Differences in the mineral status of European bison populations (Poland)

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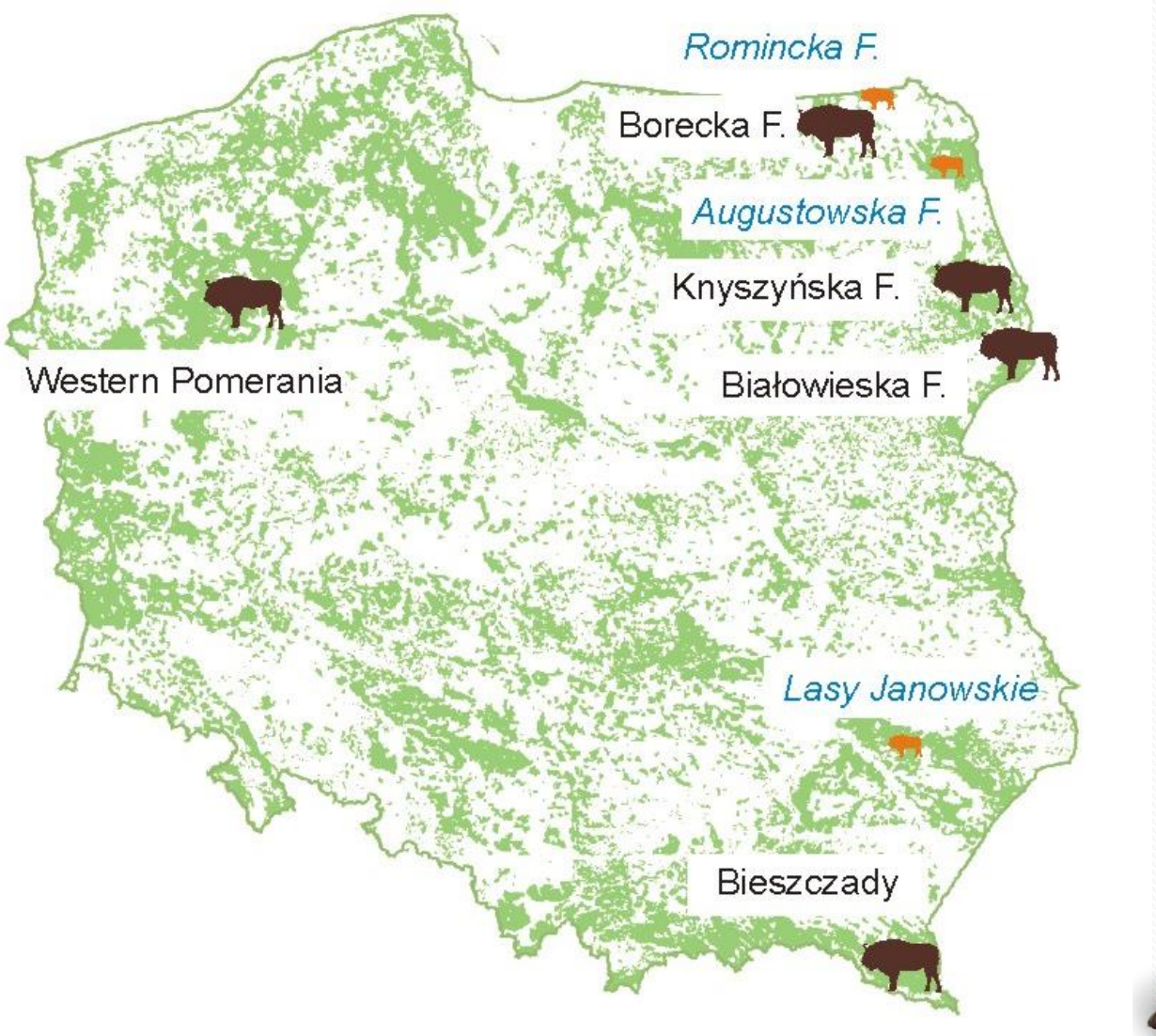
European bison population in Poland



Risks for the European bison population

- Bacterial and viral diseases,
- Parasitic invasions,
- Loss of genetic diversity,
- Migration barriers,
- Lower social acceptance,
- Concentration of elements?

