An equivocal relation between bear harvest and damage occurrence in the Eastern Romanian Carpathian Mountains

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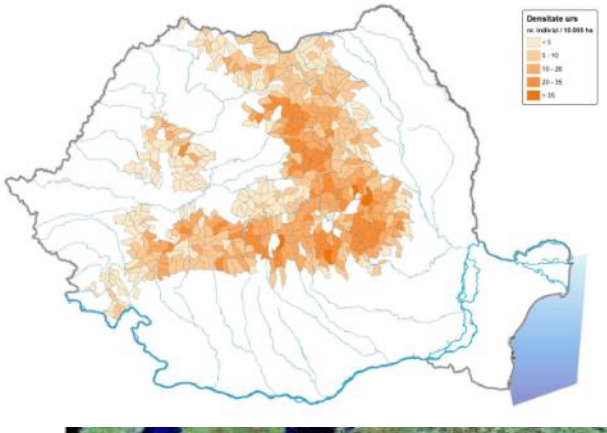
21st International Conference on Bear Research and Management
New Delhi, India | 26-30 November, 2012

Bears in Romania

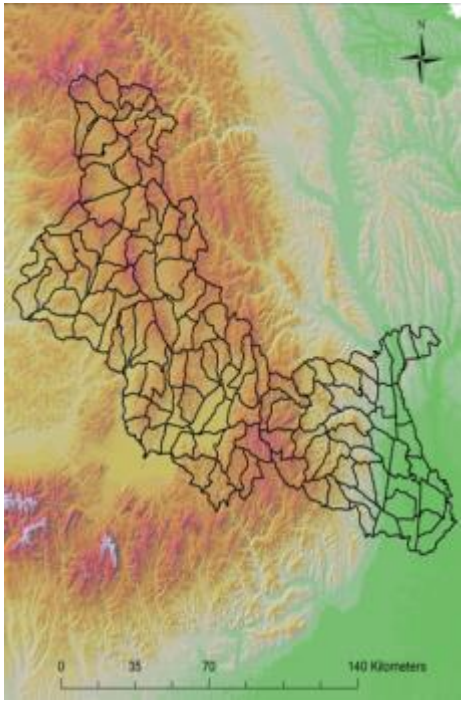
- Species: Brown bear (*Ursus arctos*)
- Distribution area: approx. 69 000 km2
- Population size: approx. 6 000 individuals
- Legal status: protected (since 1997)
- Conservation status: vulnerable
- Hunting: derogation from protection status



Bear management

Brown bears are protected in Romania (Bern Convention – since 1997, the European Union Habitat Directive – since 2007), though they are hunted according to a yearly revised quota.

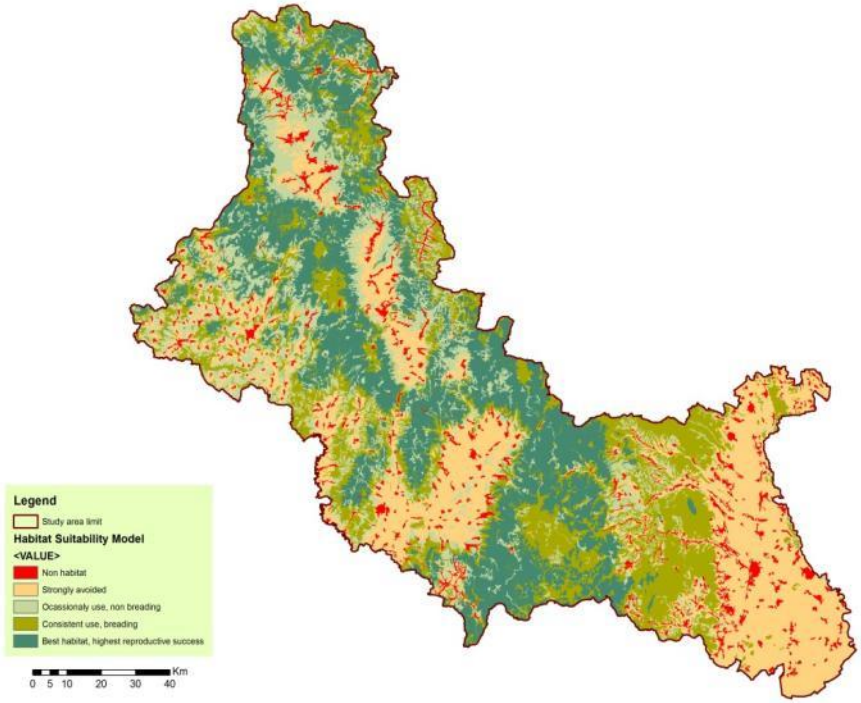
Management unit: approx. 900 Hunting units with bear presence at national level with different sizes (from 90 to 150 km^2).



