# Intrasite spatial analysis based in a Geographic Information System and apply to extensive Middle Palaeolithic open-air sites in northern France. The example of Caours (Somme, France).

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# Middle Palaeolithic open air sites in northern France

GeoAppS
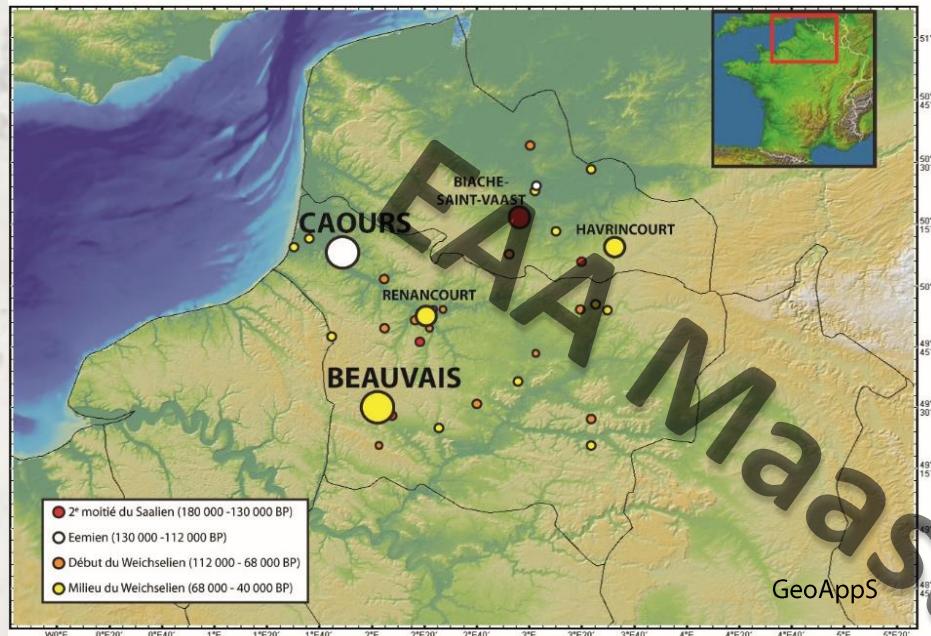
- ➢ Excellent Chronostratigraphic framework

- ➢ Different:
  - • Biotopes
  - • Cultures
  - • Behaviours

Locht *et al.*, 2015

* Sites with radiometric datations

1
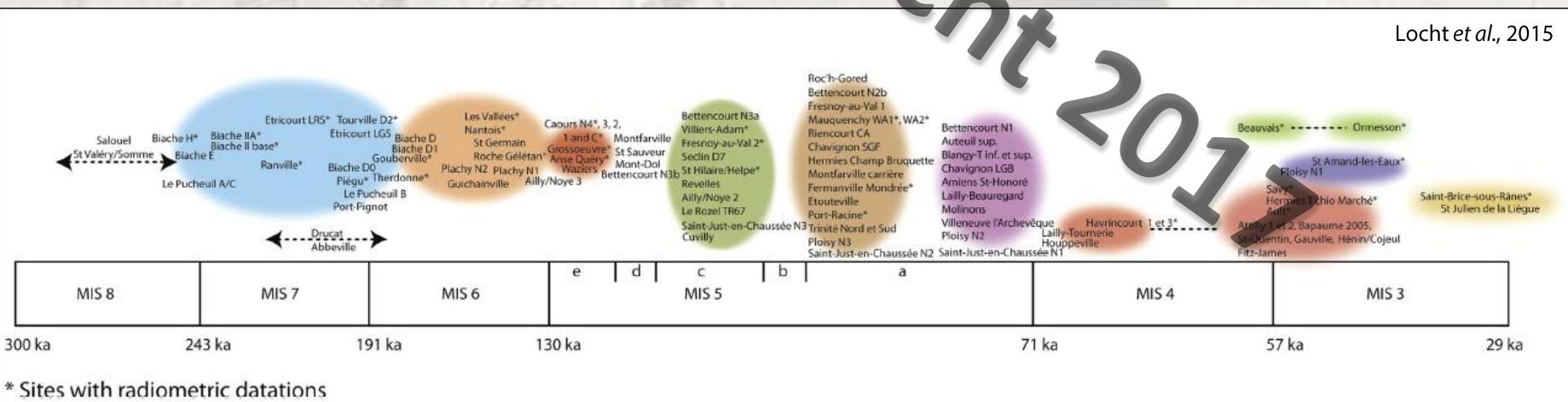
Middle Palaeolithic **open air sites** in northern France

> Exceptional preservation, superficies and faunal remains abundance :
>
> - Sedimentation : calcareous, fine, quick
> - No alteration of layers
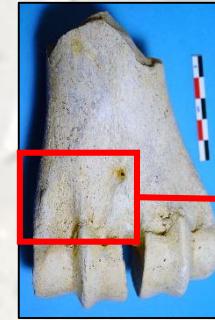
Cut marks on Aurochs bone
(Photos: P. Auguste)

Aurochs mandible and fractured bones (Photos: J.L. Locht)