Methods

Analysis of hepatic concentration of 27 elements

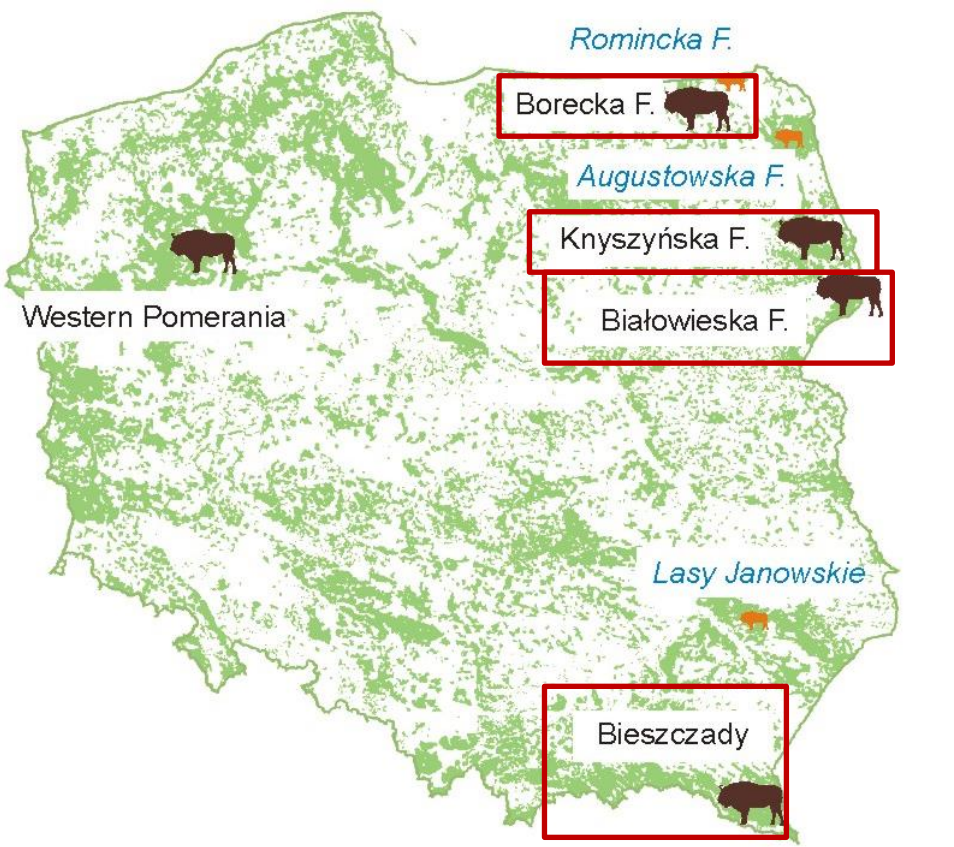
- Liver samples form animals found dead or eliminated through lethal control)

