

Saturn against or against Saturn; passive resignation or real action against lead in hunting ammunition?

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Saturism in avian scavengers in relation to hunting modalities: the tip of the iceberg.



Hunting of Ungulates has common habits within the Alps

- a. Use of **lead bullets** (high fragmentation)
- b. Hunting period: **late summer - first winter**
- c. **Hunted species:** Roe deer, Red deer, Chamois, Mouflon and Wild boar (in all kind of habitat)
- d. Traditional practice of **EVISCERATION** on the ground
- e. **Viscera release overlaps** with the most difficult period for the survival of the raptors (nov-dec)
- f. The **62% of 153 viscera** of shot ungulates in **Sondrio Province contained LEAD!** (Bassi et al. 2014)

10 y ago we asked for collaboration with several partner to analyse Lead accumulation in large raptor carcasses

LIVER AND KIDNEY

> 6 mg/kg

ACUTE POISONING

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



BONES

> 6.75 mg/kg

POTENTIALLY TOXIC for a PROLONGED LEAD EXPOSURE

(Komosa & Kitowski 2008)

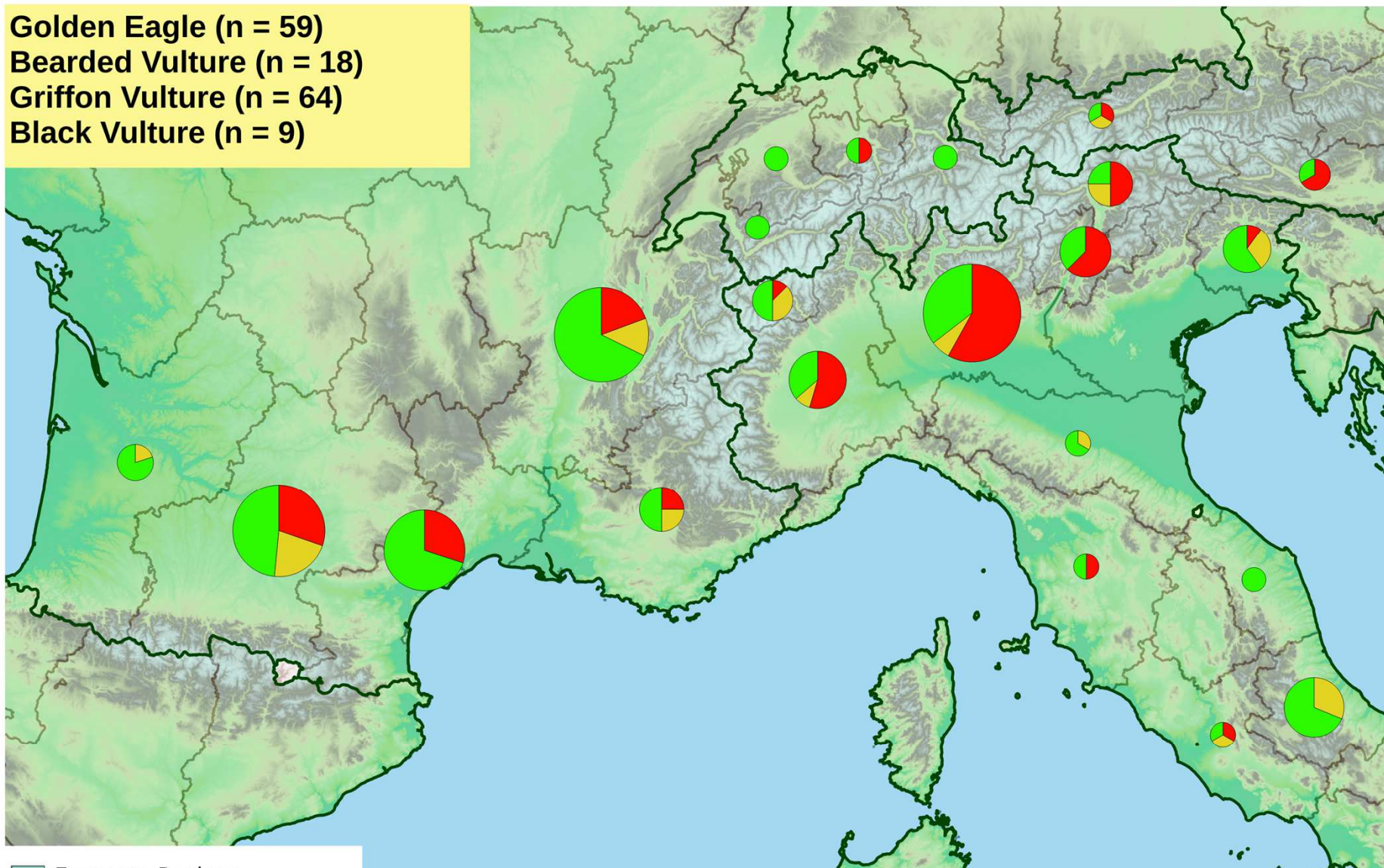
SUBCHRONIC and CHRONIC POISONING

(Mateo *et al.*, 2003; Pain *et al.*, 2005)



All Samples

Golden Eagle (n = 59)
Bearded Vulture (n = 18)
Griffon Vulture (n = 64)
Black Vulture (n = 9)



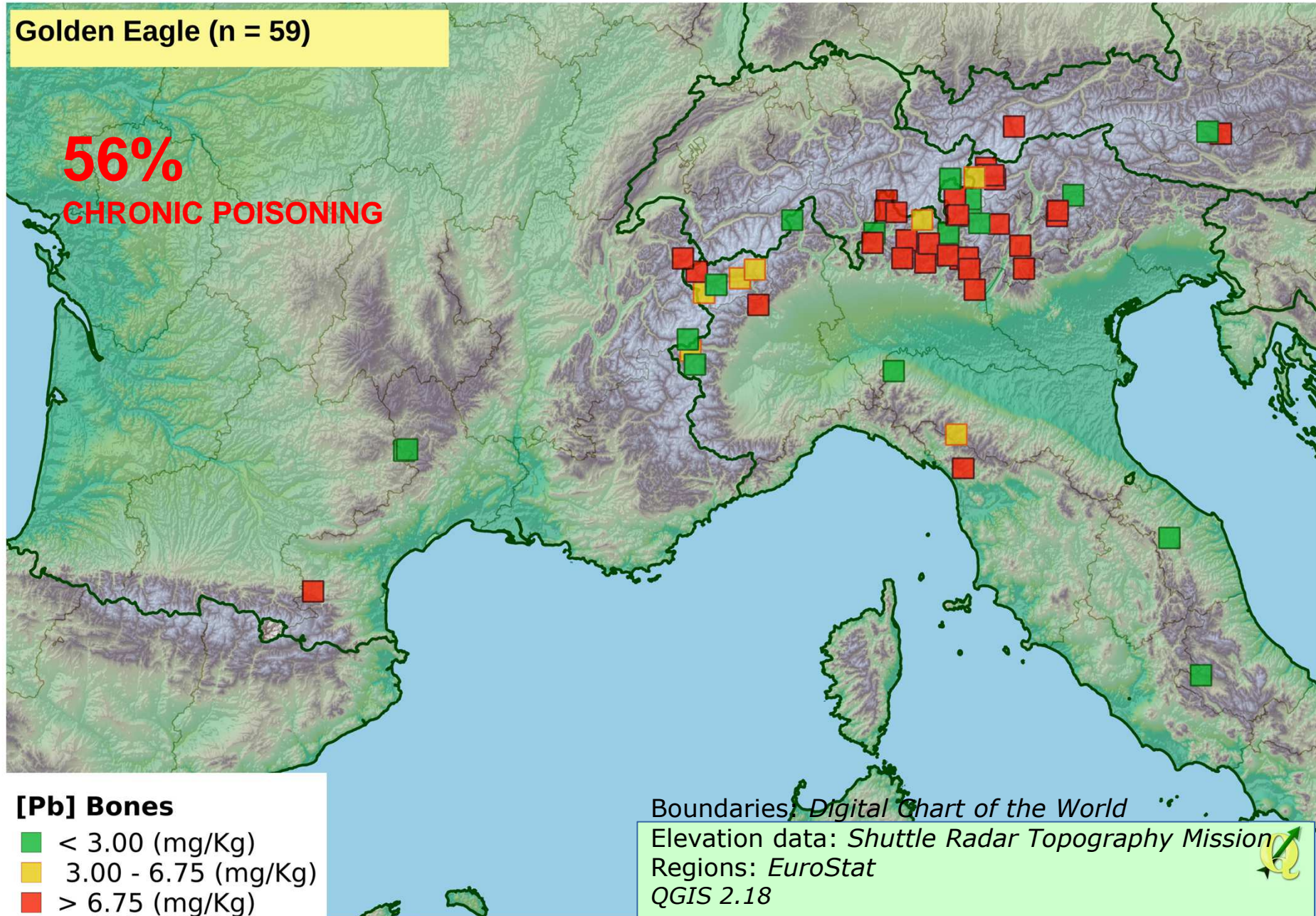
- European Regions
- samples with < 3 (mg/Kg)
- samples with 3 - 6.75 (mg/Kg)
- samples with > 6.75 (mg/Kg)

Boundaries: *Digital Chart of the World*
Elevation data: *Shuttle Radar Topography Mission*
Regions: *EuroStat*
QGIS 2.18

