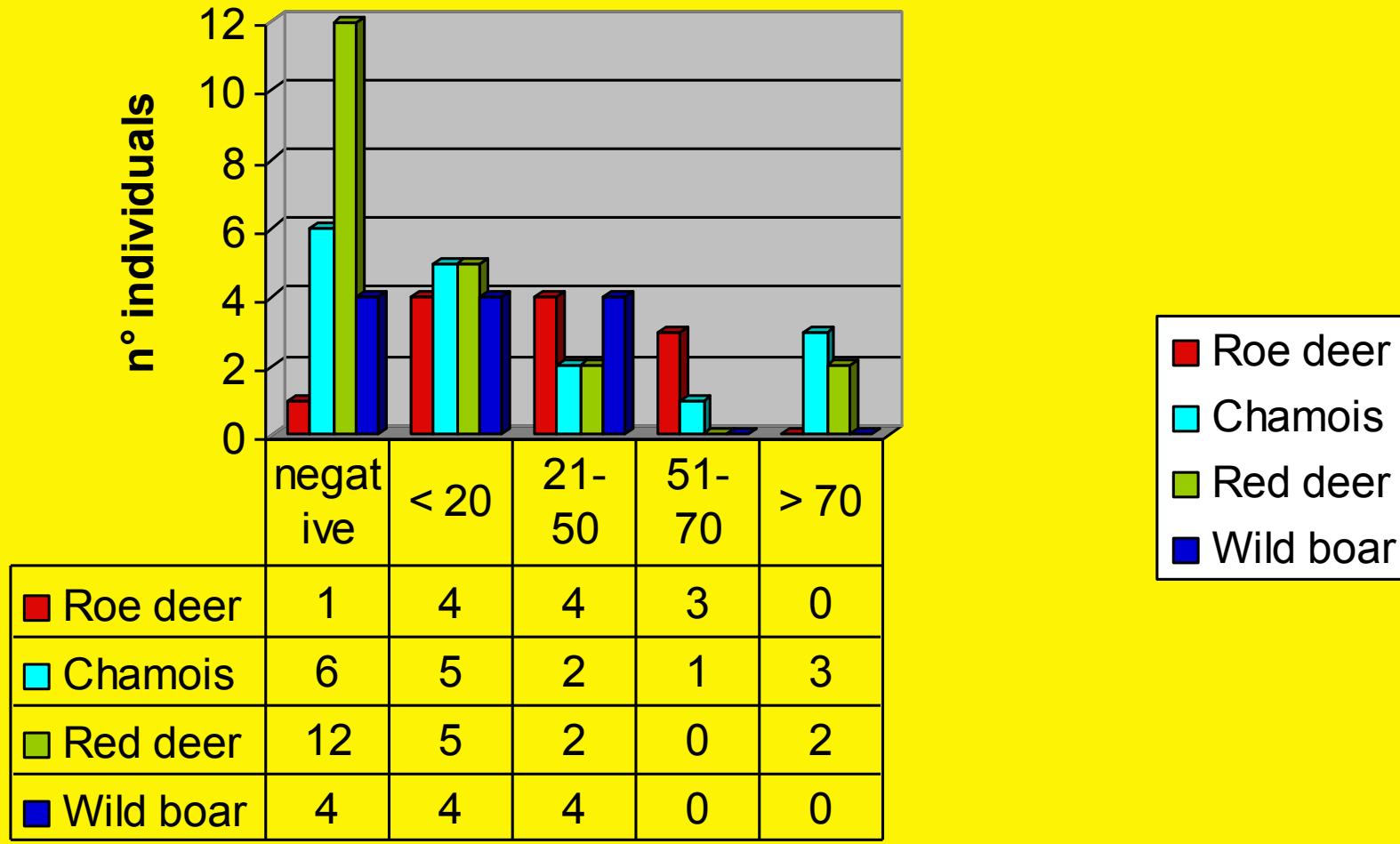


Chamois - Positive viscera in % N= 32



- Shoulder Scapula (SS)
- Thorax (T)
- Thigh and hind parts (THP)
- Back 'fore parts' (B)

# Number of FRAGMENTS in the VISCERA



Lost Lead fragments: mean weight 10 mg

Roe deer: up to 600 mg of Pb/viscera

Red deer and Chamois: up to 700 mg of Pb/viscera



Peu des grammes  
mais dans la  
mauvaise place!

**INCROYABLE!**

Avez-vous  
organisé un  
*Symposium international*  
pour quelques grammes  
de plomb?