- Samples collected between 2004 and 2018

- four populations in eastern Poland

- age of individuals: 1-25 years

- Inductively coupled plasma optical emission spectrometry - ICP-OES



Methods

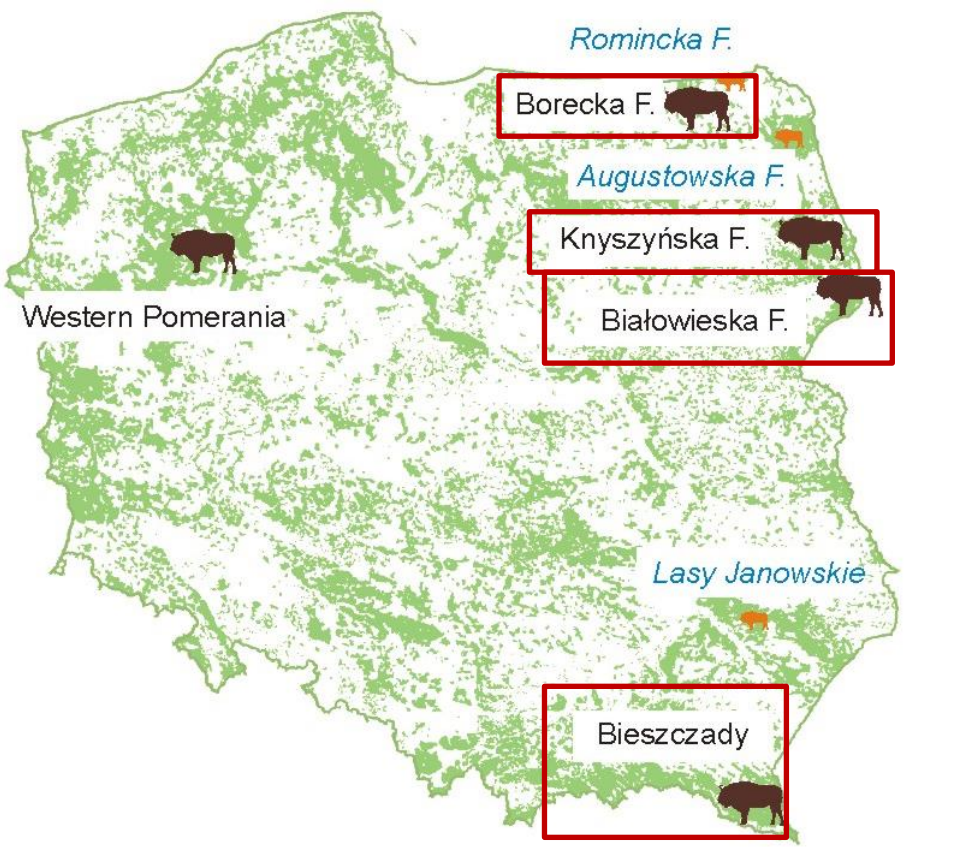
Data elaboration and statistics

- transformation of variables to reach normal distribution

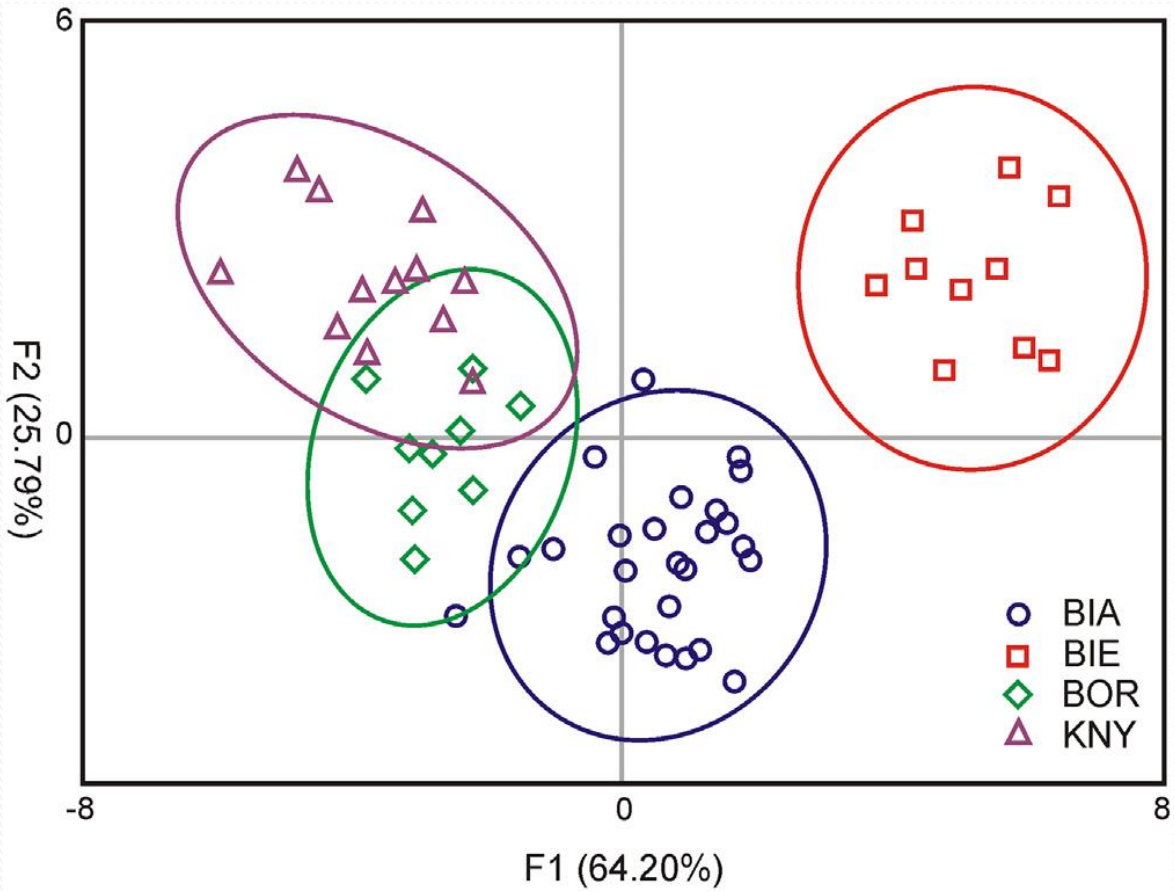
- discriminant analysis

- 27 general linear models: age, sex, site (population)

- Pearson's correlation – all elements in pairs



Results



Plot of functions F1 and F2 used in the discriminant analysis of themineral status of the four European bison populations (BIA – Białowieska Forest, BIE – Bieszczady Mountains, BOR – Borecka Forest and KNY – Knyszyńska Forest) based on ICP-OES analysis of 27 elements in liver samples. The cumulative discrimination value of functions F1 and F2 is 89.99%.

Results

Among the 27 analyzed elements, **17** indicated a relation with site (14), sex or age

Two elements (Ca and K) differed regarding site and sex,whereas only Li differed regarding site and age.

Bieszczady was the most distinctive site as it had higher levels of Ba, Ca, Cd, Se, and lower levels of Mo and V than all other sites

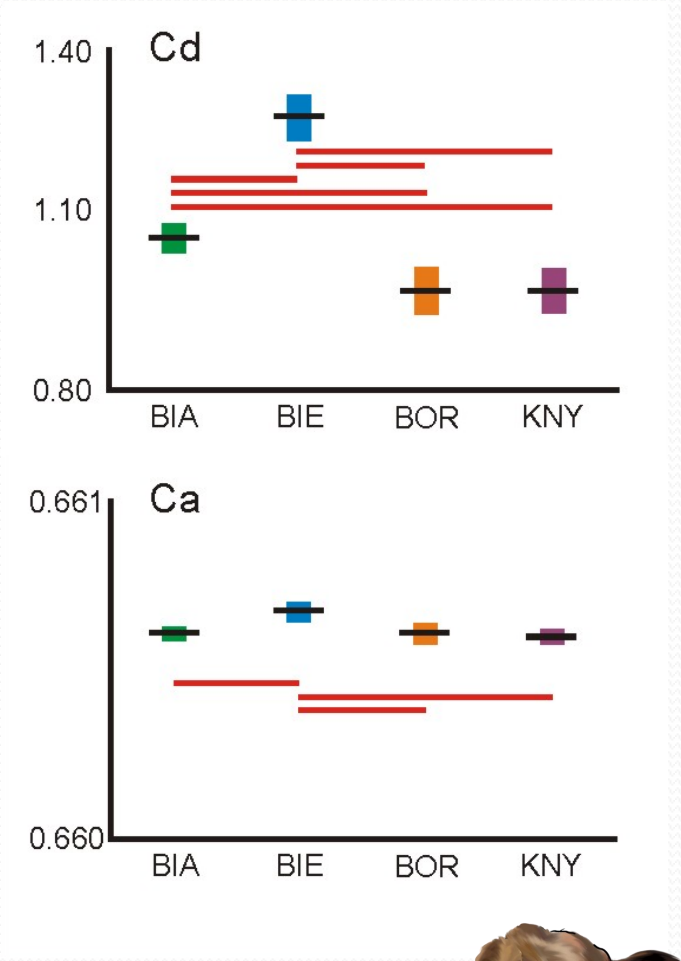
Knyszyńska Forest had a higher level of Al than other sites and was lower in Cu and Na