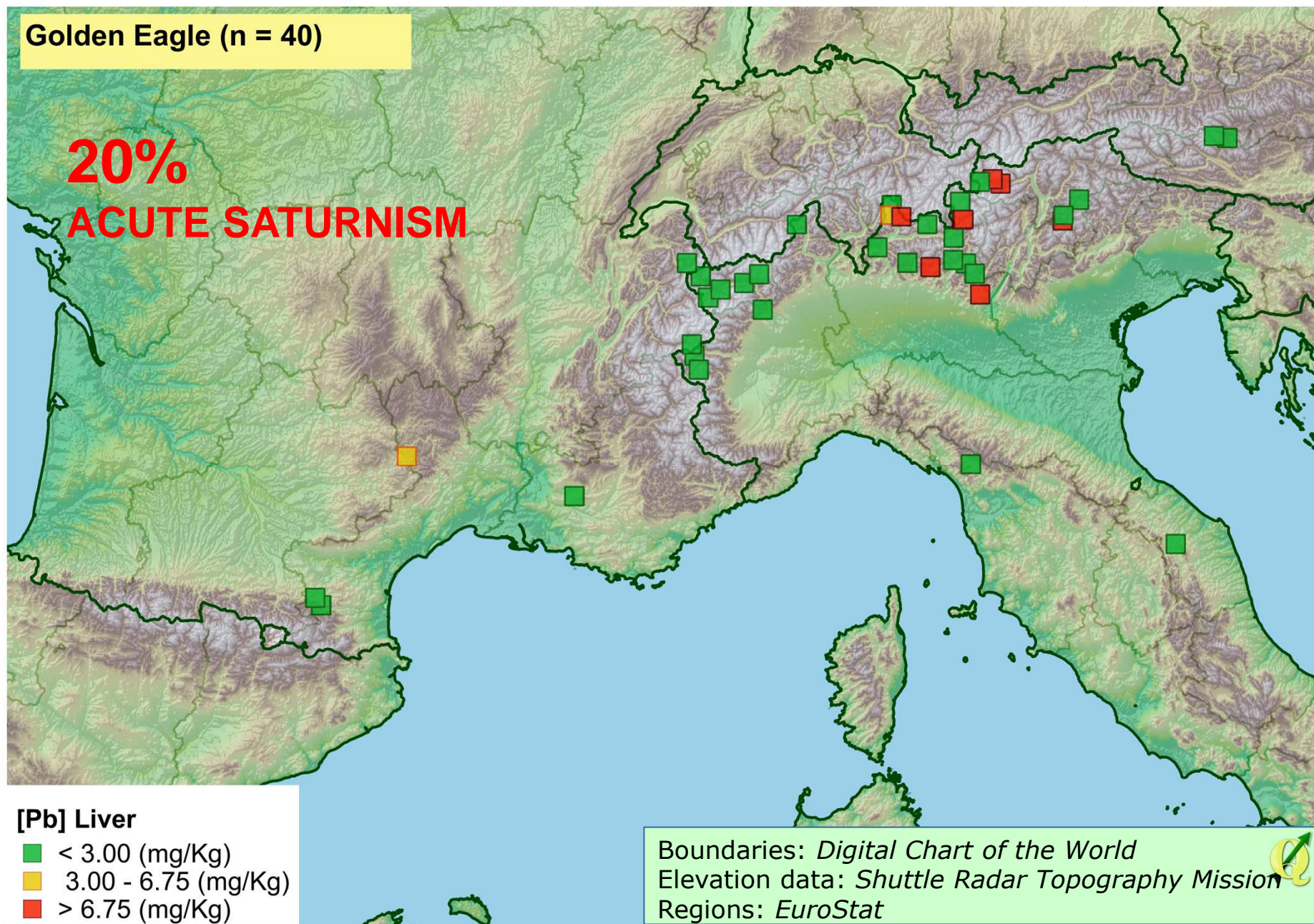
Golden Eagle - *Aquila reale*

Golden Eagle (n = 59)

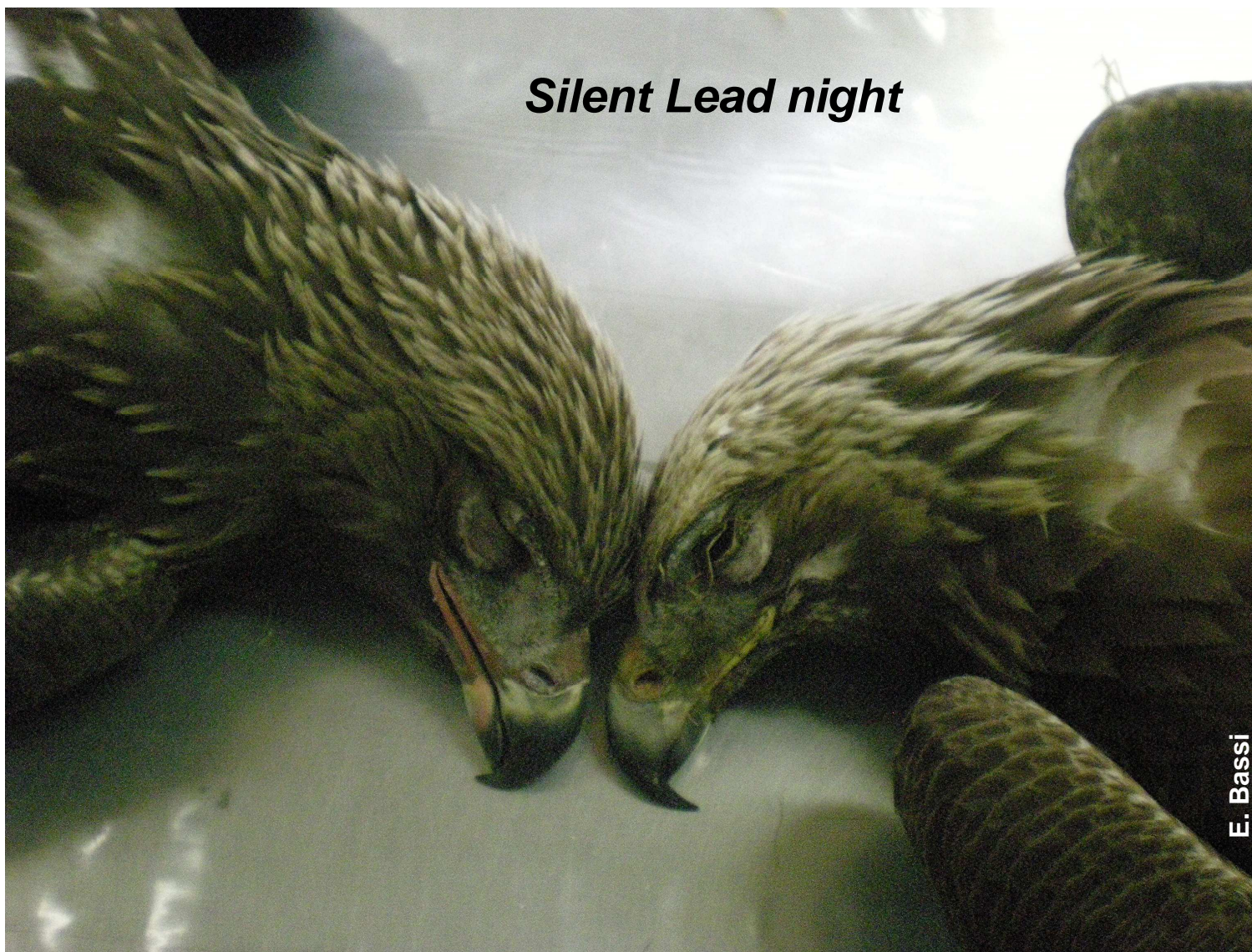
56%
CHRONIC POISONING



Golden Eagle - *Aquila reale*



Intossicazione lenta e silente



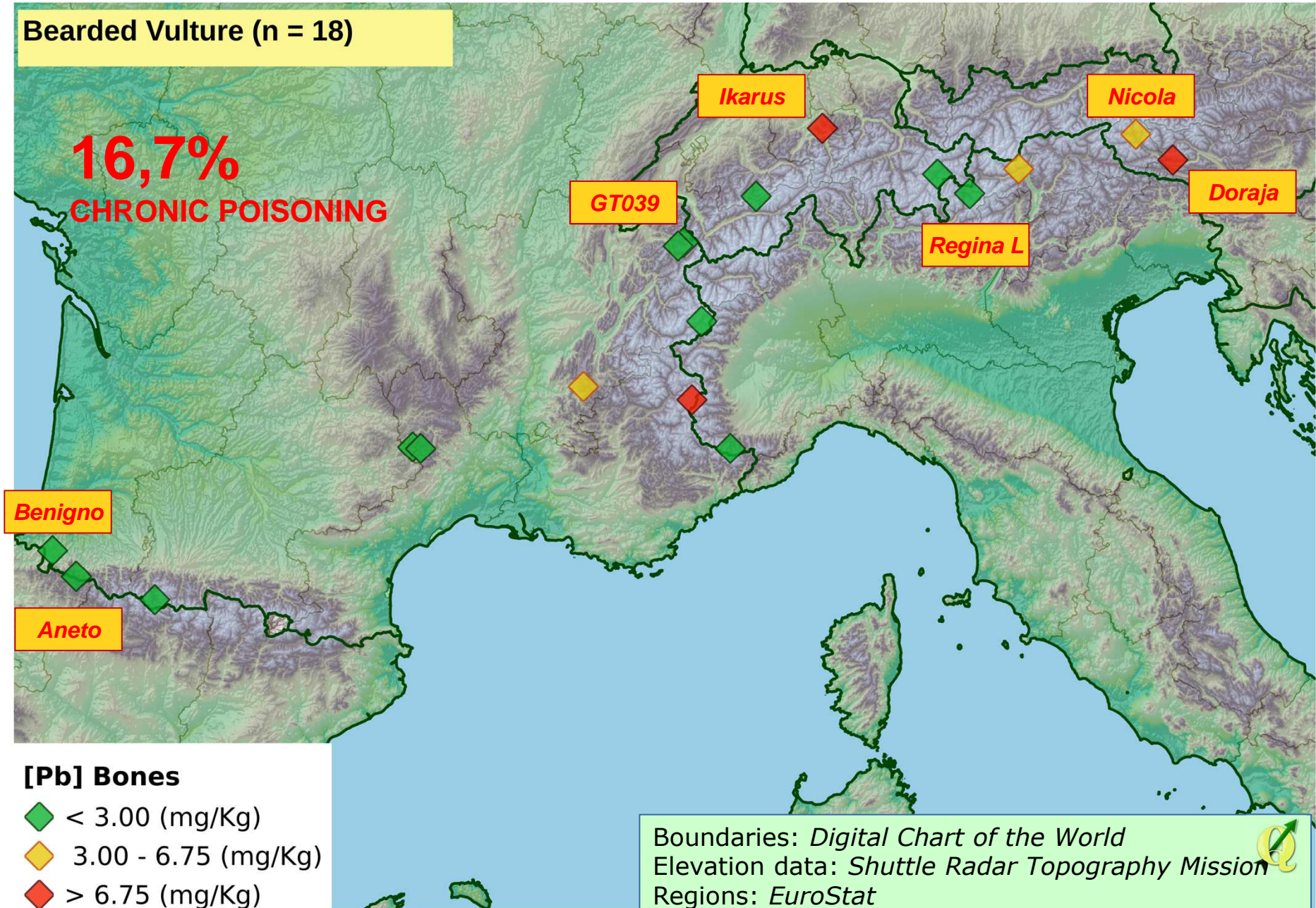
Dead



Bearded Vulture - Gipeto

Bearded Vulture (n = 18)