responsible for bear management:

- **Ministry of Environment and Forests (legislation, strategies)**
- Environmental Protection Agency, Forests and Hunting Inspectorate (permits, reports, damages, monitoring)
- **Managers of game units (counting, hunting, damage prevention)**
- Administrators of protected areas (monitoring)
- Research institute (studies, reports)
- NGO's (maintaining the gouverment busy)

Study Area



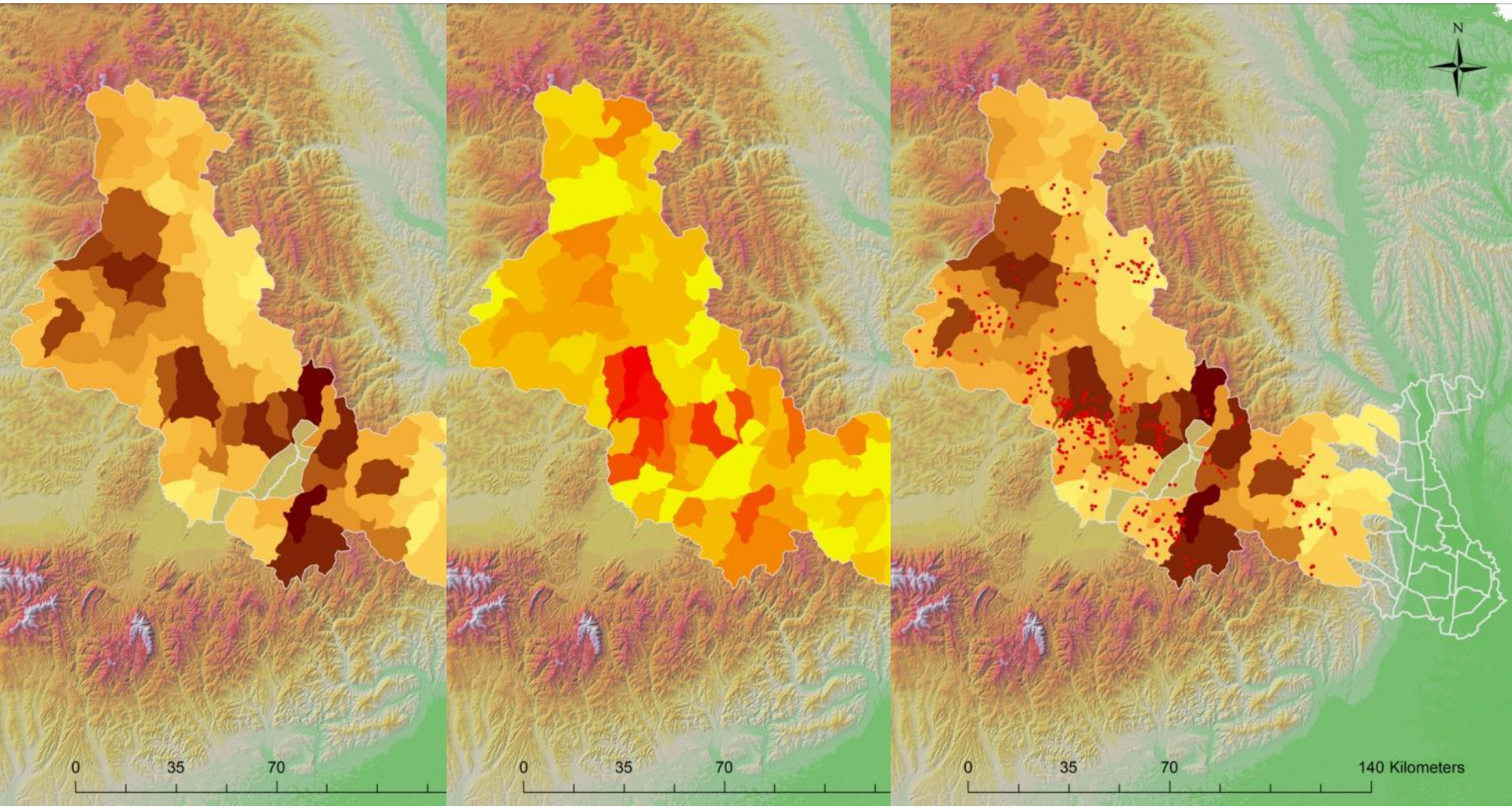
- LIFEURSUS Project Area
- located in the Central and Southern part of the Eastern Romanian Carpathians
- 15 196 km^2 which covers approx. 20% of the estimated total bear distribution area in Romania
- the suitable habitat for bear during the winter period is about 5500 km^2 (approx. 36%).
- brown bear mean density: estimated at 4.3 brown bears/10 km^2.
- hunting units with bear presence: 97 (10% of all game units)