Chèr gypaète,  
c'est ne pas important  
la quantité  
...mais ou il se trouve!



“Grand corbeau” est réductif...  
appelez-moi  
“Grand Sage corbeau”

Since 2010

## 2<sup>nd</sup> experimental survey. Analysis of the carcasses



Registration Data Sheet  
Survey on Lead intoxication in scavenger birds



Provincia di Sondrio  
Servizio Caccia, Pescare e  
Strutture Agrarie

# Necropsy of free ranging scavengers Extraction of INTERNAL ORGANS, Long and Short Bone

Stelvio NP and Sondrio Province cover cost of analyses



E. Bassi



M. Razin

## Carcasses analyzed 2010-15 (N= 83)

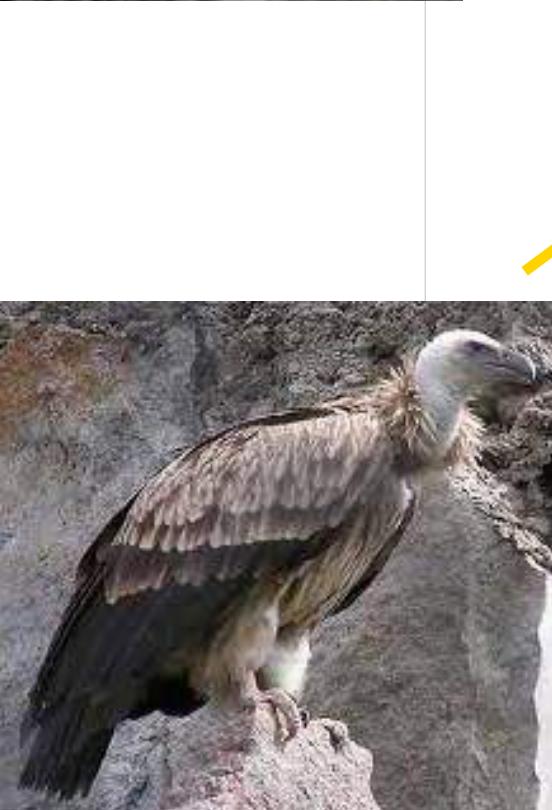
Black Vulture (5)

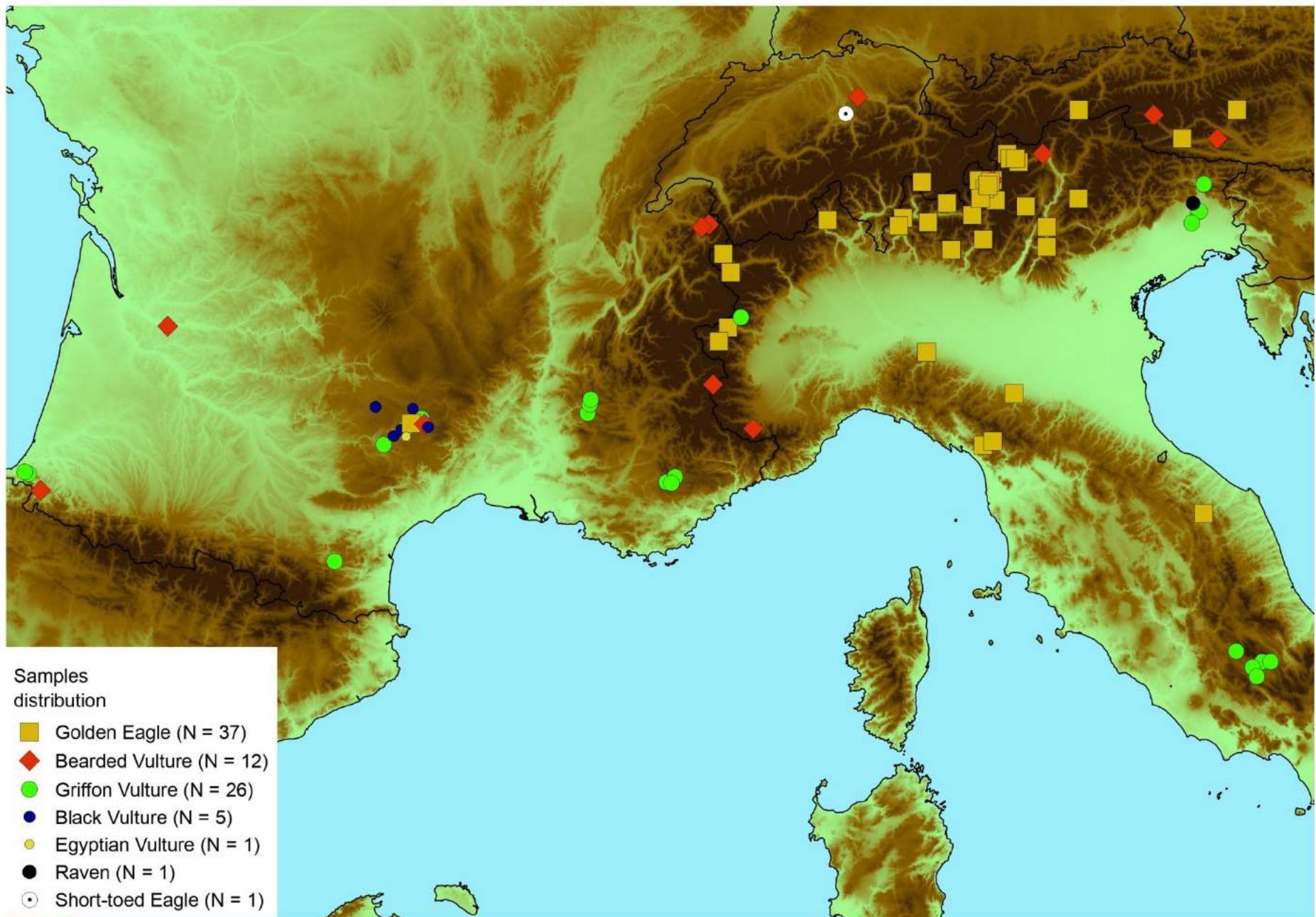
OTHER (3)