16,7%
CHRONIC POISONING



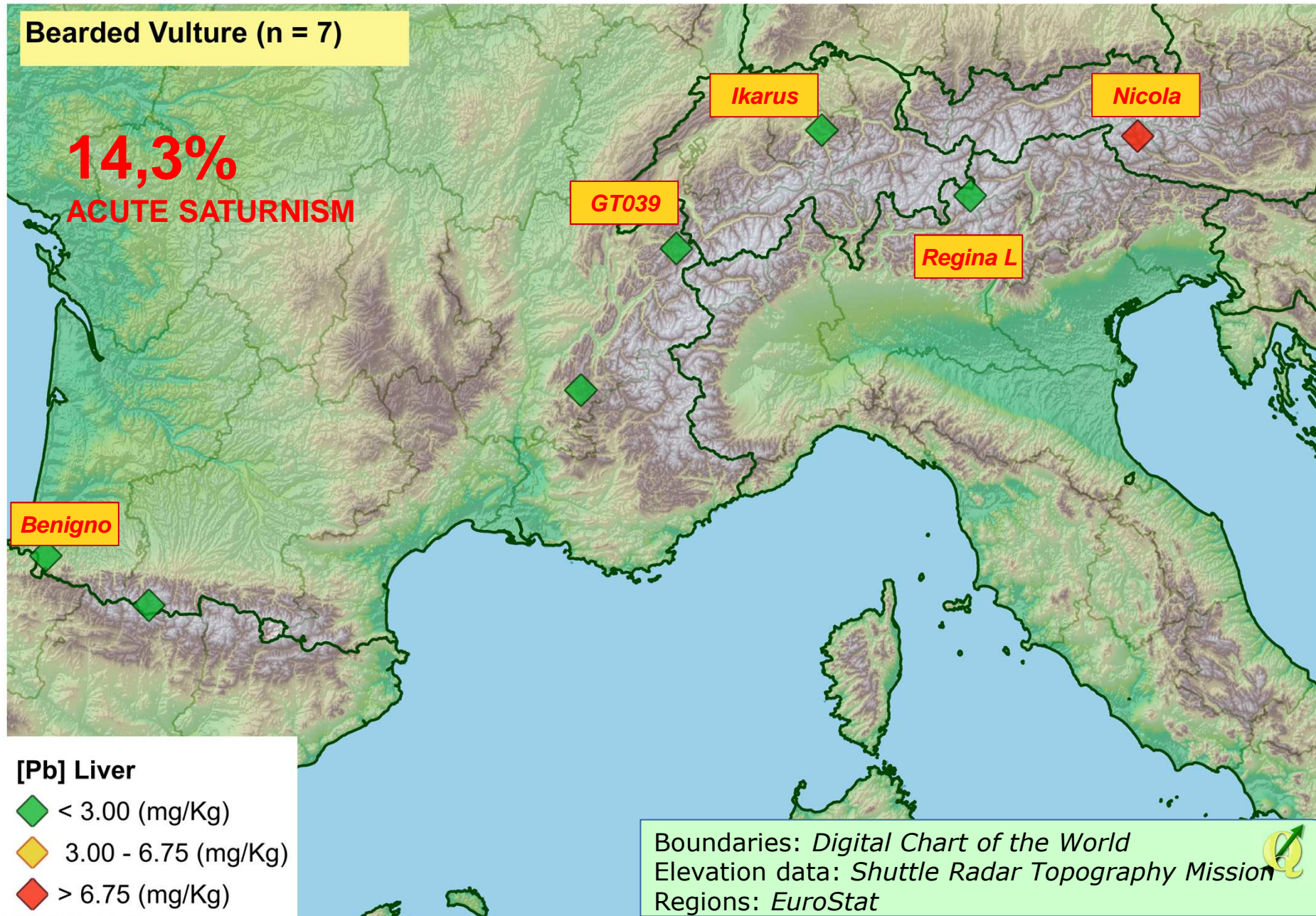
[Pb] Bones

- ◆ < 3.00 (mg/Kg)
- ◆ 3.00 - 6.75 (mg/Kg)
- ◆ > 6.75 (mg/Kg)

Boundaries: *Digital Chart of the World*
Elevation data: *Shuttle Radar Topography Mission*
Regions: *EuroStat*