Results

BIESZCZADY

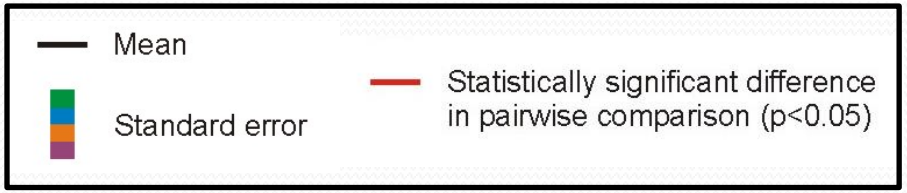
Cadmium (Cd) concentration in E. bison in Bieszczady was over 5 times higher than in other sites, 45% of liver samples were above the maximum reference level of Cd.

Probable source – local plants



Calcium (Ca) about 50% higher concentration in E. bison in Bieszczady than in other sites

Probable source – local rivers

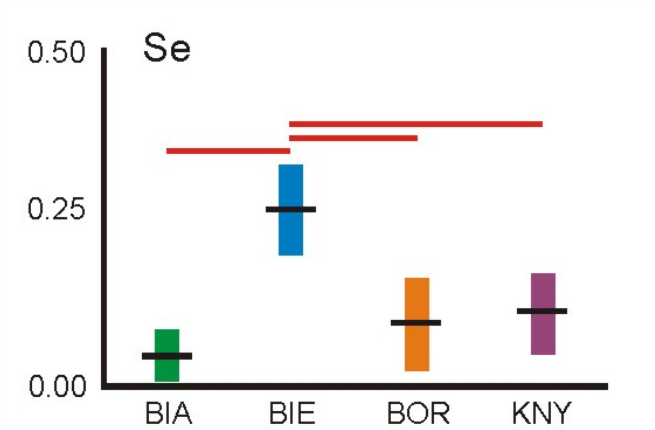


Results

BIESZCZADY

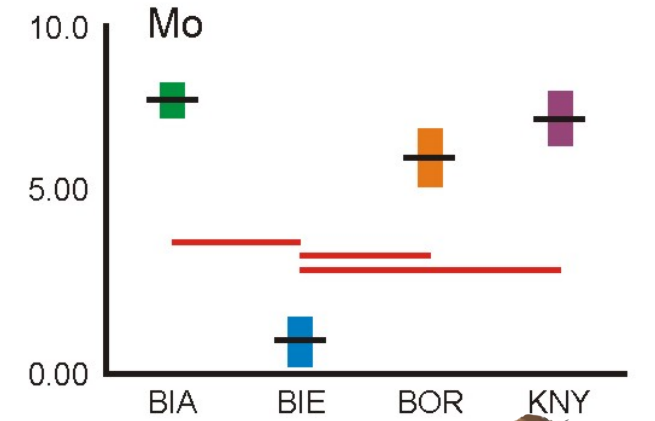
Selenium (Se) about 50% higher concentration in E. bison in Bieszczady than in other sites
- 12% showed marginal hepatic levels of Se

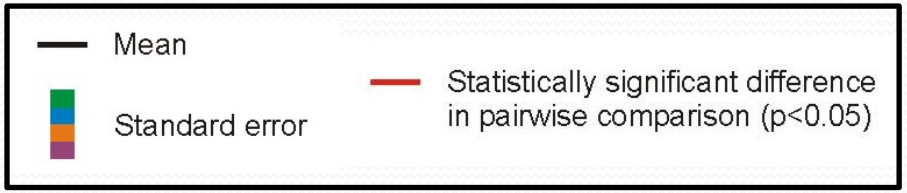
Probable source – local plants



Molybdenum (Mo) about 3 times lower concentration in E. bison in Bieszczady than in other sites