Study area- data for 2007-2011

approx. 1700 bears

341 harvested bears

343 damage reports



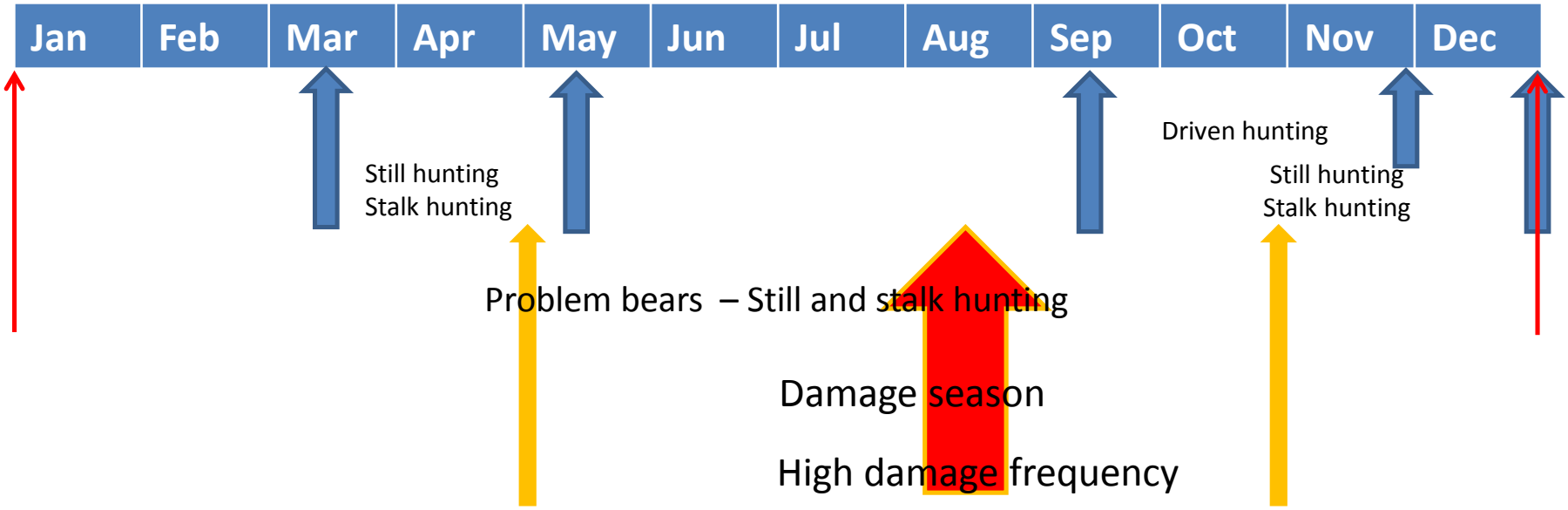
Bear hunting

- Maximum intervention number (quota) is established by the Ministry of Environment and Forests for **damage and human-conflict prevention,** species and habitat conservation
- Quota is approx. 5% from the estimated population (at national level approx. 350bears/year)
- Two hunting seasons:

Baiting for hunting purposes is forbidden, but suplimentary food is offered during spring and autumn for facilitating bear population estimation and to minimize the damage frequency.