QGIS 2.18

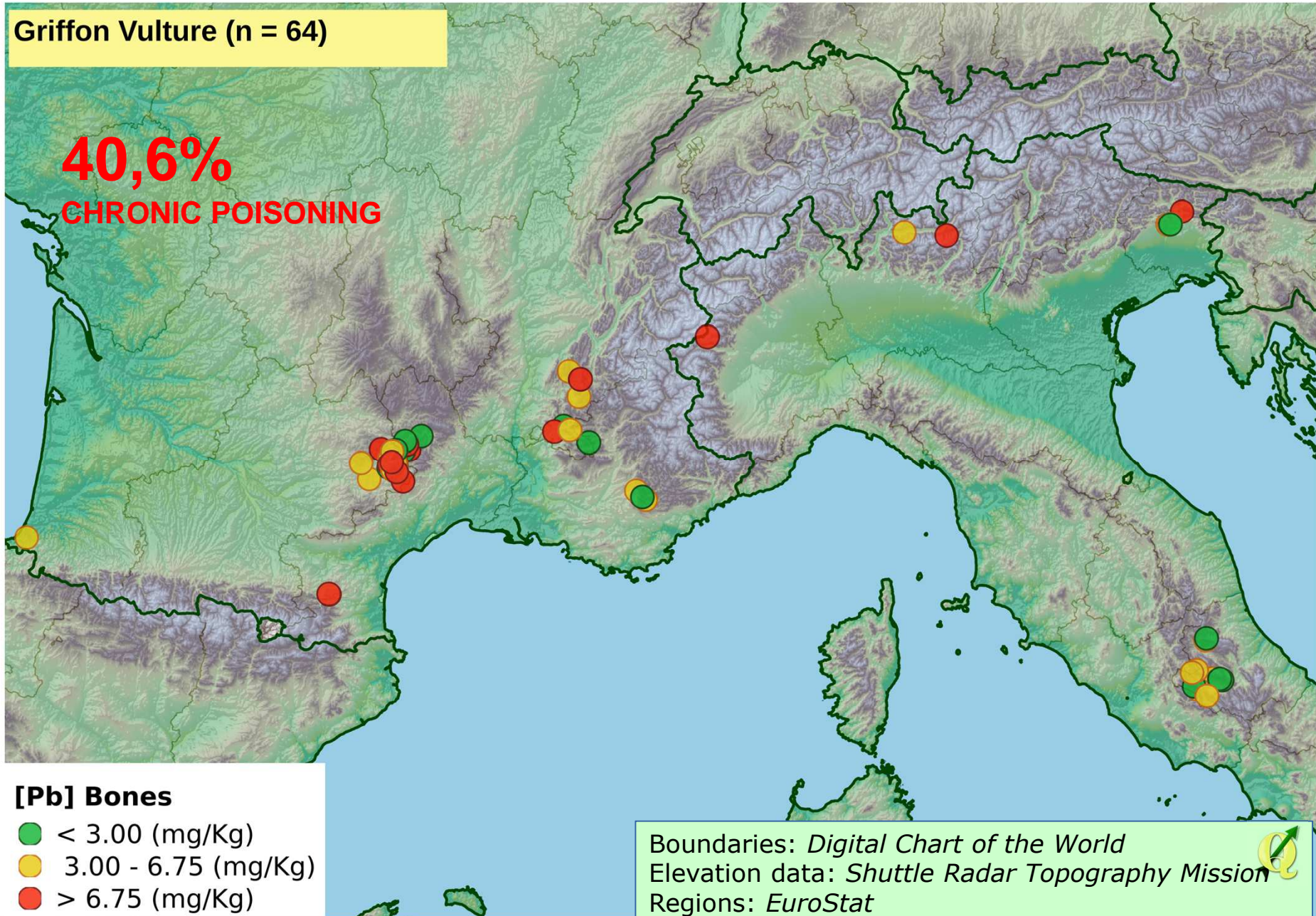
Bearded Vulture - Gipeto



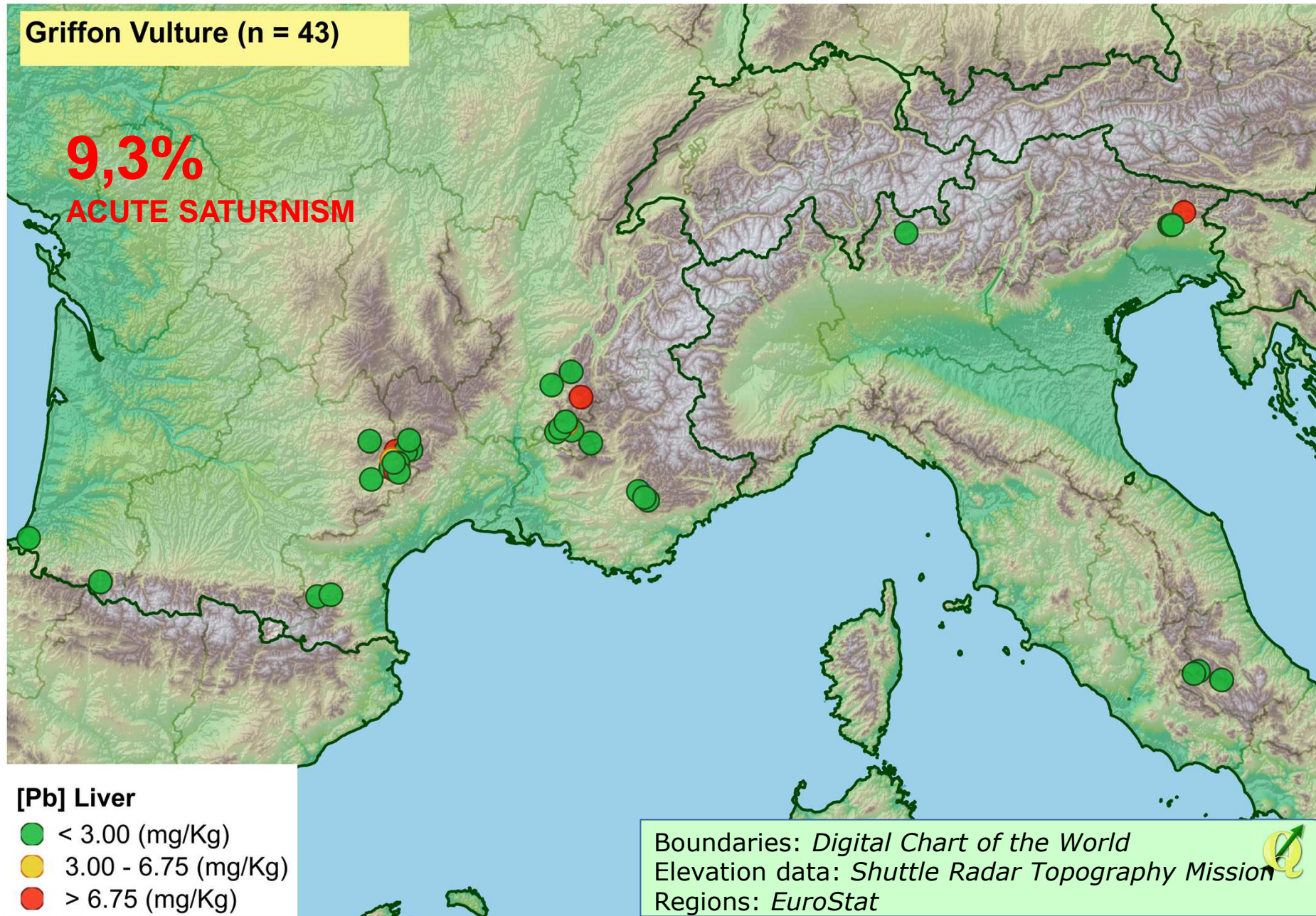
Griffon Vulture - Grifone

Griffon Vulture (n = 64)

40,6%
CHRONIC POISONING



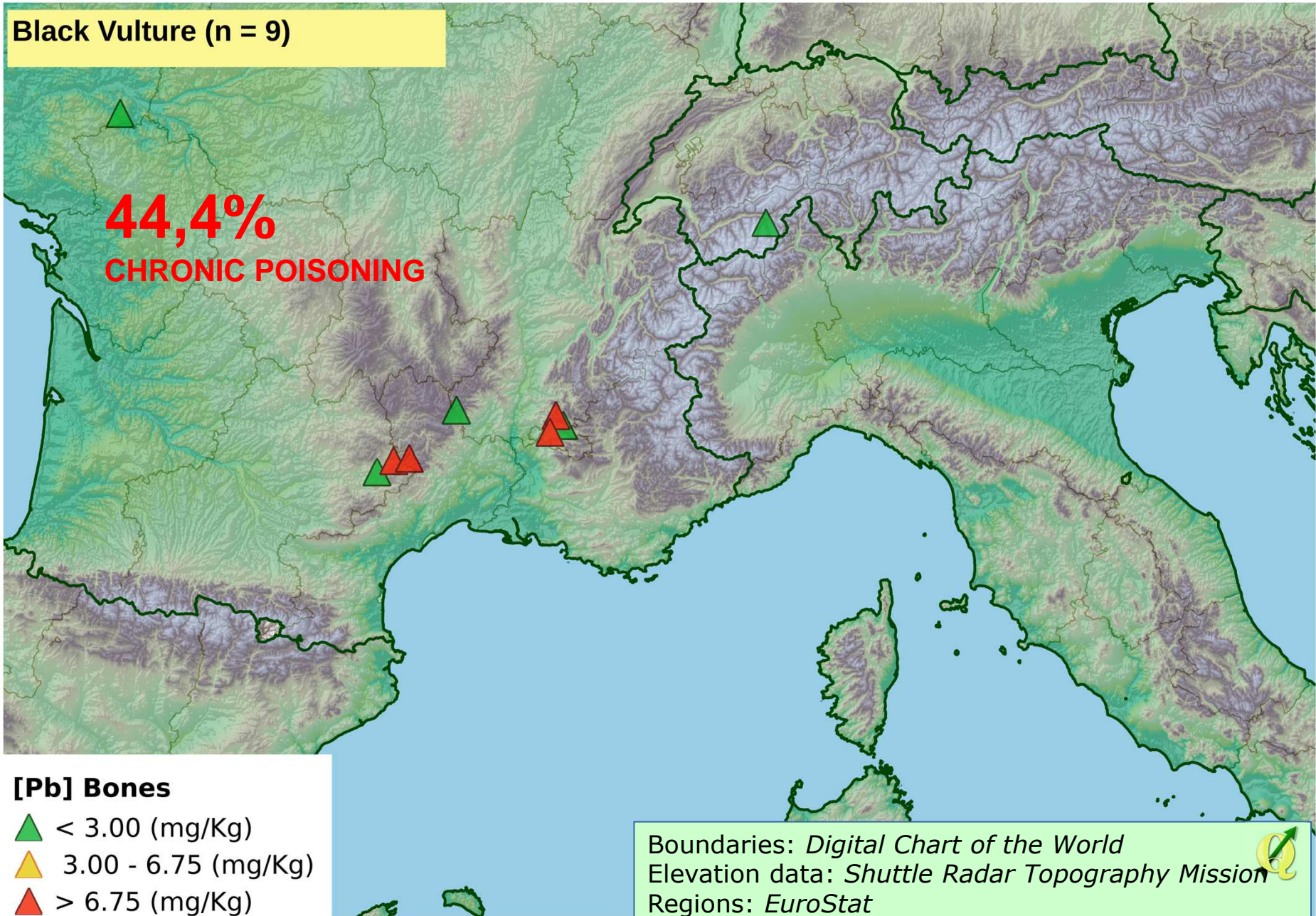
Griffon Vulture - Grifone



Black Vulture - Avvoltoio monaco

Black Vulture (n = 9)

44,4%
CHRONIC POISONING



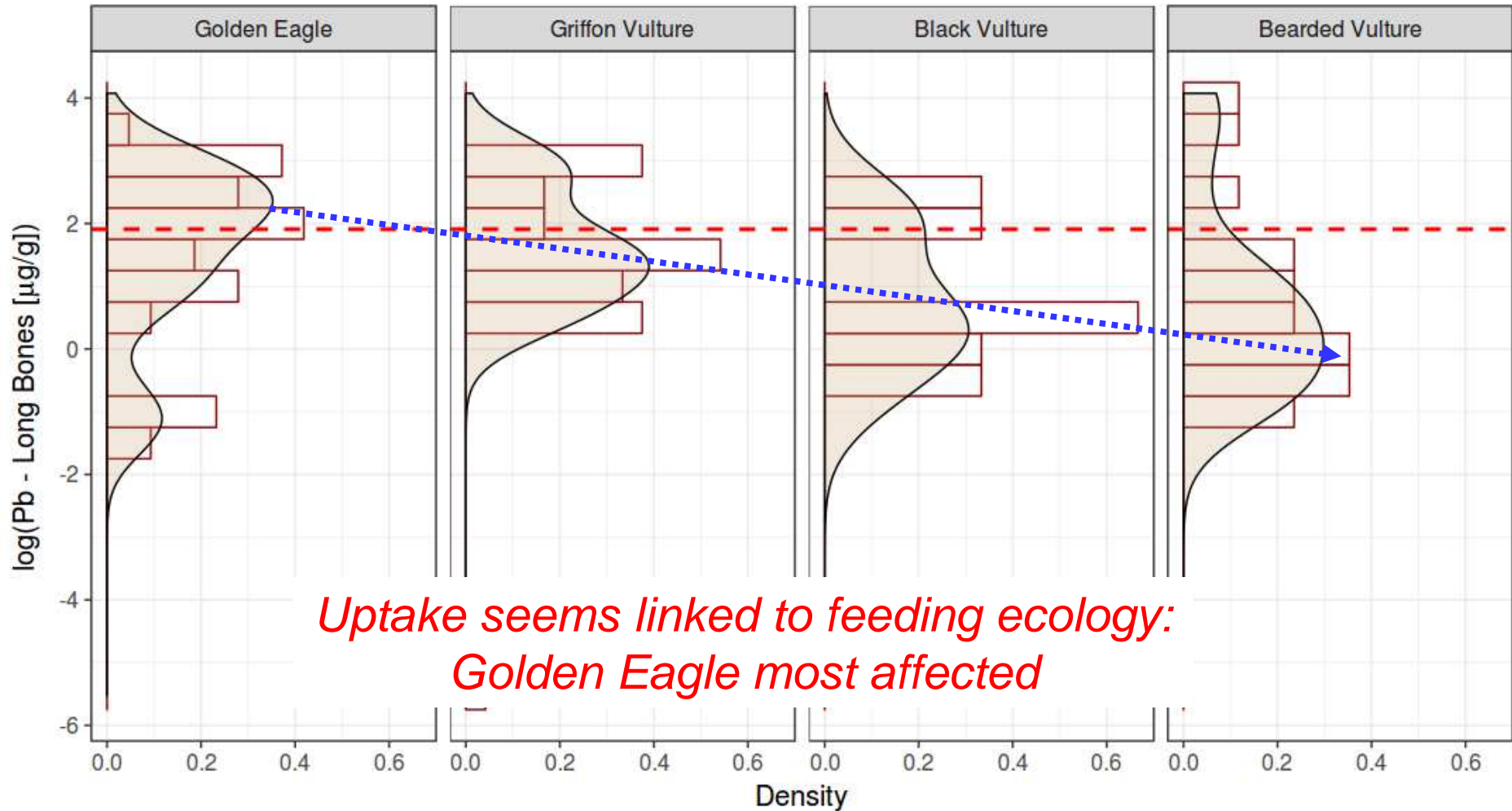
[Pb] Bones

- ▲ < 3.00 (mg/Kg)
- ▲ 3.00 - 6.75 (mg/Kg)
- ▲ > 6.75 (mg/Kg)