Site of Caours

2

Middle Palaeolithic open air sites in northern France

Middle Palaeolithic : no organisation detectable but dots cloud

→ Concentration zone of archaeological artefact

→ Modelization

Site of Caours : Faunal remains of archaeological layer 4
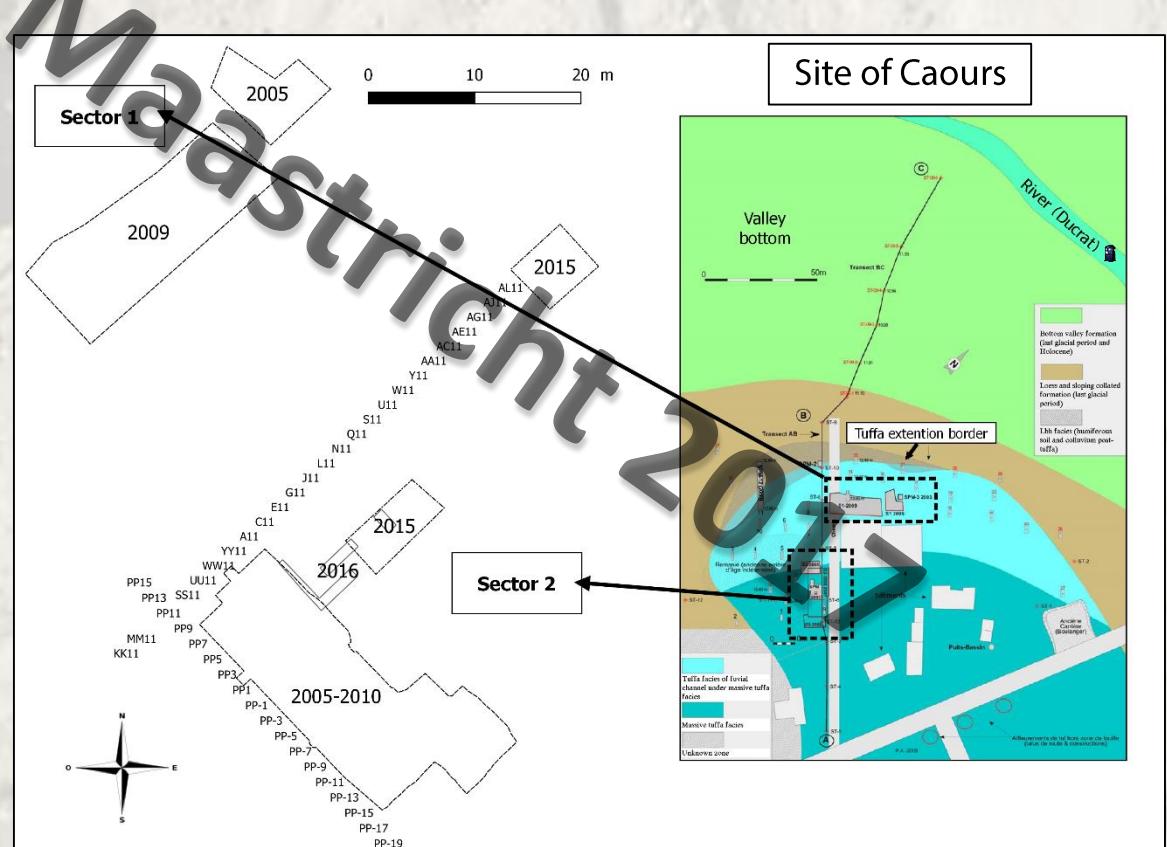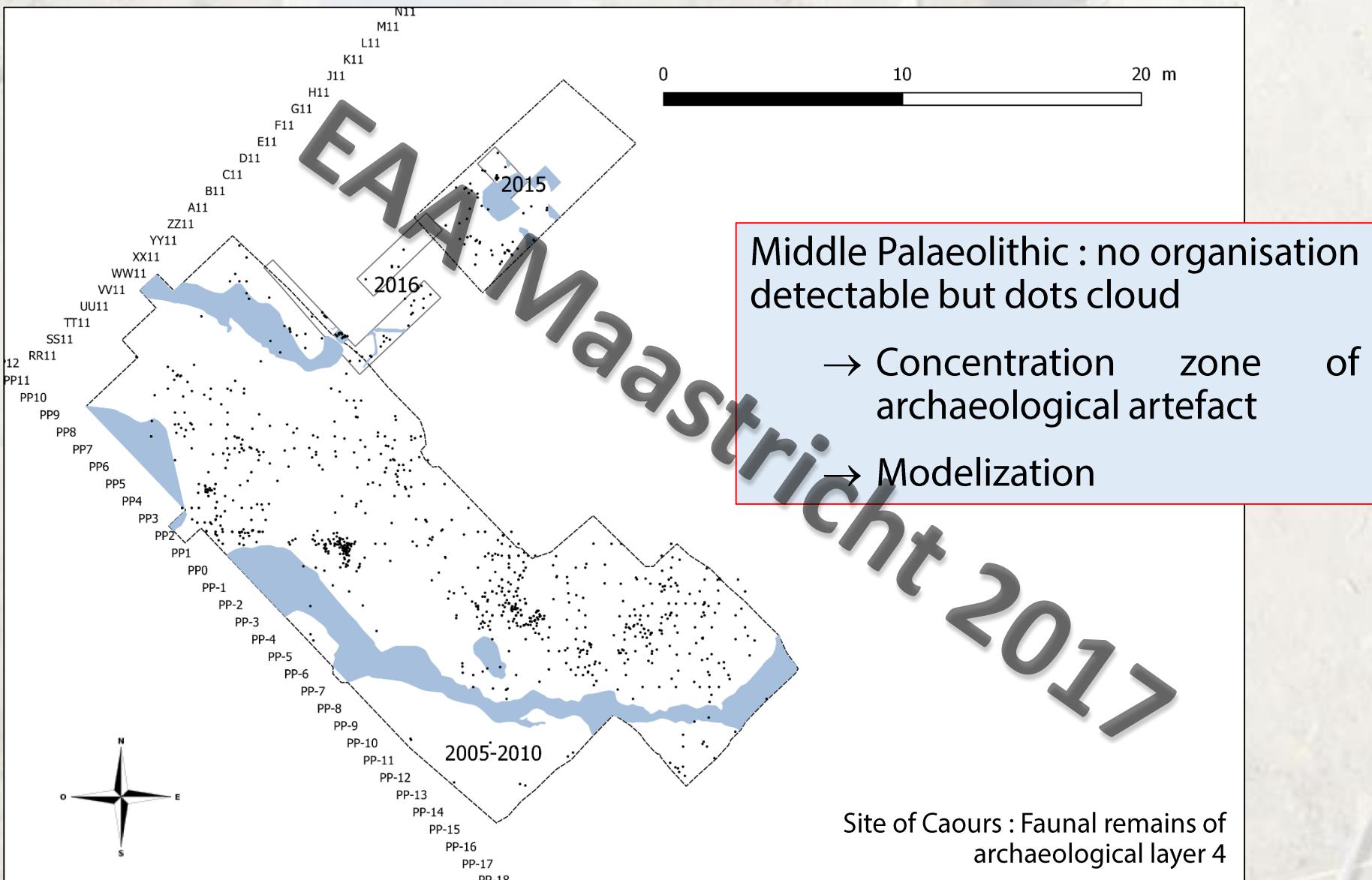
Activity area : different **spatial** data
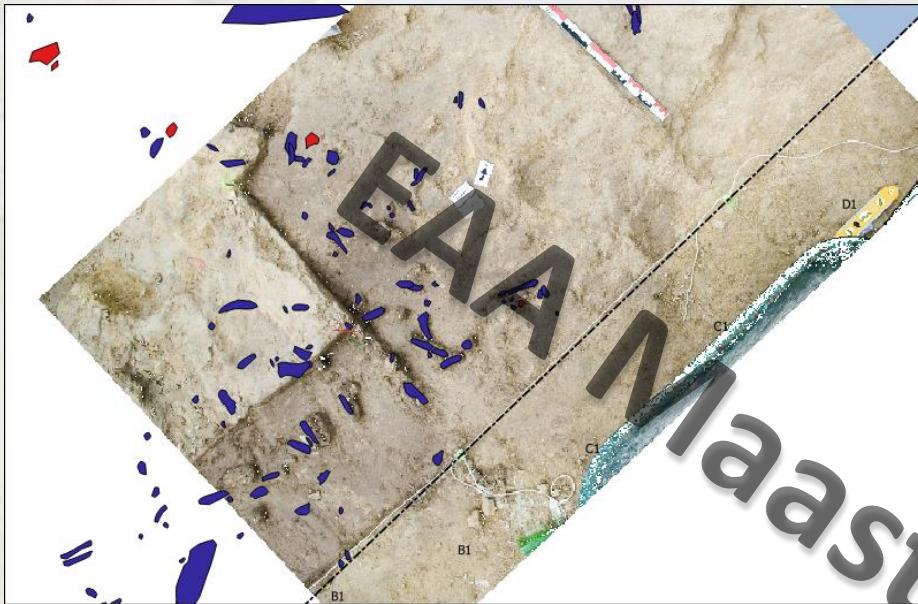
Screenshot: Computer Assisted Drawing