Golden Eagle (37)

Griffon Vulture (26)

Bearded Vulture (12)





## Liver and kidney

**6 mg/kg** indicates a subject

**Lead exposition**

(Pain et al., 2005; Franson 1996;  
Clark & Scheuhhammer 2003)

**ACUTE POISONING**



## Bone

**< 6.75 mg/kg:** level of background exposure



**10 mg/kg:** elevated level potentially toxic for  
a prolonged Lead exposure during the life cycle  
of the bird (Komosa & Kitowski 2008)

**20 mg/kg:** level of elevated Lead exposu  
(Mateo et al., 2003; Pain et al., 2005).



**SUBCHRONIC and CHRONIC POISONING**

## 11 cases of ACUTE SATURNISM over the Alps

- ✓ 5 Bearded V. in 8 years (2005-2012)
- ✓ 5 Golden Eagle in 5 years (2011-2015)
- ✓ 1 Griffon V. in 4 years (2011-2014)



Jan 2015 – Italy. Golden Eagle agonizing and dead the day after.

X-Ray evidence in stomach 10 lead shots used for hunting to small mammals and grouses



In 40 cases  
on 83 (48%)  
scavenger  
significantly  
exposed to  
Lead!



29 cases over the level of background exposure (Lead in Bone >6.75 mg/kg)

- ✓ 15 Golden Eagle in 5 years (2011-2015)
- ✓ 9 Griffon V. in 4 years (2011-2014)
- ✓ 3 Bearded V. in 8 years (2005-2012)
- ✓ 2 Black Vulture in 5 years (2010-2014)



*Silent lead night*

*intoxication lente et dormante*

# Results from 83 carcasses

Species	Long Bones		Small Bones		Liver		Kidney	
	Min-Max (n)	Mean-Median	Min-Max (n)	Mean-Median	Min-Max (n)	Mean-Median	Min-Max (n)	Mean-Median
Golden Eagle	0.2 - 76.1 (35)	12.6 - 8.5	0.8 - 82.6 (8)	9.6 - 21.6	0.05 - 68.7 (21)	7.2 - 0.7	0.03 - 35.3 (19)	2.9 - 0.25
Bearded Vulture	0.4 - 58.9 (11)	11.8 - 2.6	1.07 - 12.5 (2)	6.8 - 6.8	0.14 - 29.6 (4)	7.6 - 0.4	0.3 - 49.6 (3)	17.05 - 1.2
Griffon Vulture	0.004 - 272 (24)	8.86 - 4.9	1.1 - 17.9 (4)	8.5 - 7.4	0.05 - 19 (15)	1.7 - 0.2	0.08 - 7.3 (16)	0.75 - 0.2
Black Vulture	0.5 - 9.5 (5)	3.9 - 1.4	10.3 - 4	10.3	0.1 - 0.5 (4)	0.2 - 0.1	0.04 - 1.7 (4)	0.6 - 0.3
Egyptian Vulture (Chick)	2.6 (1)	2, 6!	3.2 (1)!	3.2	//	//	//	//
Short-toed Eagle	0.9 (1)	0, 06	//	//	//	//	//	//
Raven	1.2 (1)	1.2	//	//	0.26 (1)	0, 18	//	//