Boundaries: *Digital Chart of the World*
Elevation data: *Shuttle Radar Topography Mission*
Regions: *EuroStat*

QGIS 2.18

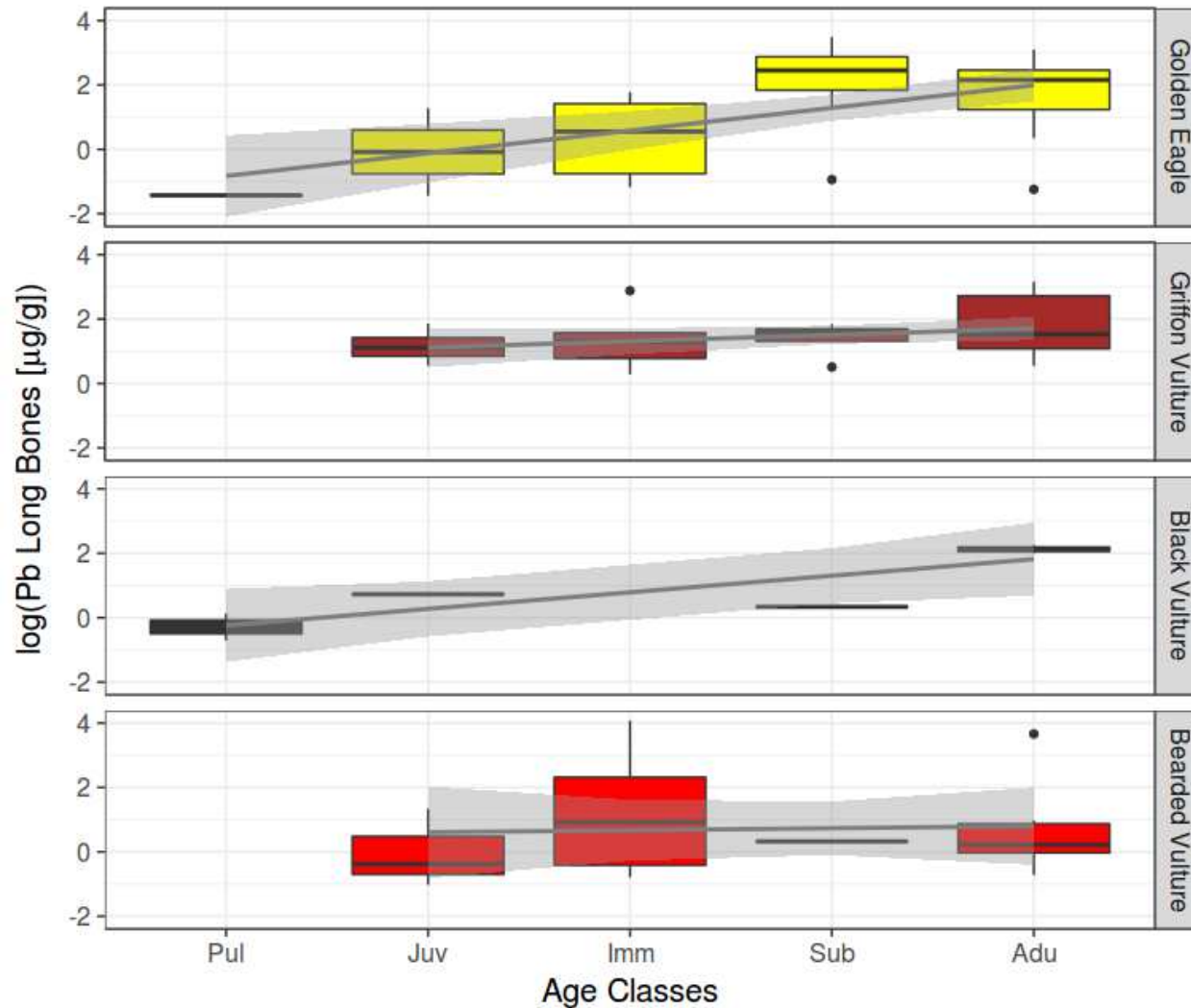
Chronic & SubChronic Accumulation



ANOVA (p-value: 0.03074)

	Estimate	Std. Error	Pr(> t)
(Intercept)	1.52169	0.21099	7.42e-11 ***
Griffon Vulture	-0.02995	0.29051	0.9181
Black Vulture	-0.73276	0.60296	0.2269
Bearded Vulture	-0.80658	0.39639	0.0443 *

Chronic & SubChronic Accumulation - UPTAKE



Golden Eagle:

SubAdult & Adult have uptake significantly greater ($p < 0.0005$)

Griffon Vulture:

Only Adult have uptake significantly greater ($p < 0.0005$)

Black Vulture:

Only Adult have uptake significantly greater ($p < 0.05$)

Bearded Vulture:

No significant difference in uptake between class

Uptake seems linked to the age mostly for Golden Eagle, Griffon and Black vulture. Not for Bearded Vulture.

We compare the LEAD within 17 most used ammunition (used for hunting to ungulates/birds/hares in Italy) with LEAD within the raptors carcasses

BABY MAGNUM BPS
Ptarmigan
42gr



Lead pellet
Cartuccia a pallini

HORNADY A.MAX
7mm 162gr



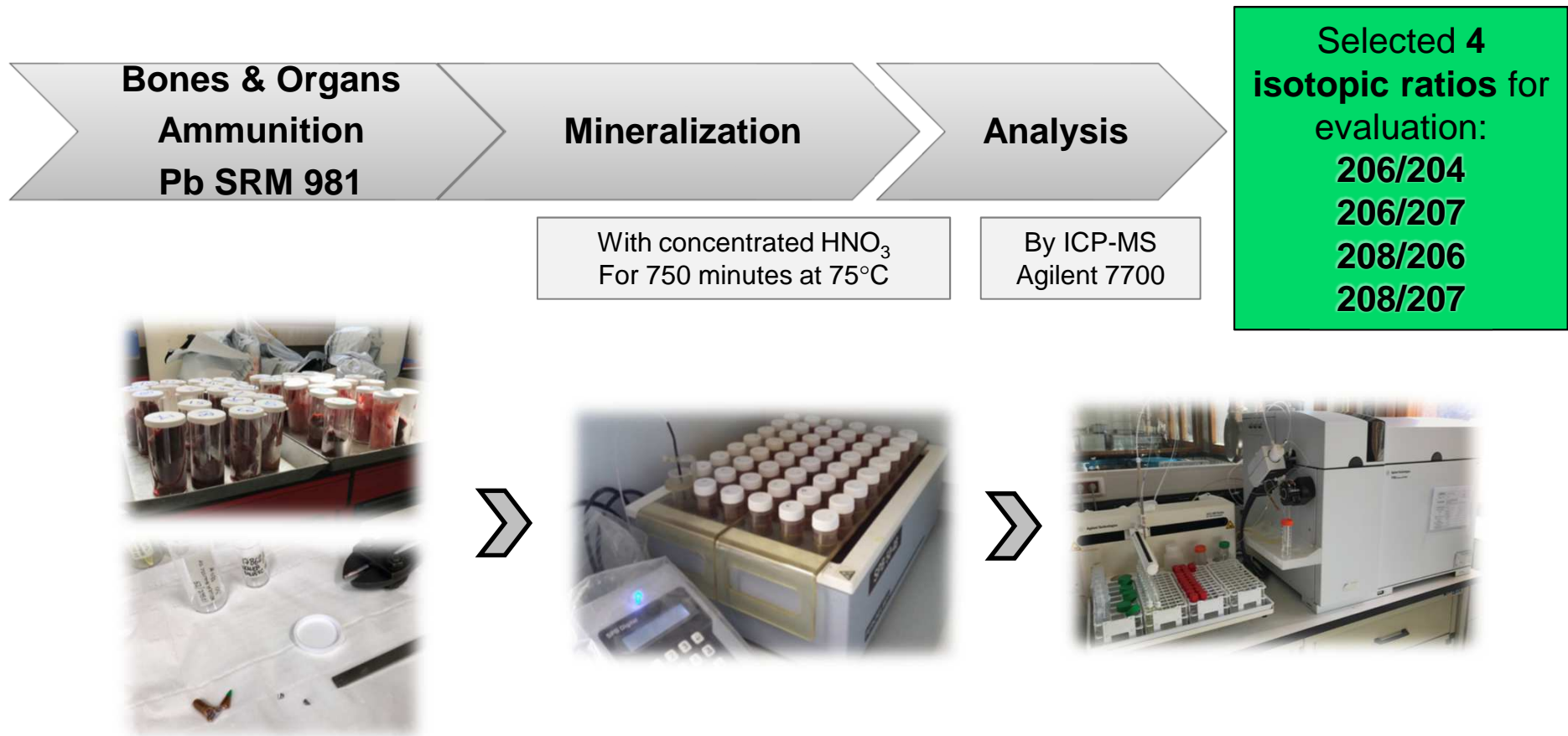
Bullet
Proiettile ogivale

Ammunition	Brand / Name	Caliber	Gr.
Pellet	Rottweil, N°5	12	36
Pellet	Fiocchi Caccia, N°3	12	36
Pellet	Maionchi, M-speed Extra	12	37
Pellet	Baschieri&Pellagri, N°4	12	36
Pellet	Tanaser	12	36
Pellet	Baby Magnum, BPS	12	42
Bullet	Sierra, Spitzer Boat Tail	.284	160
Bullet	Norma, Soft Point	.284	150
Bullet	Hornady, A.Max	.308	178
Bullet	Hornady, Interlock	.308	180
Bullet	RWS	.284	145
Bullet	Hornady, A.Max	.284	162
Bullet	Hornady, Interlock	.256	140
Bullet	Nosler, Accubond	.308	180
Bullet	Hornady, SST	.284	154
Bullet	Sierra	.284	140
Bullet	Nosler, Ballistic Tip	.30	180