Probable reason – low pH of forest habitats (beech forest)





Results

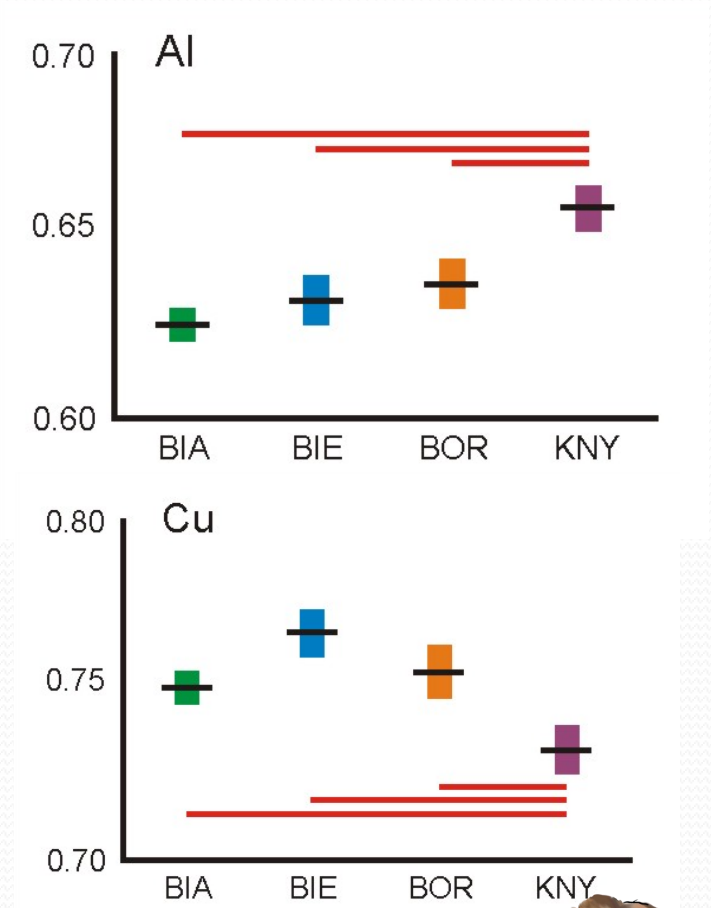
KNYSZYŃSKA FOREST

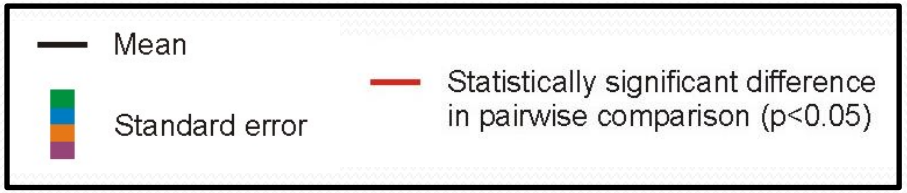
Aluminium (Al) concentration in Knyszyńska F. was twice as high asin other populations, comparable to concentration in wild boar

Probable reason – eating of soil while foraging on crops

Copper (Cu) significantly lower Cu concentrations than all other populations

Probable reason – copper content in the rapeseed fields (application of N and P)