Damage

Hunting season vs. Damage season



Damage assessment:

- More frequently on livestock than agricultural field
- Predominantly cows were killed (specific farming)
- During grassing period
- In the vicinity of forests (less than 500 m distance)
- Repeated attacks in several areas
- Few cases of multiple killing

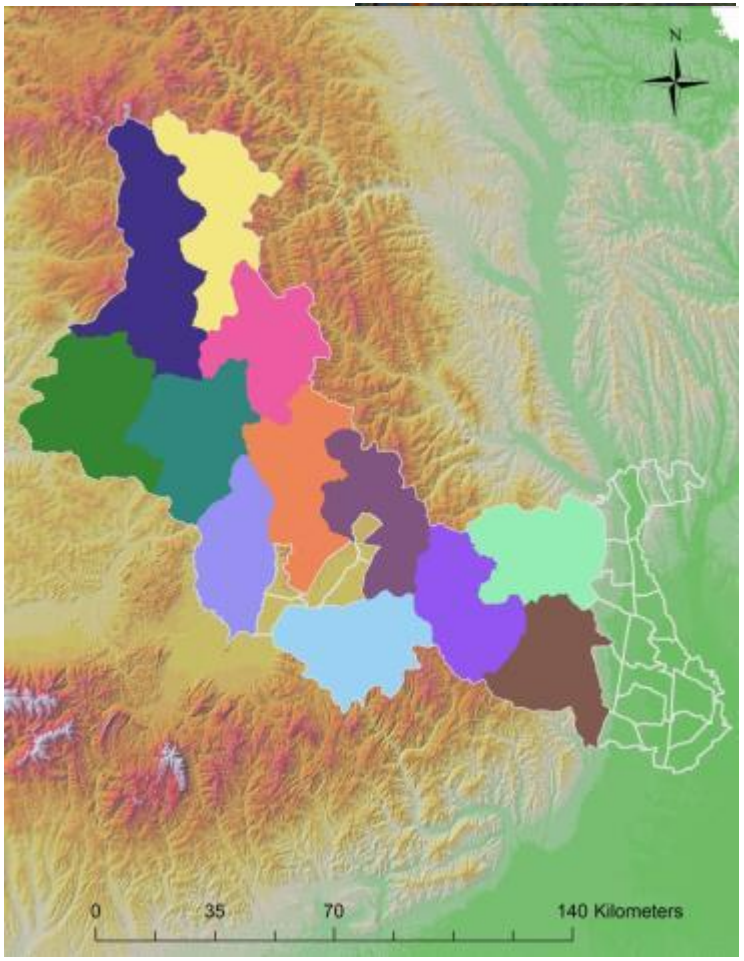
Hypotheses

Assuming that hunting reduce carnivore populations, eliminate nuisance individuals selectively and thus minimize subsequent damage occurrence , following relations should be valid:

- ❑ a higher population size generates more damage
- ❑ a higher hunter take minimizes population size and damage occurence
- ❑ a seasonal impact of hunting on damage occurence
- ❑ evidence of selective hunting according to damage related aspects

Data and methods

- data of **341 hunted bears and 343 damage reports** on livestock and agricultural fields between 2007 and 2011
- reports of hunters included: harvest location, harvest method, sex and age of harvested bear (visual estimation), CIC skull measurement
- **123 game units were grouped into 12 study areas** with sizes between 750 and 1500 km^2 according to the prevailing relief and potential barriers for bear movements.
- the harvest data set was split into **two hunting periods per year**.
- damage information included the location, time of attack, animal killed or type of culture.
- population density was calculated on the base of population estimation of each hunting unit (in 2010) and respective HU size