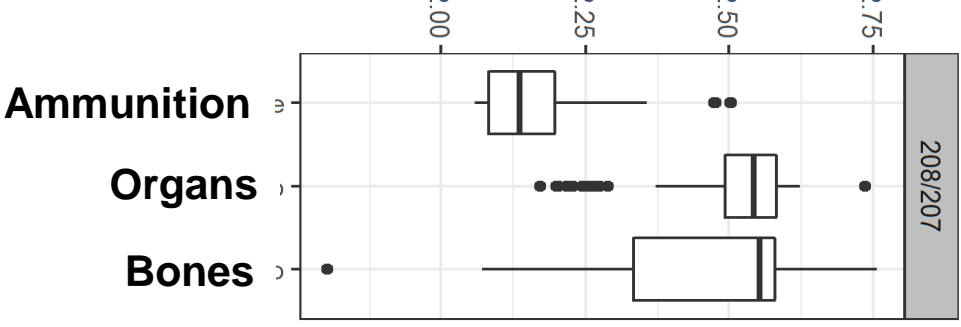
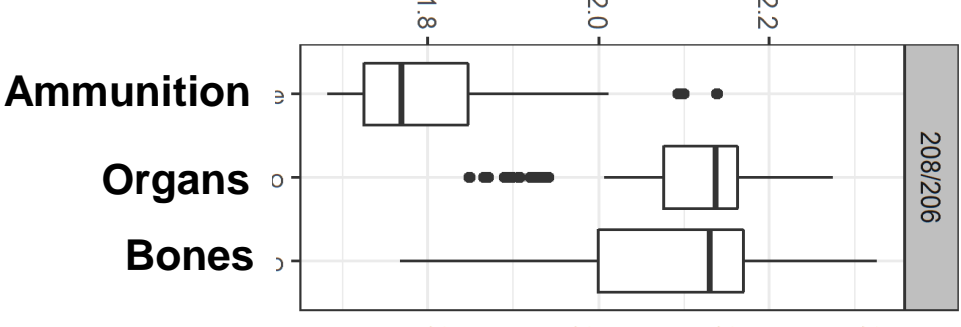
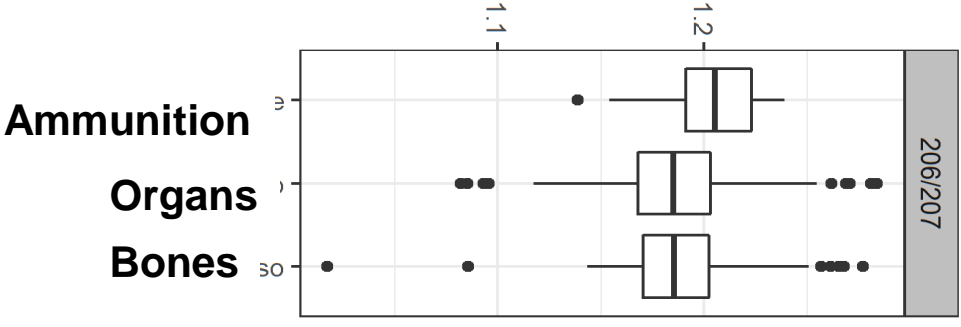
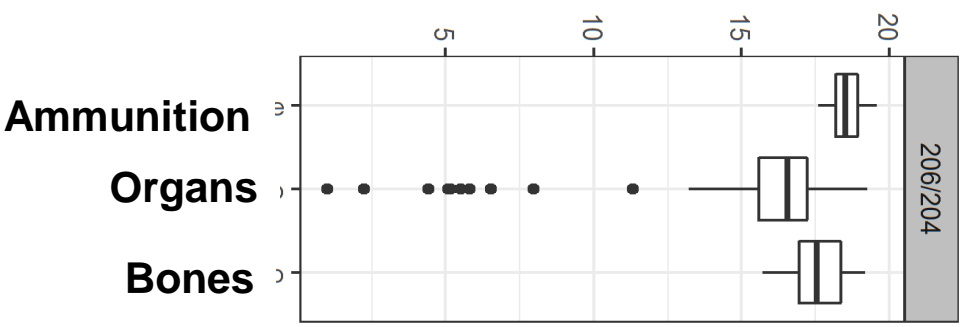
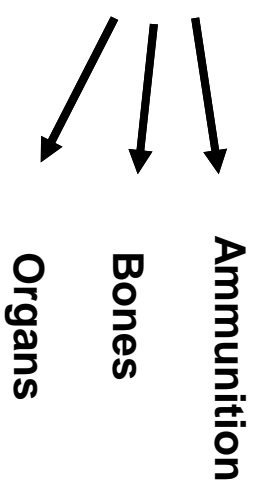


I. Blaas

Determination of the Isotopic Ratio (I.R.)