> Quantity and density : problem of fragmentation and combustion

> Dots cloud VS Polygons

> Absolute coordinates or not

Bones combustion experiment
(Hérisson et al., 2013)

Activity area : different **archaeological** data
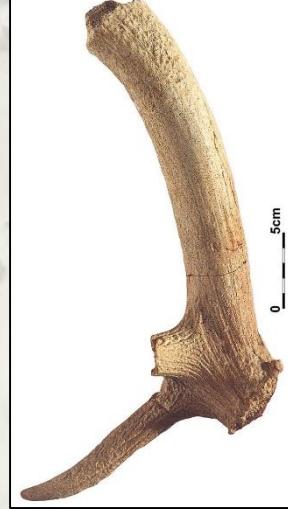
Red Deer antler (P. Auguste, 2010)

Discoïde nucleus (J.L. Locht, 1998)

Faunal remains → Subsistence behaviours → Butchery activity area

Lithic artefacts → Technical behaviours → Knapping workshop

Site's function

Drawing from B. Clarys

5

Activity area : different **archaeozoological** data

Cranial skeleton

Axial skeleton

Limbs

Autopods

Modified by August, 1995
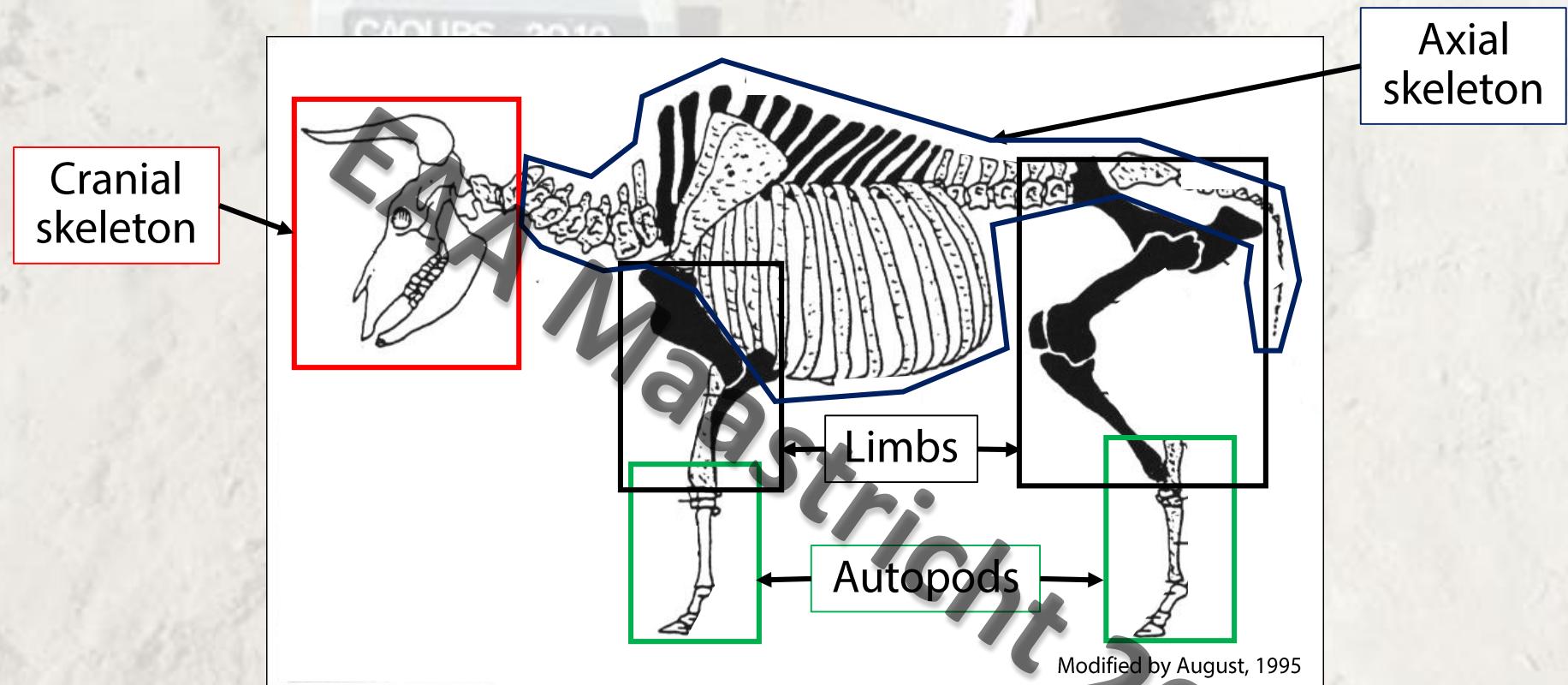
➤ Interpretative framework

➤ 6 anatomical groups

Specific butchery activity area

Activity area : different **archaeozoological** data

Food Utility Index

■ ⩾ 40

▨ 20 - 40

□ ⩽ 20

Modified by August, 1995
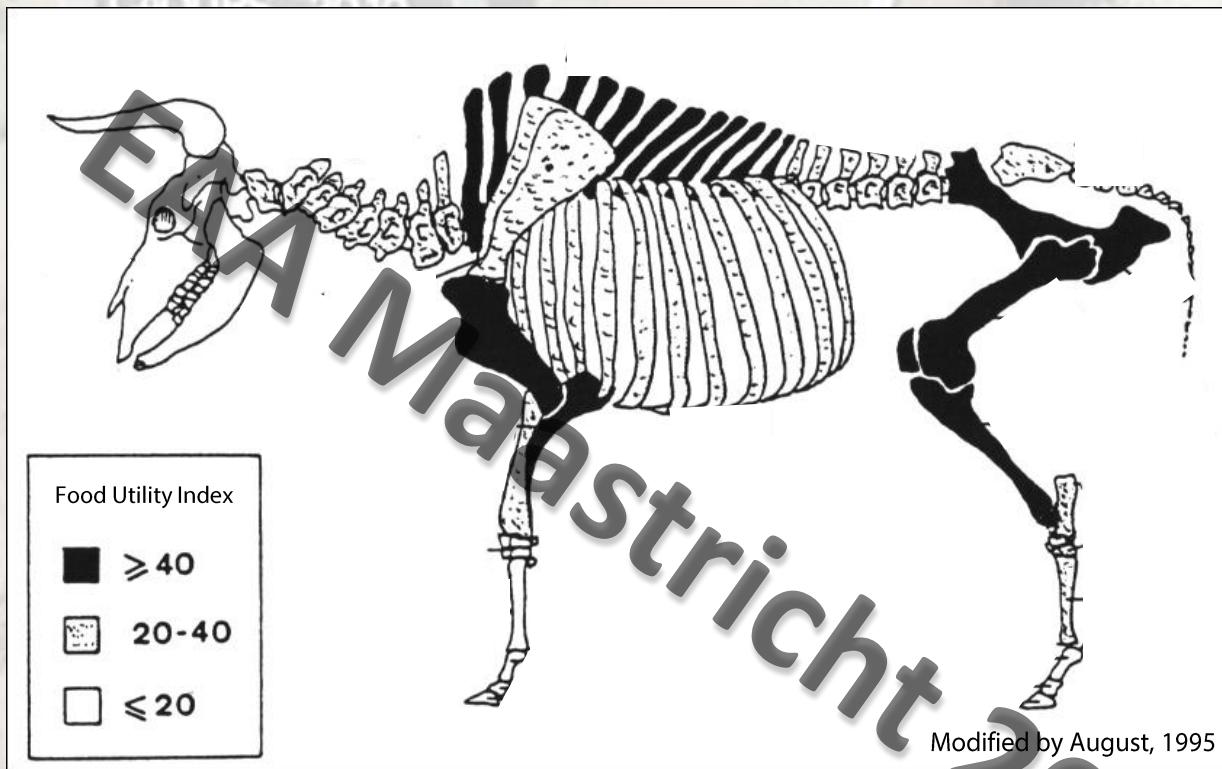
> Interpretative framework