Results - Hunting vs Damage

Control variable	Grouping			n	df	r	P	SE	95% lCI	95% uCI
		Population density	Damage occurrence	120		0.121	0.187	0.065	- 0.015	0.248
			Hunter take	120		0.267	0.003	0.070	0.133	0.411
	2011	Population density	Hunter take	24		0.445	0.029	0.172	0.109	0.747
		Hunter take	Damage occurrence	120		0.088	0.338	0.075	- 0.047	0.242
Population density		H	D		117	0.058	0.529	0.080	- 0.083	0.221
	Spring	H	D	60		0.076	0.565	0.114	- 0.138	0.302
	Autumn	H	D	60		0.302	0.019	0.119	0.080	0.546

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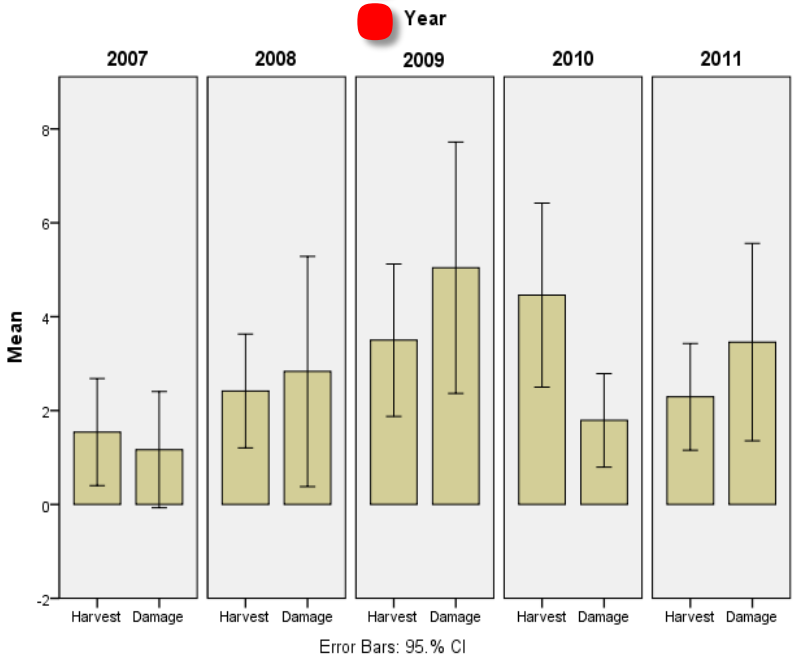
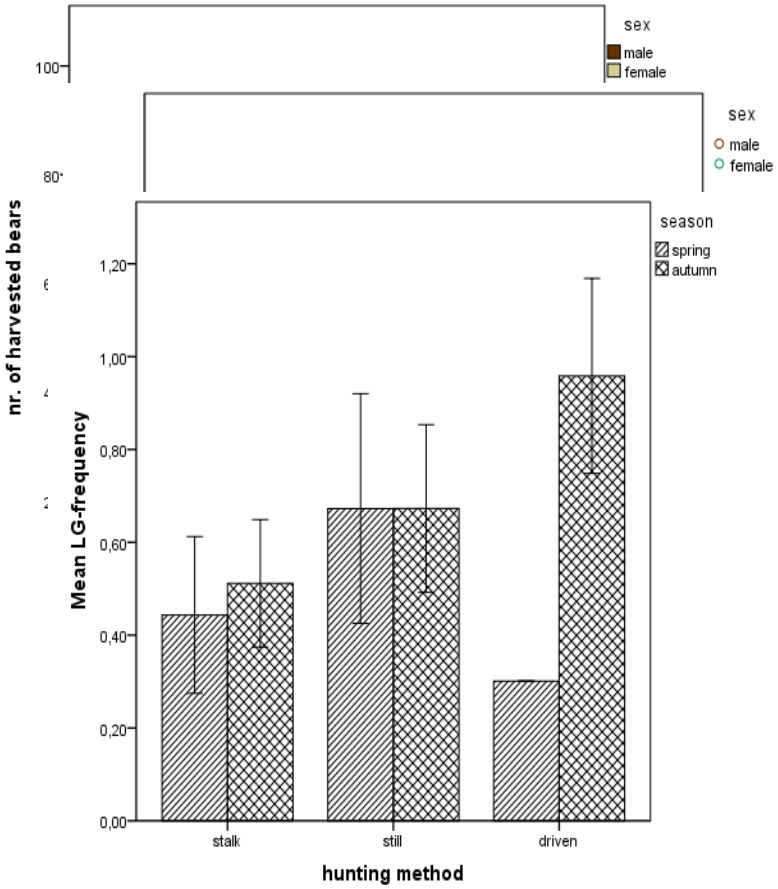


Results-harvest analyses

Do the **gender, age and hunting method** have an effect on the number of harvested bears?