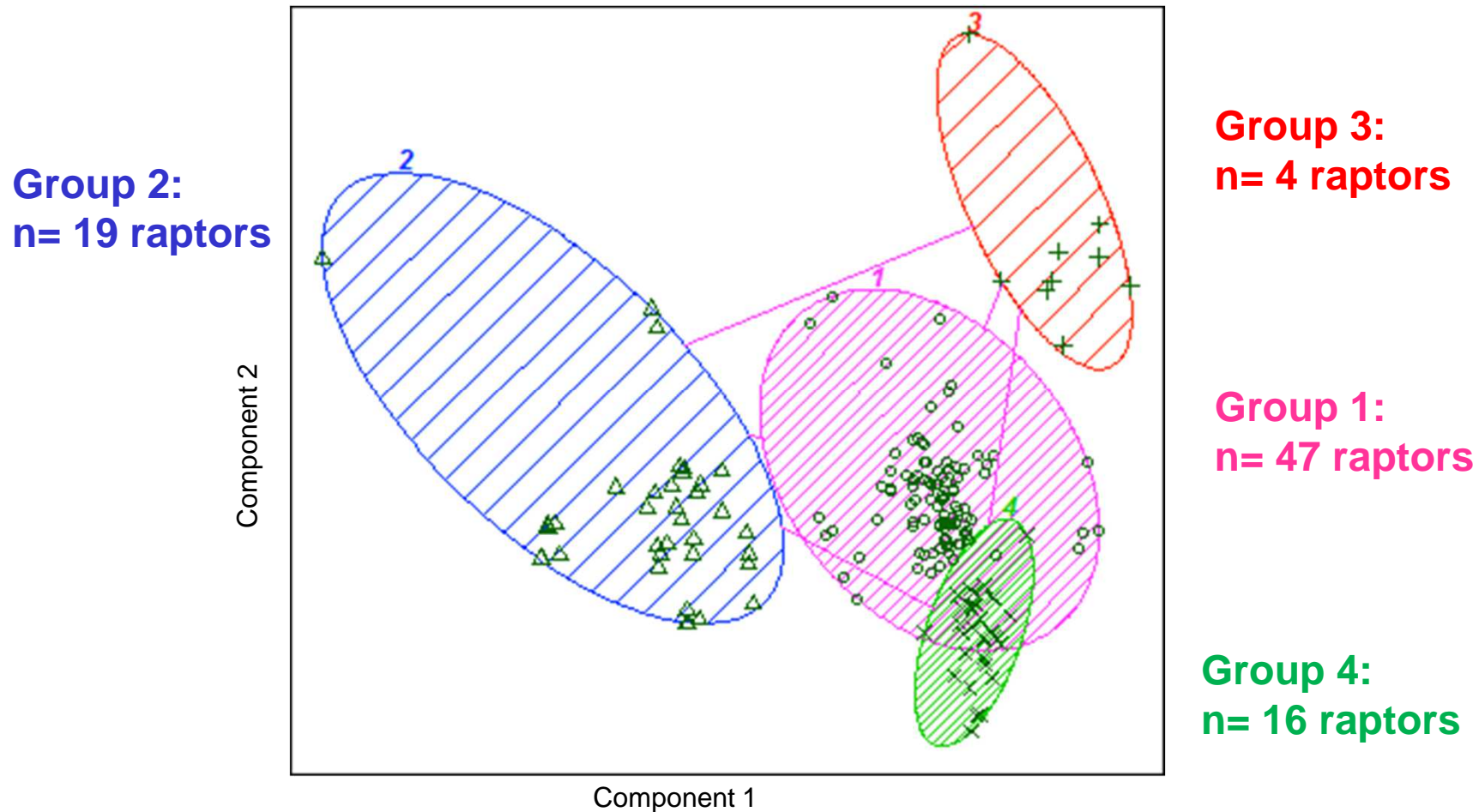


Using box-plots we compared the distribution of I.R. values



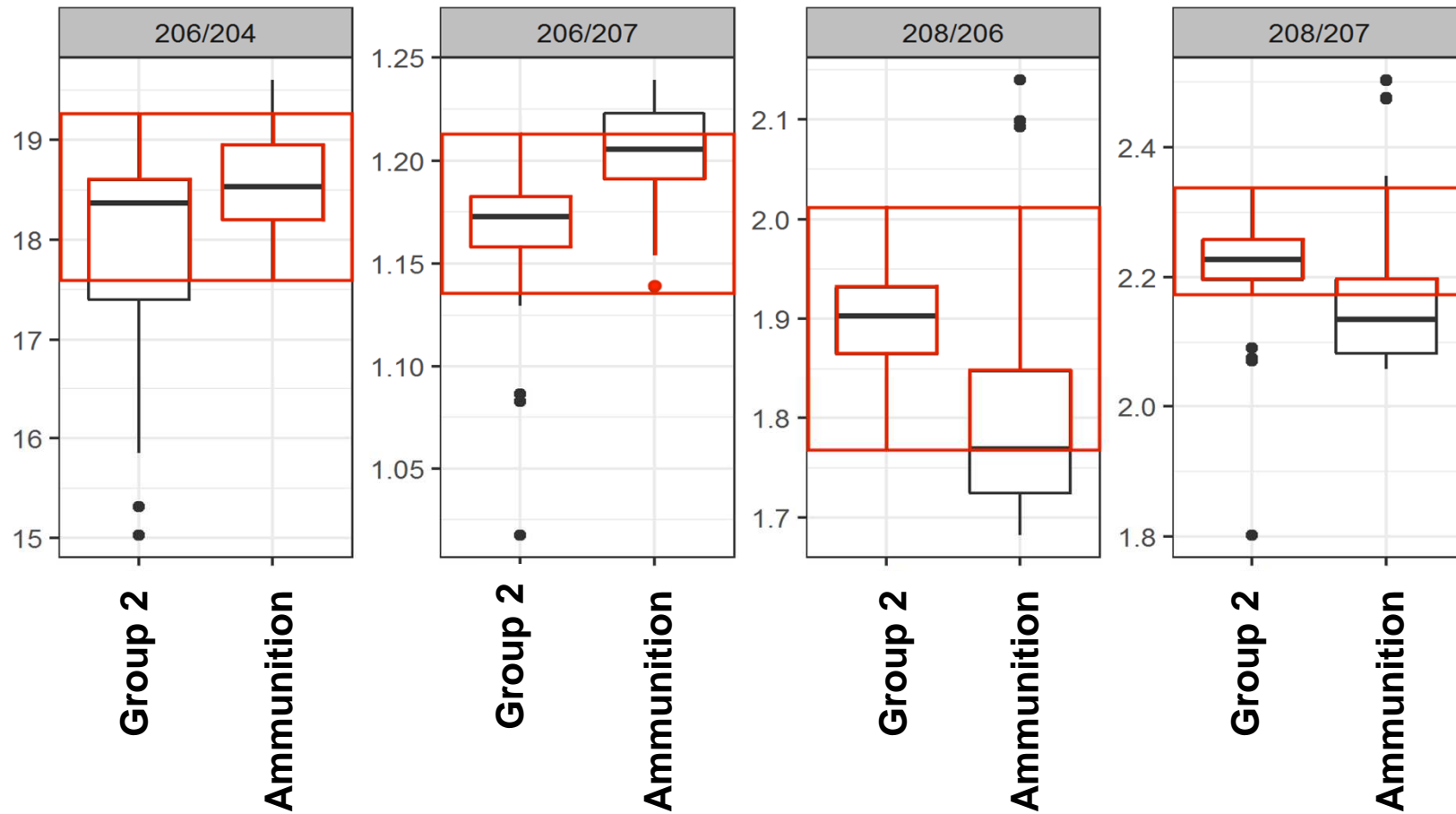
(Cluster Analysis)

4 groups of samples: «similarities» in the distribution of their I.R.



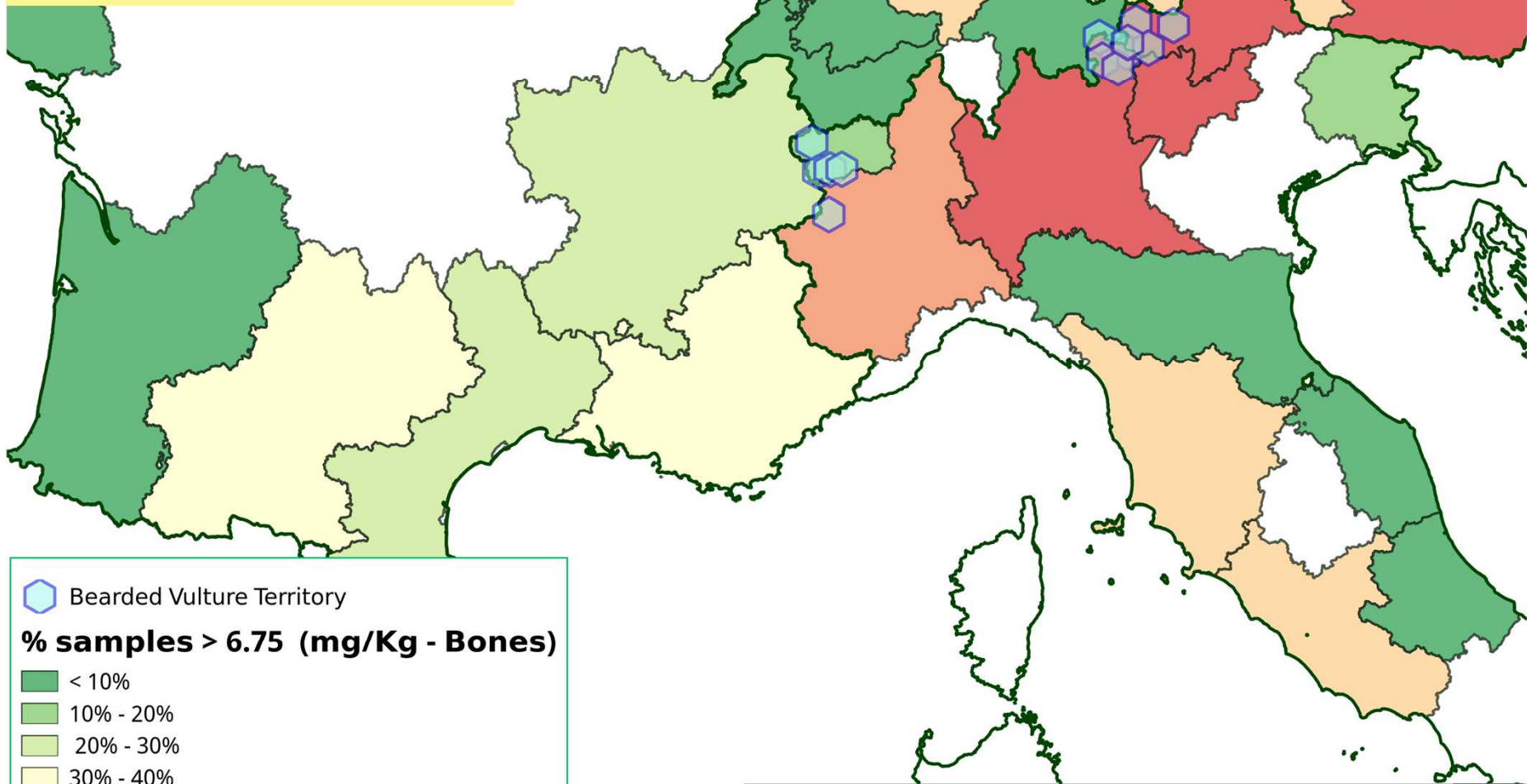
71 samples on 85 (83.5%) show a significant overlap within distribution of the values of at least 2 isotopic ratios!

These box-plots shows an overlap in the distribution of all four I.R. values of **GROUP 2 (19 raptors)** with I.R. values of ammunition



HUNTING with LEAD is a Priority risk for BV expansion

Golden Eagle (n = 59)
Bearded Vulture (n = 18)
Griffon Vulture (n = 64)
Black Vulture (n = 9)



Bearded Vulture Territory

% samples > 6.75 (mg/Kg - Bones)

- < 10%
- 10% - 20%
- 20% - 30%
- 30% - 40%
- 40% - 50%
- 50% - 60%
- > 60%

Boundaries: *Digital Chart of the World*

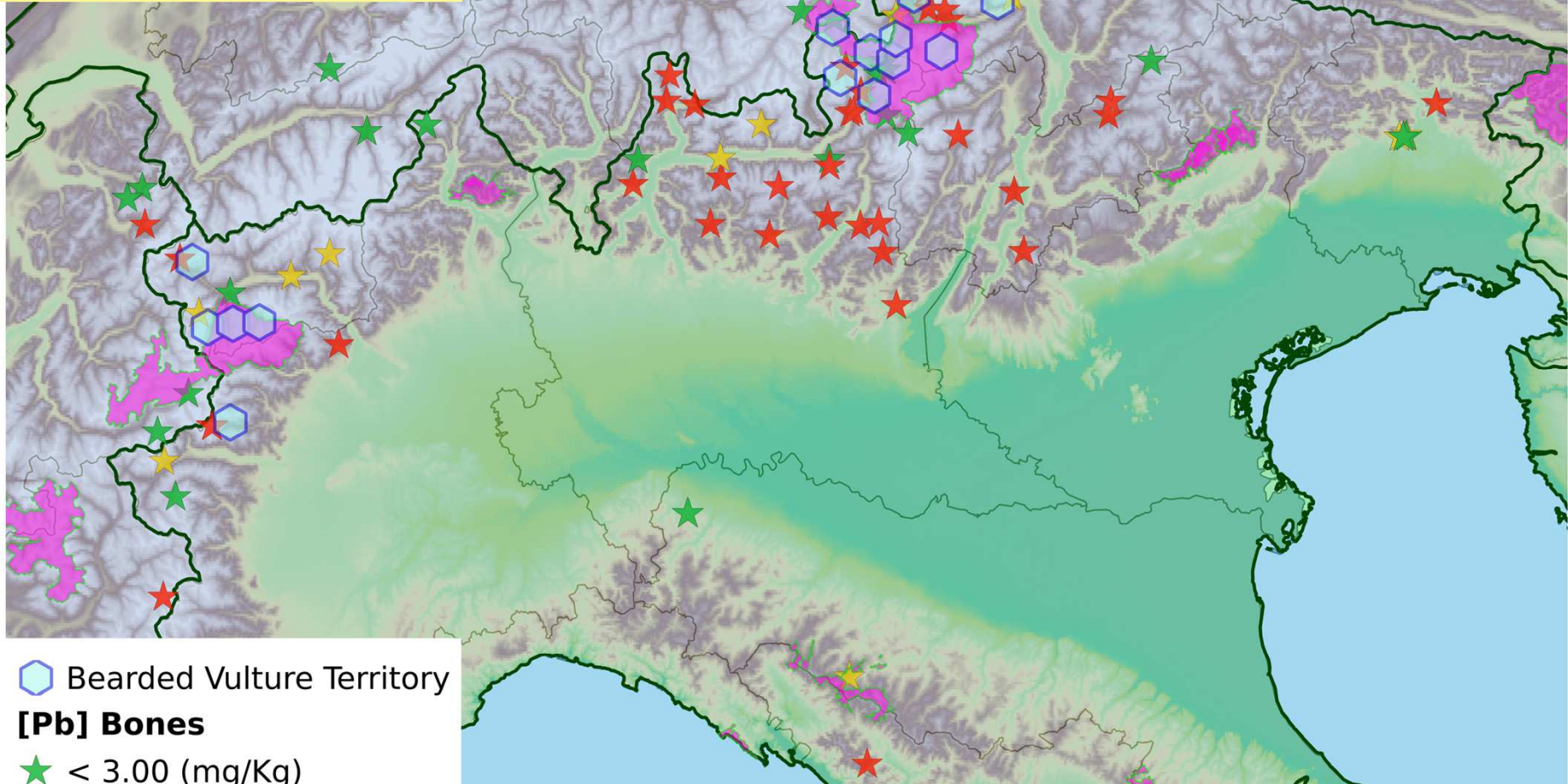
Regions: *EuroStat*



QGIS 2.18

Alps - All species

Golden Eagle (n = 59)
Bearded Vulture (n = 18)
Griffon Vulture (n = 64)
Black Vulture (n = 9)