> 3 groups by Food Utility Index

→ Specific butchery activity area

The site of **Caours** (level 4)

- ➤ Excavation area: 680 m^2
- ➤ 4 archaeological levels

- ➤ Three main species → Red Deer, Roe deer, Aurochs
- ➤ Burned bones

- ➤ Five lithic series associated with fauna
- ➤ Discoid knapping
- ➤ Unretouched tools (J.L. Locht)

Level 4: 1499 faunal remains

Elephant 0,85%
Wolf 0,43%
Boar 2,56%
Horse 0,43%
Rhinoceros 5,98%
Aurochs 5,98%
Other vertebrates 18,80%
Deer 22,65%
Fallow deer 2,99%
Roe deer 9,83%
Cervids 29,49%

From Auguste's data

Level 4: 672 lithic artefacts

Antoine *et al.*, 2006

Photos from P. Auguste

8

Activity area : Mesh analysis

> - Effective per mesh
> - Arbitrary subdivision → arbitrary spatial delimitation between some artefacts

Site of Caours : Faunal remains of archaeological layer 4

Number of faunal remains per meter squared
- 0
- 1.0 - 37.4
- 37.5 - 74.8
- 74.9 - 112.2
- 112.3 - 149.6
- 149.7 - 187.0

- Faunal remains
- Channels

Excavation area
- 2005-2010
- 2015
- 2016

→ Subjectivity

Activity area : K-mean Clustering

Method:

➤ Classification of raw data per distance between artefacts

Results:

➤ Spatial organisation as concentration zones

➤ Number of concentration zones (Cluster)

Limits:

➤ Can't define the perimeter of concentration zones and their density

Activity area : Kernel Density Estimation

Method:
- Modelization: calculate a density map based on artefacts density and distance between artefacts

Results:
- Model of distribution of concentration zones
- Density of concentration zones

Limits:
- Not a proof of the existence of the spatial organisation
- Research bandwidth to fixe
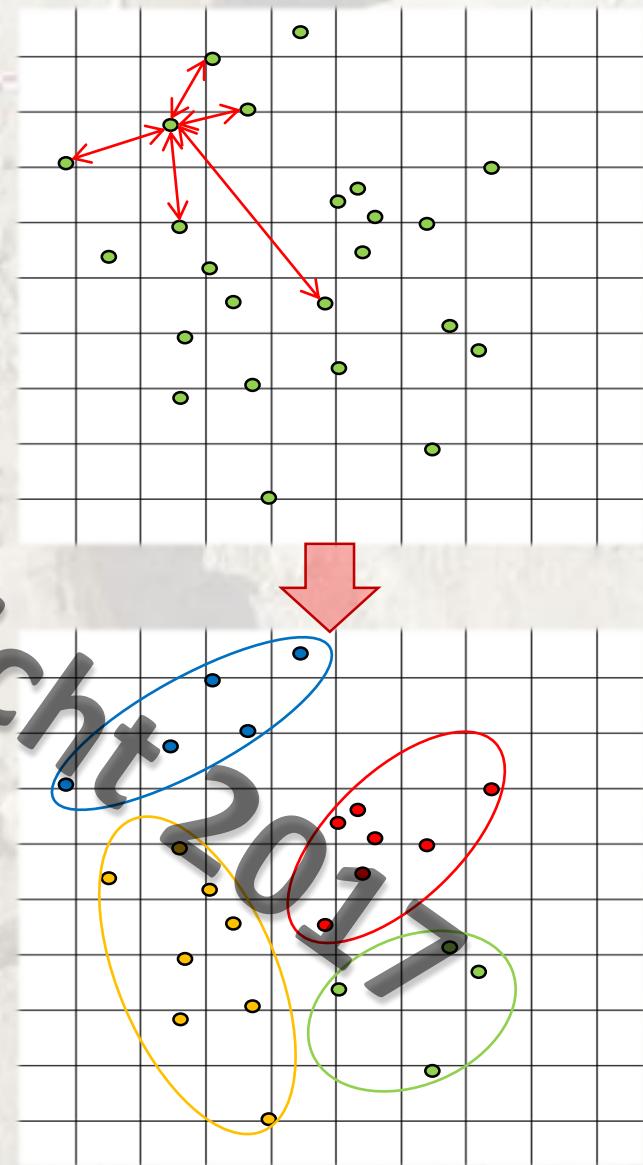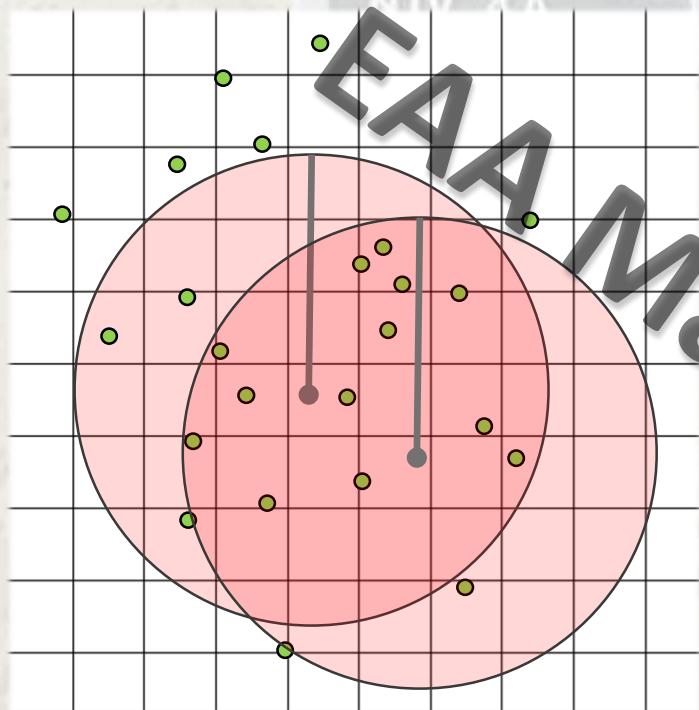
Legend:
- ● Raster cell
- ○ Artefact
- — Bandwidth