Significantly more males than females were harvested

High level of adult individuals

Univariate Analysis of Variance
Dependent variable: Log-transformed harvest frequency

- significant main effects of the gender, age class and hunting method (stalk, still, driven) on the number of harvested bears.

$F(1, 13) = 66.87$, $P < 0.001$, $\eta^2 = 0.84$
$F(5, 13) = 11.78$, $P < 0.001$, $\eta^2 = 0.82$
$F(2, 13) = 33.62$, $P < 0.001$, $\eta^2 = 0.84$

- significant interaction between the gender and age on the number of harvested bears

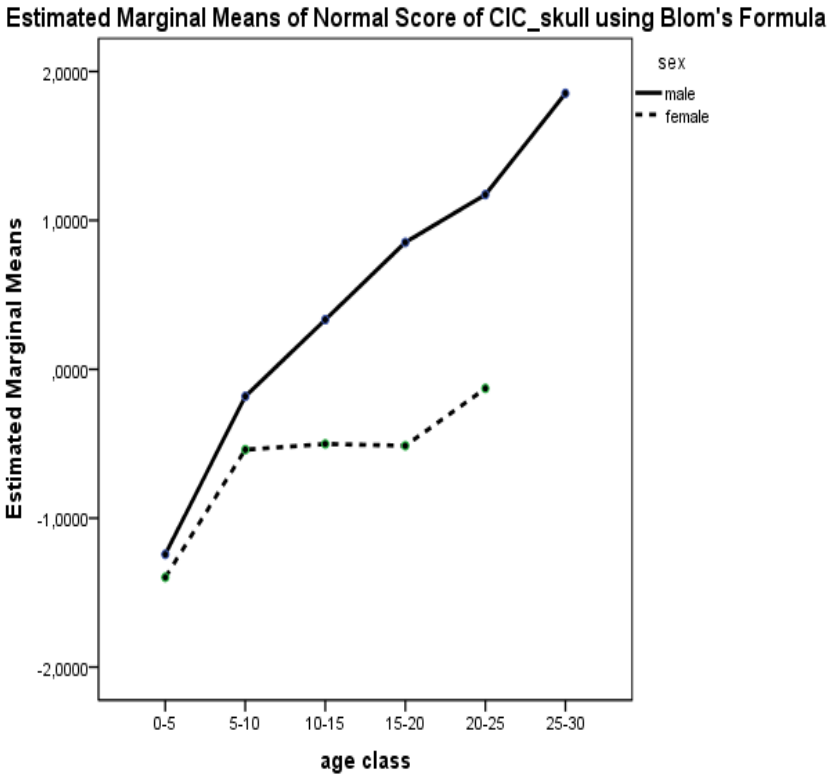
$F(4, 13) = 3.33$, P 0.05, n2 = .51

- The Bonferroni post hoc test :

Driven (M = 10.73, SD = 10.15) is sign. different from still (M = 5.74, SD = 6.95) and stalk (M = 3.45, SD = 3.11).

Results-harvest analyses

Is the **CIC skull** well reflected by the sex and the age of harvested bears?



Univariate Analysis of Variance
Dependent variable: Normal Score of CIC_skull using Blom´s Formula