⬡ Bearded Vulture Territory

[Pb] Bones

- ★ < 3.00 (mg/Kg)
- ★ 3.00 - 6.75 (mg/Kg)
- ★ > 6.75 (mg/Kg)
- National Park

Boundaries: *Digital Chart of the World*
Elevation data: *Shuttle Radar Topography Mission*
Regions: *EuroStat*
Protected Areas: *UNEP - WCMC*


QGIS 2.18

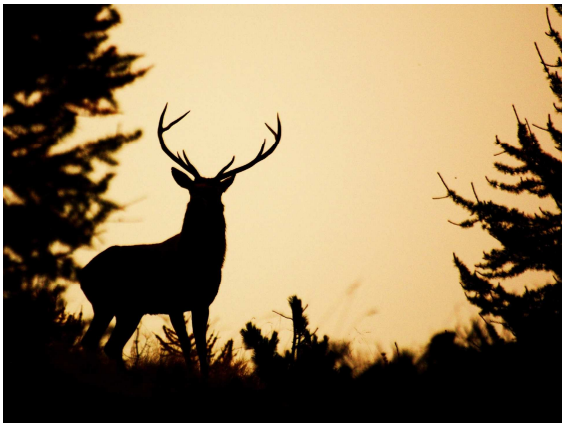


IN THE MEAN TIME STELVIO NP starts a CULLING PLAN TO REDUCE RED DEER (*Cervus elaphus*) HIGH DENSITIES

1. In the first 2 YEARS Lead Bullets were allowed with removal of the entire carcasse

**2. In the following 4 years:
OBLIGATION to use ONLY NOT TOXIC SHOTS
in order to prevent lead intoxication in large raptors**

3. Starting of a LEAD FREE AMMUNITION TEST



***Are lead-free bullets
less effective?***

1) Does the use of lead free bullets cause a loss of precision?

Ammunition	Shot deer	Missed shot	% missed shot
Lead	127	26	20.5%
Lead free	975	234	24.0%

2 - Does the use of not toxic shots cause an increase of injured?

Ammunition	1 Shot deer	2+ shot deer	% wounded
Lead	136	33	19.5%
Lead free	551	149	21.3%

**3 - What is the most determinant factor that causes the wound of the deer?
Shot Precision!**

Hit area	Lead Ammunition		Lead free Ammunition	
	1 shot	2+ shot	1 shot	2+ shot
Head and cardiac area	85.7%	15.2%	87.1%	15.4%
Gut / abdomen	14.3%	54.5%	10.9%	42.3%
Graze shot	1.4%	38.6%	2.0	42.3%

4 - Do the injuring provoked by lead free bullets cause greater problems for the recovery of the deer?

Ammunition	Shot deer*	% hit deer	% wounded	% recovered
Lead	300	79.5%##	12.3%	62.2%
Lead free	975	75.9%	14.9%	60.9%

5 - Is the number of injured animals also dependent to the distance of the shot?

Distance of shot deer	N	% wounded deer
0-50 m	57	3.5%
50-100 m	164	9.8%
100-200 m	215	11.2%
200-300 m	61	9.8%
TOT	497	9.7%

87.7% of deer shot within a distance of 200 meters

6 - Do the deer shot with lead free bullets die far away from *anschuss*?

Distance from Anschuss of shot deer	N	% wounded deer
0-5 m	301	67.0%
5-20 m	61	13.6%
20-50 m	41	9.1%
+ 50 m	46	10.2%
TOT	449	

89.8 % of deer died within a distance of 50 meters from Anschuss

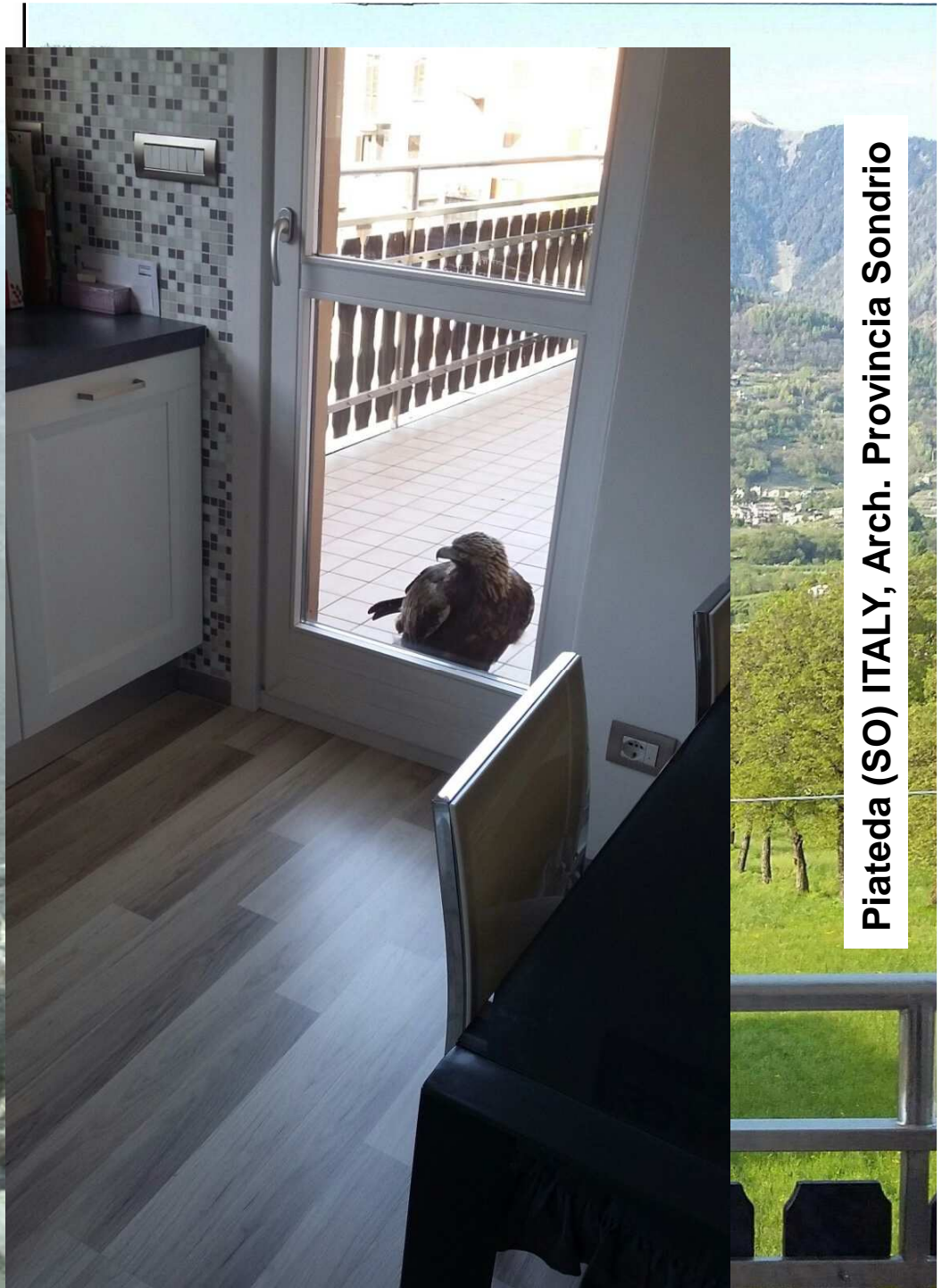
**Optimism and Confidence,
NO Useless Controversy.**

**This is NOT a battle of Environmental Associations
against Hunting and Hunters.**

**This Battle, if accepted by politicians,
public administrators, game wardens and hunters,
can ennoble POLICY and HUNTING
also towards public opinion.**



Val Bolscheras (CH), David Jenny



Piateda (SO) ITALY, Arch. Provincia Sondrio

...paraphrasing the title of a famous italian movie “SATURN AGAINST”



Saturno contro

2007 · Film drammatico/Film romantico · 1h 53m

Ma alla fine la differenza la fa sempre
chi è alla guida



That's the time to have a new title:

«AGAINST SATURN »

the movie about the end of saturnism



It's your choice!

Thanks



THANKS TO

International Bearded vulture Monitoring PARTNERS, *friends and colleagues*



Alberti S., Allavena S., Altea T., Andreotti A., Angelini J., Ariemme L., Armanasco I., Artese C., Battaglia A., Bertoletti I., Bionda R., Bliem K., Boano G., Bonettini A., Bonvicini P., Breton F., Capelli F., Chemollo M., Chiappini A., Chioso C., Ciereghin M., CRAS Valpredina (BG), De Florian M., Di Vittorio M., Frey H., Gavaudan S., Genero F., Giacomelli S., Giraud L., Gossi M., Izquierdo D., Knollseisen M., Lainer F., Landucci G., Llopis A., Macario R., Mauri E. e M., Marlé E., Mendi M., Merli E., Milani F., MUSE Trento, Museo di Bergamo, Museo di Carmagnola (TO), Naritelli I., Neouze R.,



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