Activity area : Kernel Density Estimation combine with K-mean Clustering

Site of Caours : Faunal remains of archaeological layer 4

→ 6 concentration areas

Activity area : Mesh analysis

Site of Caours : Faunal remains of archaeological layer 4

→ Subjectivity

Activity area : Kernel Density Estimation combine with K-mean Clustering

Site of Caours : Faunal remains of archaeological layer 4

→ Objectivity
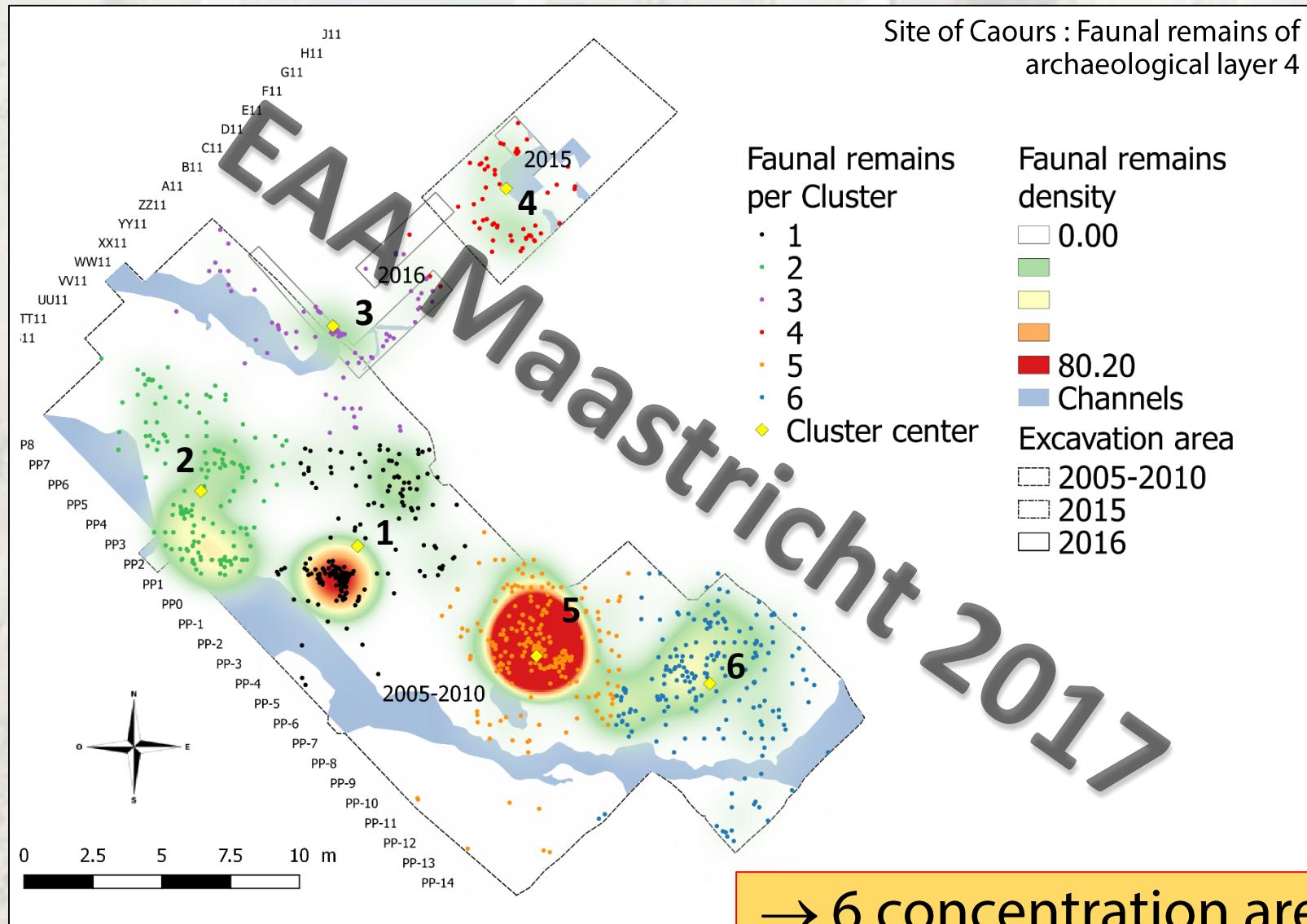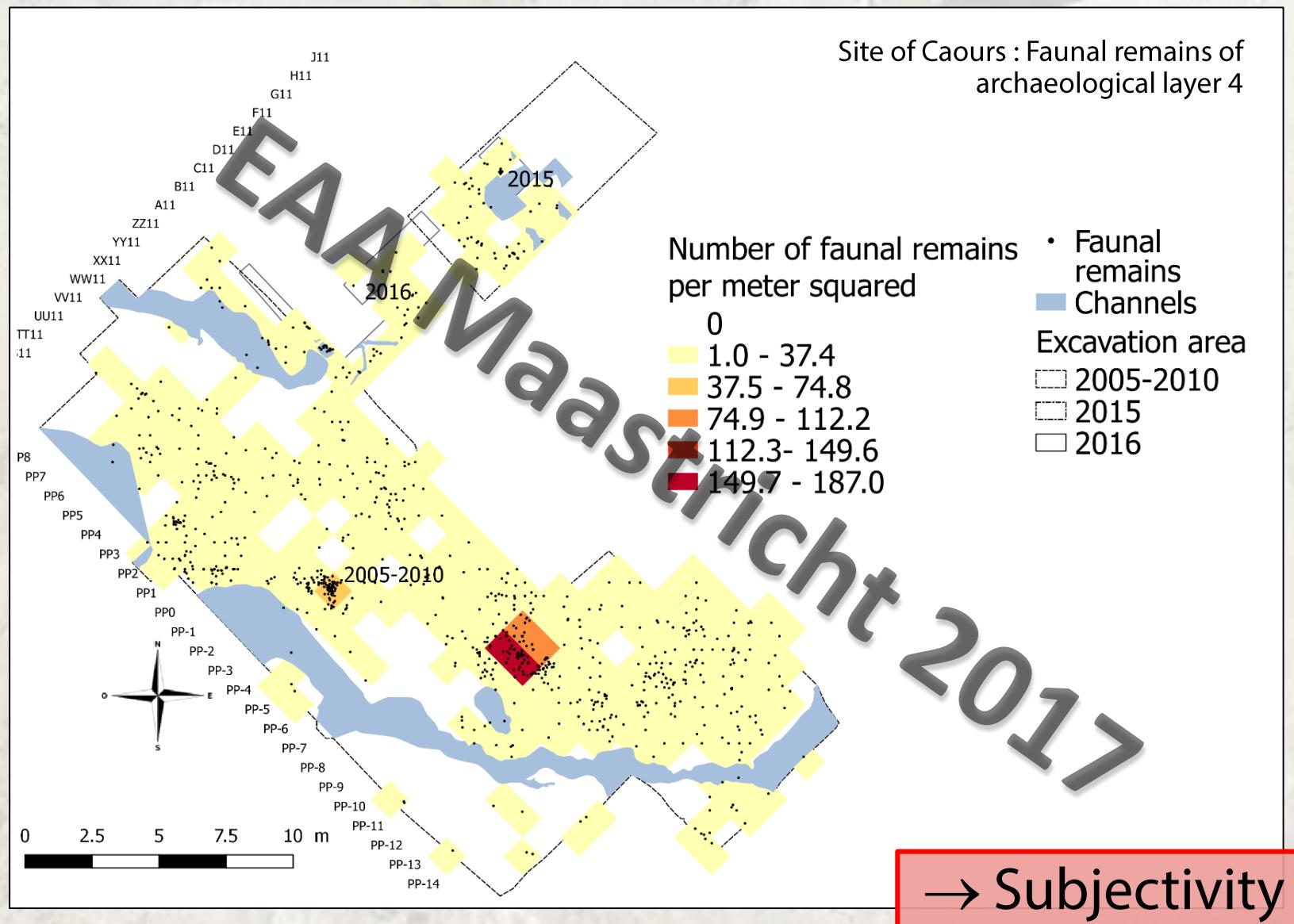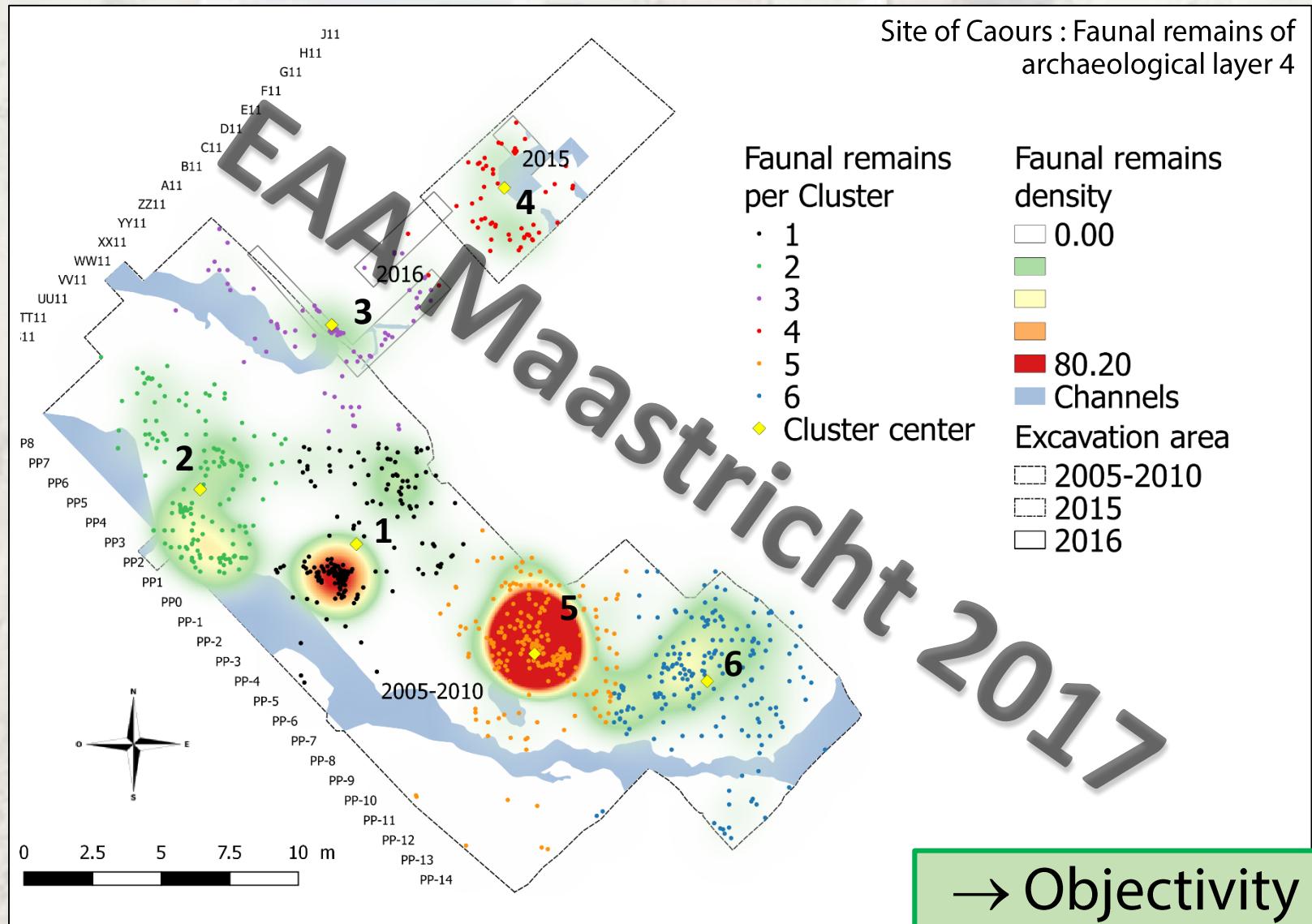
Specific activity area