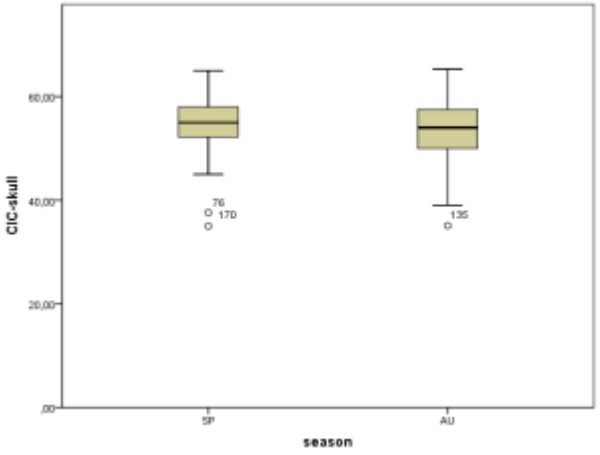
- There was a significant main effect of the gender on the skull size, $F(1, 302) = 36.38$, $p < 0.001$, $\eta^2 = 0.11$.
  Males (M = 54.12, SD = 5.20), min. 35.00 – max. 65.30
  Females (M = 50.43, SD = 3.76), min. 41.00 – max. 60.70

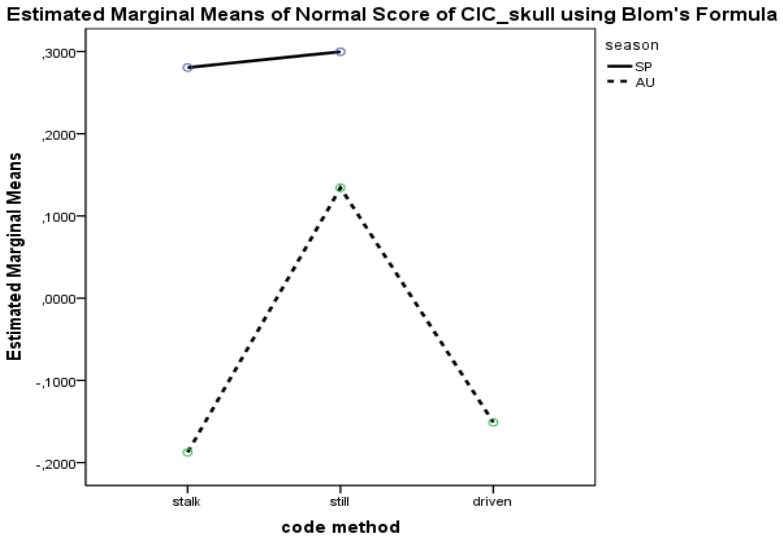
- There was a significant interaction between the gender and the age class on the size of the skull, $F(4, 302) = 3.32$, $p < 0.05$, $\eta^2 = 0.04$.

- Age class had a significant effect on skull size, $F(5, 302) = 18.67$, $p < .001$, $\eta^2 = 0.27$.

Results-harvest analyses

Do the **season and the hunting method** have an effect on the skull size of harvested bears?





Pairwise comparison of the hunting seasons (spring and autumn) showed a significant effect on the skull size ($p<0.05$). SP (M = 54.55, SD = 4.80), AU (M = 52.90, SD = 5.28)

The Bonferroni post hoc test revealed no difference in skull sizes between stalk (M = 53.80, SD = 5.55) and still (M = 54.69, SD = 4.56), and between stalk and driven (M = 52.70, SD = 5.39), **but between still and driven** ($p<0$ .05).

Hunting Period 2007-2011	Harvested Bears	% males	% females
Spring	130	94	6
Autumn	211	77	33
Total	341	83	17

Conclusion

CIC skull: useful indicator for assessing the hunting results

Impact of season: larger skull sizes in spring, more individuals in autumn

Hunting is selective and orientated towards males and adult individuals with large skull sizes

Trophy hunting

1. Strong negative impact on population structure and dynamic!

2. Vicious circle: cubs acquiring nuisance behaviour from their mother

Conclusion

- ❑ a higher population size generates more damage
- ❑ a higher hunter take minimizes population size and damage occurence
- ❑ a seasonal impact of hunting on damage occurence
- ❑ selective hunting according to damage related aspects

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- ✓ Population size is a factor with a small impact on damage occurence and difficult to be changed in a short period within a planned human intervention.
- ✓ Damage occurence is depending mainly on human activity and presence of problem bears.
- ✓ Hunting could be a useful tool for damage prevention if it is planned and applied for this purpose (e.g orientated towards problem individual or sex-age-class).

Thank you for your attention!

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Drawing made by Adorjan Katalin, 12 years old - winner of the ”Us and bears” drawing contest, LIFEURSUS Project