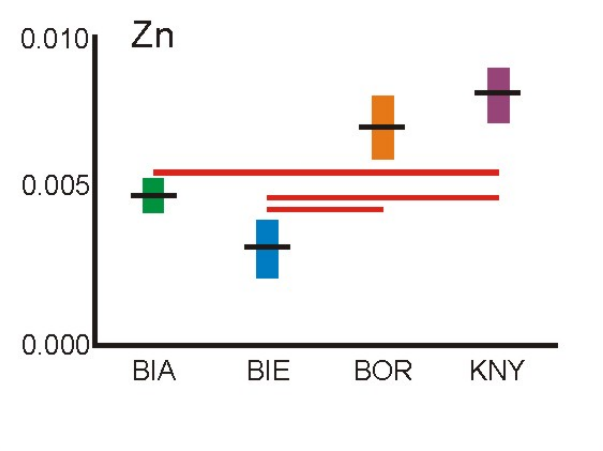


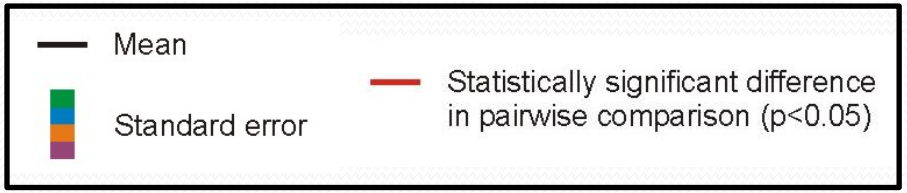


Results

Zink (Zn) Concentration was the lowest in Knyszyńska F., about 22% of population presented deficiency (mainly from Knyszyńska F.)

Probable reason – higher pH of crops (rapeseed), application of P





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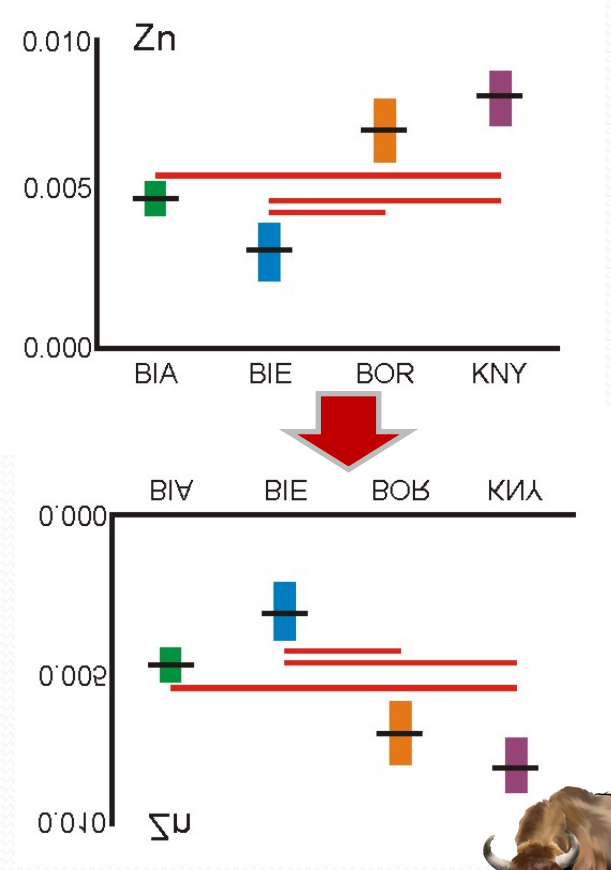

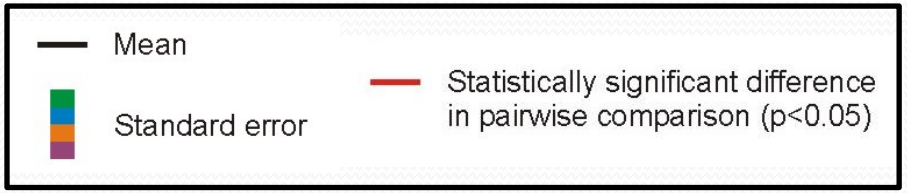

Conclusions

Individual European bison populations may each have specific mineral status

Toxic elements or deficiencies of essential elements should be considered locally

Factors:

- parent rock,
- local plants (accumulation)
- pH of habitats and crops
- application of Na and P
- consumption of soil
- antagonism of elements

Conclusions

Conservation measures should be closely adjusted to the conditions of a given local population

One should not draw conclusions about the status of all populations from a given country or even region on the basis of studies of a single population

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Essential differences in the mineral status of free-ranging European bison *Bison bonasus* populations in Poland: The effect of the anthroposphere and lithosphere

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