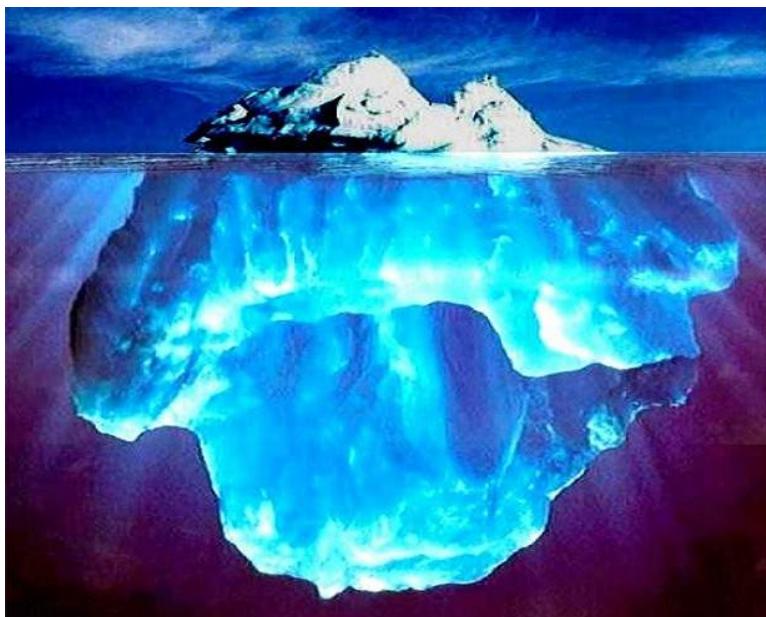
**RED: elevated Level potentially toxic for a prolonged exposure**

**ORANGE: level close to limit of background exposure (6.75 mg/kg)**

**GREEN: Level indicates NOT Acute intoxication**

**Lead poisoning from ingestion of lead shot or non-lethal shooting injuries kills eagles and may be more widespread than suspected  
(Craig Harmata & Restani 1995).**

Bearded vultures like Doraja, Ikarus, Nicola, Lousa and other anonymous raptors are very probably only the tip of an iceberg





... but only if it has an ultimate goal



## *7.000 brochures pour informer sur le risque de saturnisme.*

**The hunter aware is the best ally to overcome this serious problem.**

## The project

The main objective of the conservation and informative project called **Biosphere Gavia** ("Wetland Black breasted Gavia") is to protect and support the habitat of the black breasted gavia, its breeding and conservation of the seabirds' values (*dynasts islandica*) and its ecosystem in the Stelvio National Park.

The project is based on the following principles which are linked to each other with a single path to accompany visitors in their discovery of this unique natural heritage:

- The best place to start the learning process is the visitors' centre and there continue, inside in the Park itself.
- The main objective of the nest is to highlight the power of the protective effect which can be achieved by the presence of the human being in this valley to return to our ancestors what it has now chosen as a stable habitat.
- It is a kind of small celebration of the international importance of the area, which is the first Biosphere Reserve in Italy and is now considered to be one of the most successful conservation projects in Europe by the scientific community.
- It is also a way to increase the number of visitors to the Park, including high resolution dips, a webcam transmitting images of the activities of a breeding pair and thousands of the bearded vulture and related activities.

Not far from the Visitor Centre, the "Miller of the Bearded Vulture" will be able to offer the possibility to make amends for our past errors and come to peace with nature. The project is concerned not only with communicating but also taking concrete action to reduce the impact of the human being on the environment and that is still causing problems. This results from the use of lead bullet and that is still causing problems. This results from the use of lead bullet for hunting because the heads left in the intestines of the animals that have been shot are not removed and therefore pollute the feed off the remains. The Park and Sondrio Province Administration have promoted a campaign for the gradual abandonment of the use of toxic ammunition by hunters for this reason.

We hope that this project, financed by the CARIPLO Foundation, Sondrio Province and the Stelvio National Park, will fulfil all the information necessary for visitors to leave the Centre with a better knowledge of the bearded vulture and the environment of the Alpine region.