> ➤ Concentration zone of :
> • Burned faunal remains
> • Fractured faunal remains

Channels
Excavation area
☐ 2005-2010
☐ 2015

Burned faunal remains
0.00

388.81

Fractured faunal remains
0.00

9.50

Site of Caours : Faunal remains of archaeological layer 4

→ Human activity area

15
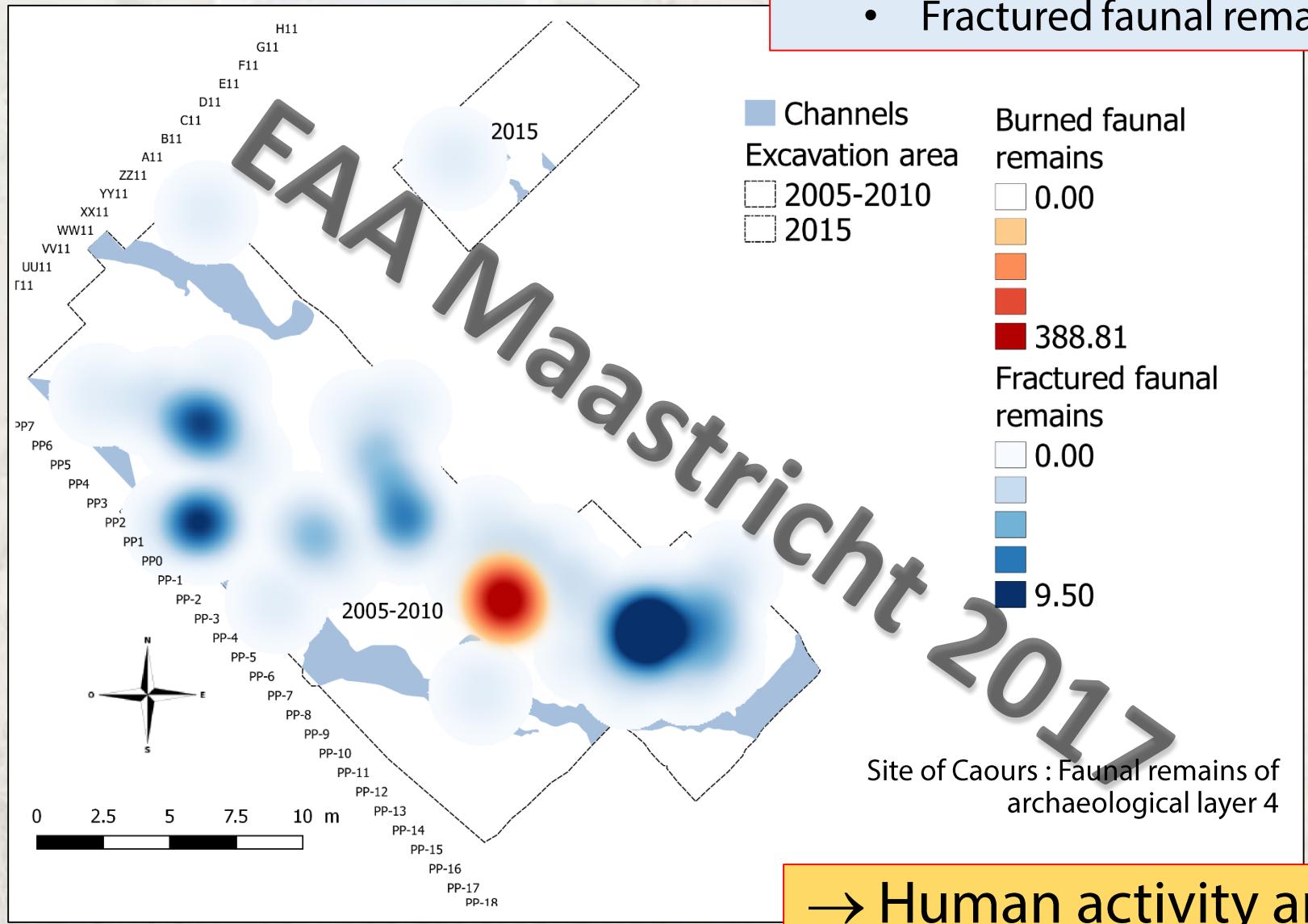
Specific activity area

> ➤ Remains with high food utility near fracturation and combustion area

Channels

Excavation area
2005-2010
2015

Food utility index
- Low
-
- High

Burned faunal remains
0.00
388.81

Fractured faunal remains
0.00
9.50

Site of Caours : Faunal remains of archaeological layer 4
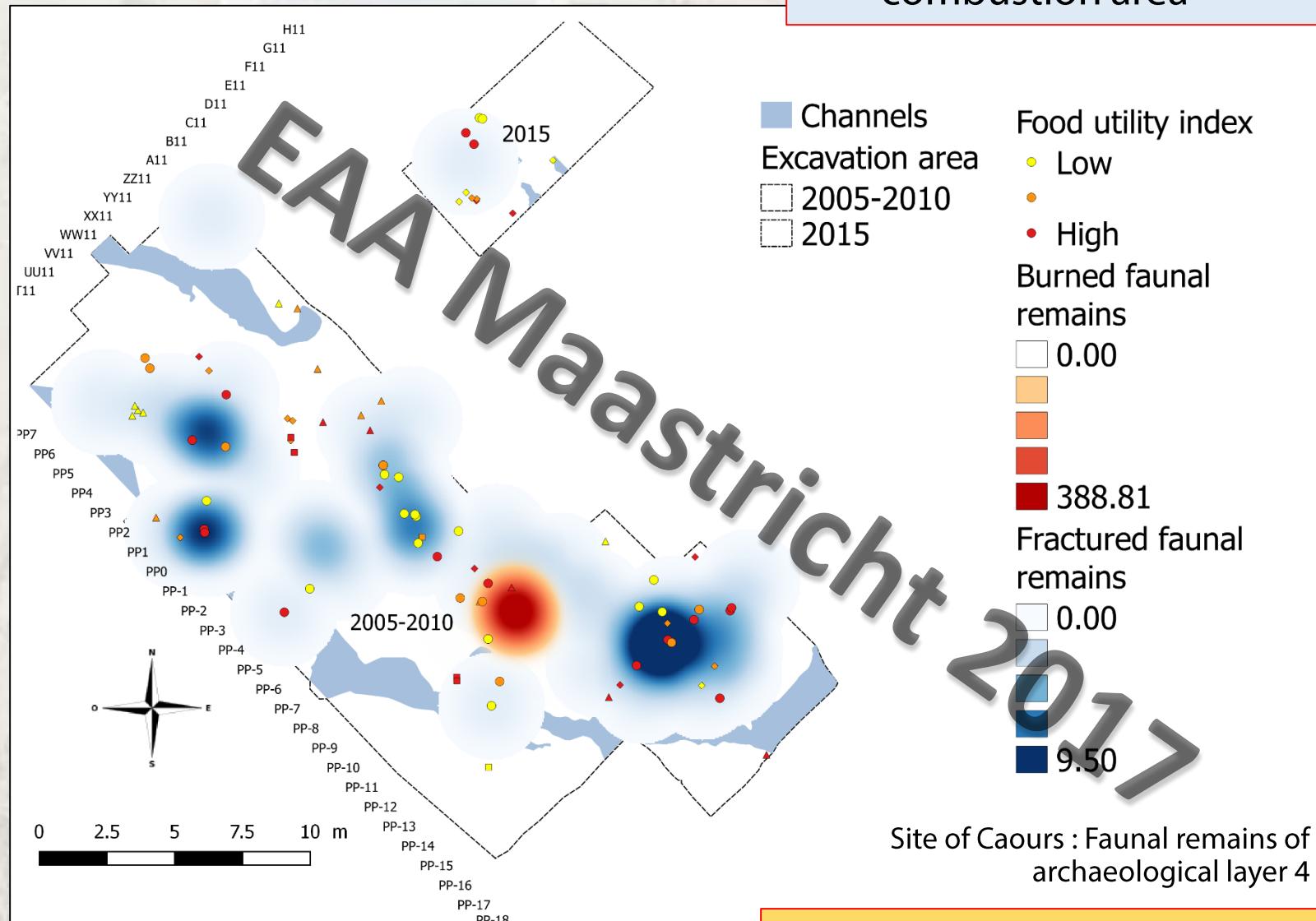
→ Butchery activity area

Conclusion

Mesh analysis →

K-mean Clustering
➢ Determine number of cluster

+

Kernel Density Estimation
➢ Fracturation
➢ Combustion
➢ Food Utility

↓

Highlight :
→ Human activity area
→ Butchery activity area
→ Combustion zone

↓

Confirm :
→ Butchery site

Next steps: distribution of lithic artefacts

Site of Beauvais : Lithic artefacts and faunal remains of the archaeological layer 2