This project will also help us to contain the harm caused by humans but also the damage caused by the climate change adopted for the noble task of encouraging people to think about the damages with a message to be continued to be passed.

## Informazioni utili

Come raggiungere il settore Lombardo del Parco:  
 da Milano, percorrendo la SS 33 dalla Vallettina fino a Brembo, da Brembo, attraverso la val Venosta e della Piana dello Stelvio transitando solo nei territori di Sondrio e Brescia.  
 da Bergamo, percorrendo la val Lagorai, attraverso il Passo del Gavia (manutenibile con metà strada) o dal Passo del Ausa (aperto tutto l'anno).

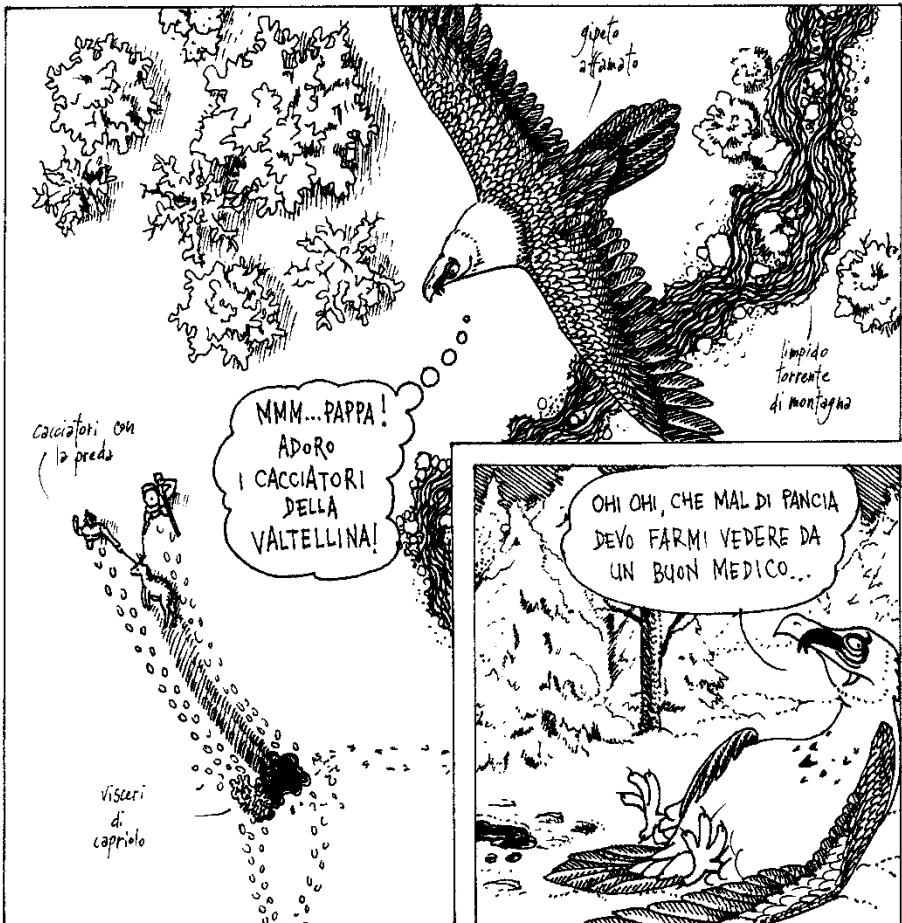


Punti d'informazione e numeri utili:

- Consorzio del Parco Nazionale dello Stelvio  
 Tel. 0342 900011 - Fax 0342/900095  
 E-mail: info@stelvioparco.it, internet: www.stelvioparco.it
- Centro Visite Gavia - 23202 Brusio (SO)  
 Tel. 0342 900024 - Fax 0342 900099  
 E-mail: info@stelvioparco.it
- Punto informazione Bormio - Tel. 0342 900184  
 Giardino Comunale Agno - Centro Turistico Tel. 0342 900055  
 Centro Visite "Baldo e Parco" - Piazza Orba 4 - 23030 (Valtellina) (SO)  
 Tel. 0342 045074
- Centro informazioni Ponte di Legno - Via Raina 36 - 26050 Tenno (BG) Tel. 0342 94352

Per saperne di più: [www.parcostelvio.it](http://www.parcostelvio.it)

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Bonvicini P., Breton F., Cannavacciuolo A., Chemollo M., Chiappini A., Chioso C.,  
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and the Hunters of Sondrio Province.**