Reindeer remains: food utility index
- Low
- High

Lithic artifact
0.00
161.79
Excavation area

18
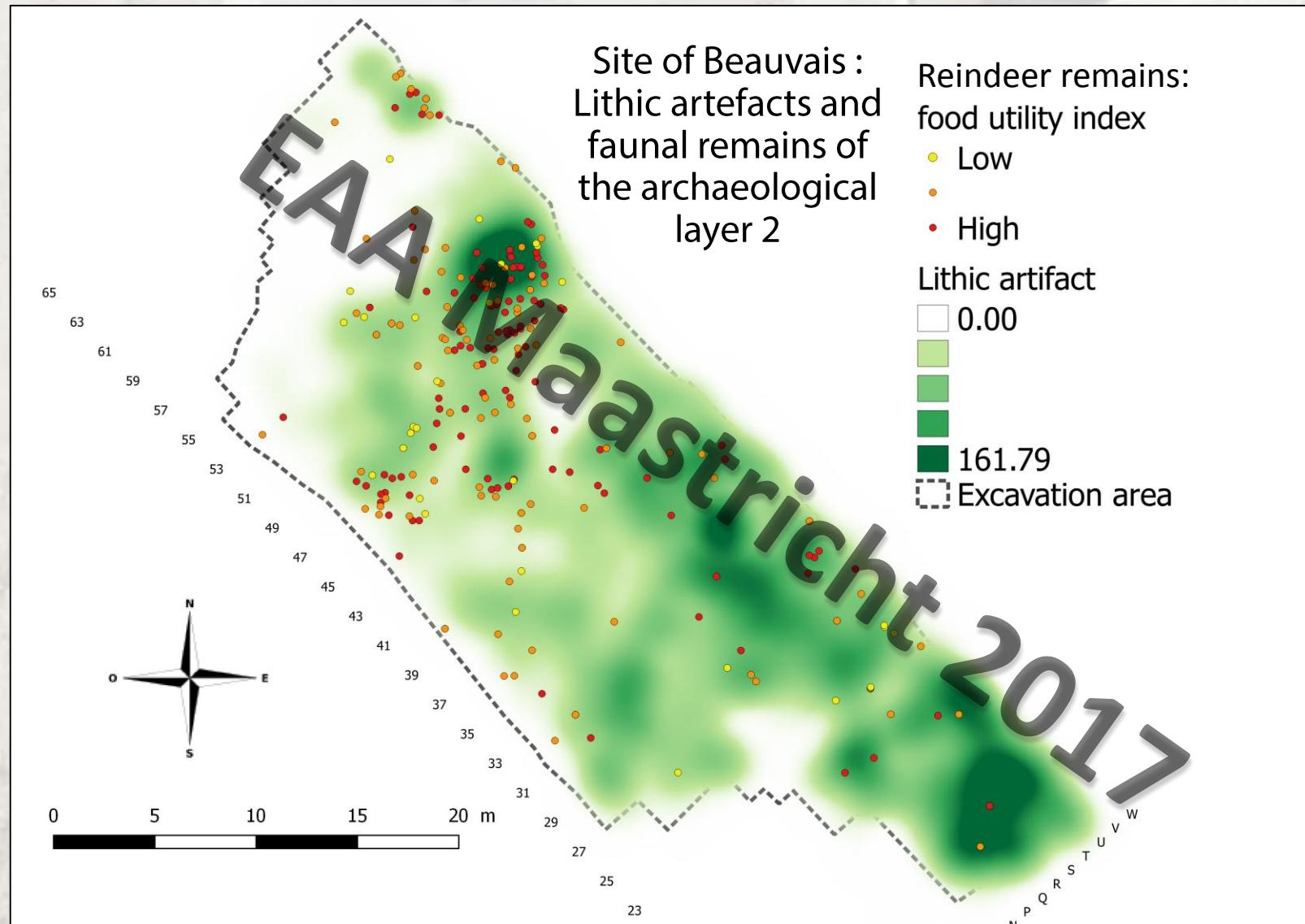
Next steps: lithic artefacts refitting

Site of Beauvais : Lithic artefacts and faunal remains of the archaeological layer 2

Number of faunal remains with fracturation traces per meter squared
0.00
4.64

Number of faunal remains with combustion traces per meter squared
0.00
81.22

Excavation area
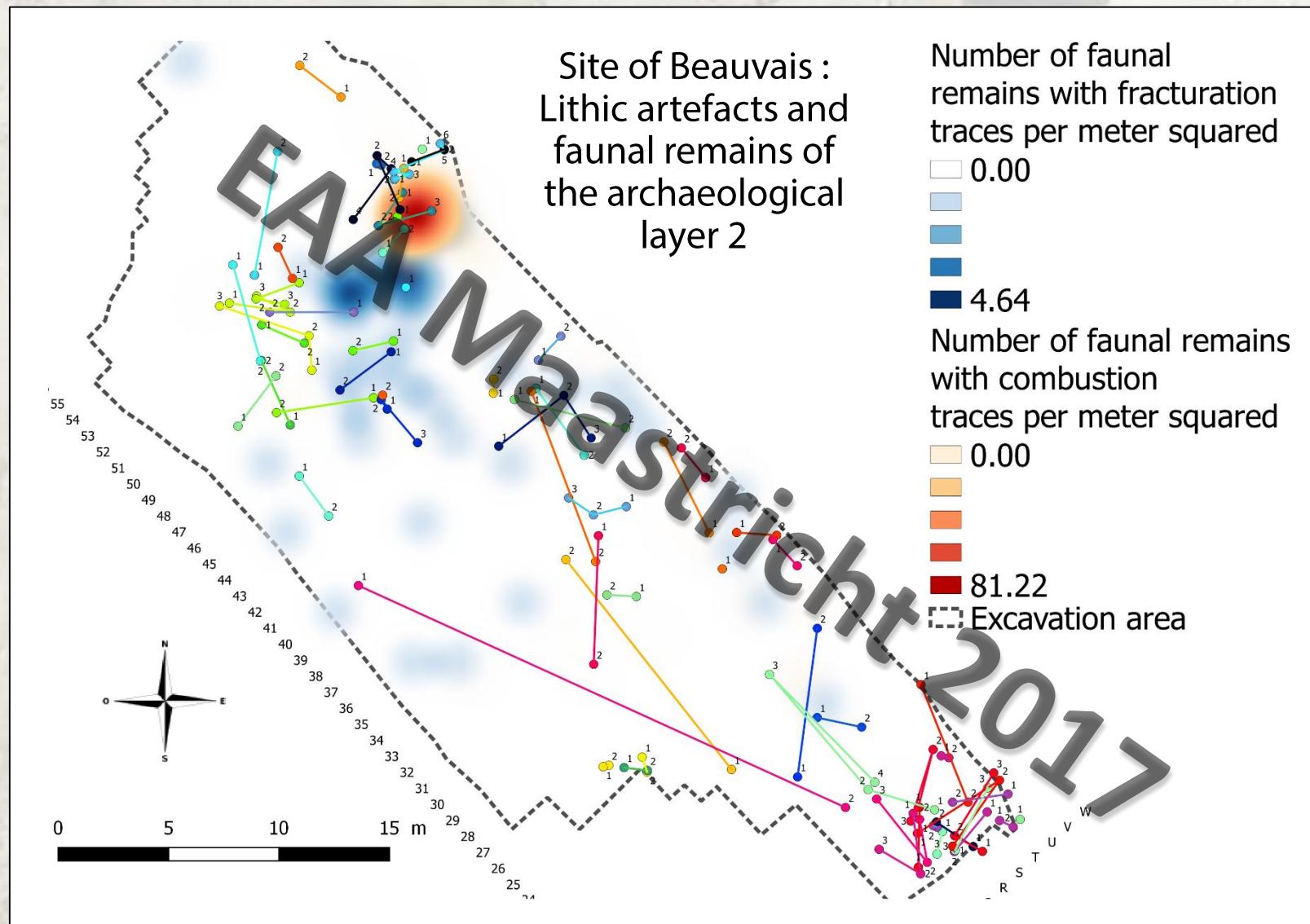
Future work

System

Fragmentation
Prey processing

Knapping workshop

Precise site function

Characterize Neanderthal groups

Thank you for your attention

Site of Caours (2008)