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Lise Devreux, Margot Chapuis, Barbara Belletti

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# Development of a new sampling methodology of benthic invertebrates on a restored braided river

## Développement d'une nouvelle méthodologie de prélèvements des invertébrés benthiques sur une rivière en tresses restaurée

Devreux L.<sup>1</sup>, Chapuis M.<sup>1</sup> et Belletti B.<sup>2</sup>

<sup>1</sup> Université Côte d'Azur, Laboratoire ESPACE/CNRS UMR 7300 ESPACE | <sup>2</sup> Université de Lyon, UMR 5600 CNRS EVS

[ldevreux@unice.fr](mailto:ldevreux@unice.fr)

Braided rivers are dynamic hydrosystems characterised by a multiple channels morphology and a marked hydrology with high amplitude variations and high diversity of macro-, meso- and microhabitats: channel types, geomorphic units and flowing conditions.

After the WFD publication<sup>1</sup> and the objective to achieve good ecological status, restoration operations increased. In this context, several indices are used to assess the good ecological status. However, in the case of the benthic invertebrate index, the methodology is based on a general sampling method adapted to all river types, which is not adapted to the specificities of the braided morphology.

We developed a new sampling methodology of benthic invertebrates that better accounts for habitat diversity. We hypothesise that the consideration of the habitats diversity, through several spatial scales, allows a better representation of the benthic invertebrates community.

### Methodology

- 1) Count of water channel by cross sections > braiding intensity
- 2) Identification of channel types according to size and connectivity<sup>2</sup> > macrohabitat
- 3) Identification of the geomorphic units<sup>3</sup> > mesohabitat
- 4) Distribution of 10 sampling sites according to the aquatic habitat diversity
- 5) Sampling collected by group of 2 within a same sampling site with varying conditions (velocity, depth and substrate) > microhabitat
- 6) Sampling of environmental variables:  
Substrate identification + physico-chemical measures + localisation, size and shape of geomorphic unit (mobile mapping, GIS)

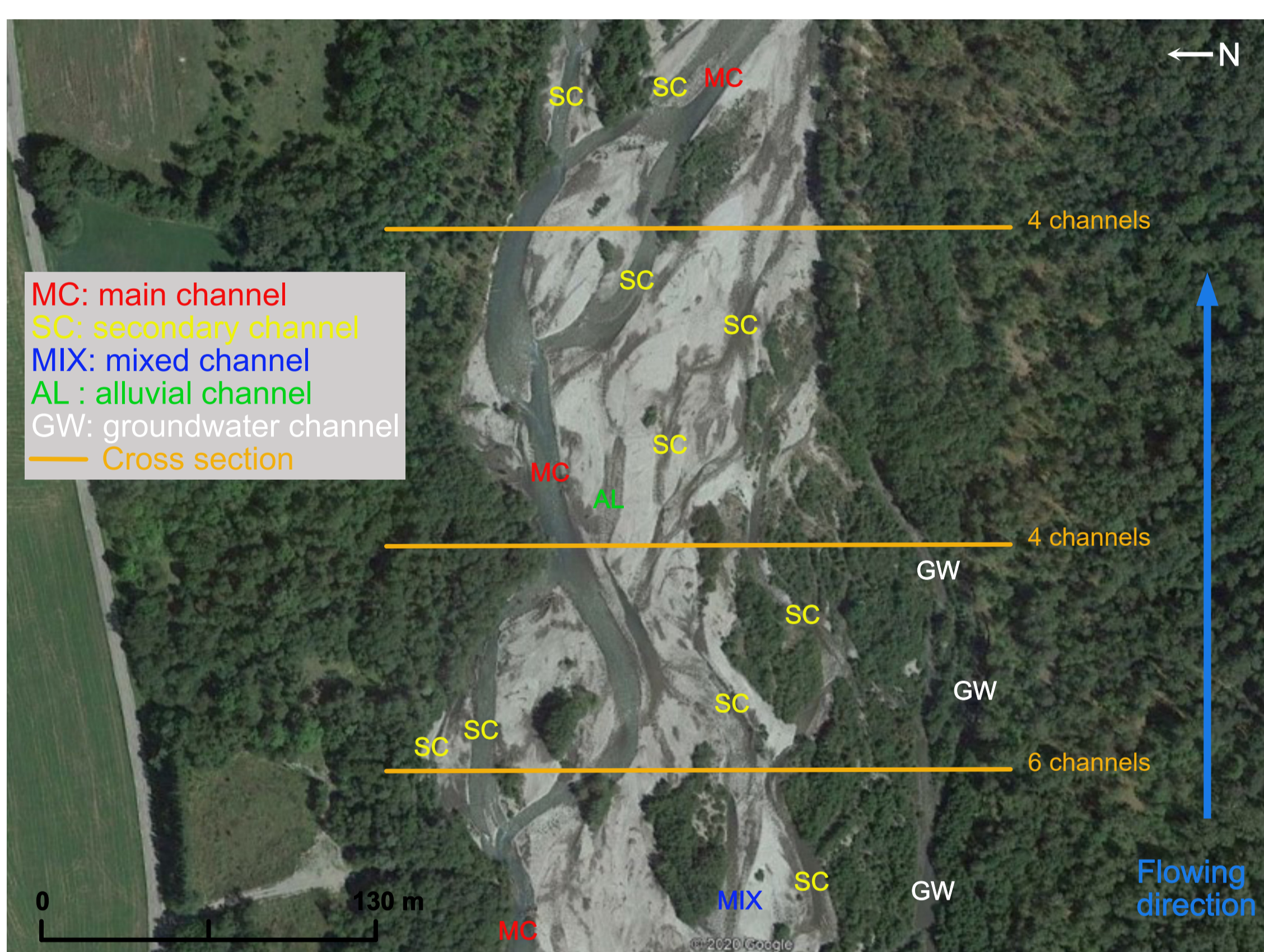


Fig 1: Count of the flowing channels by cross sections and identification of the channel types.

### Study site

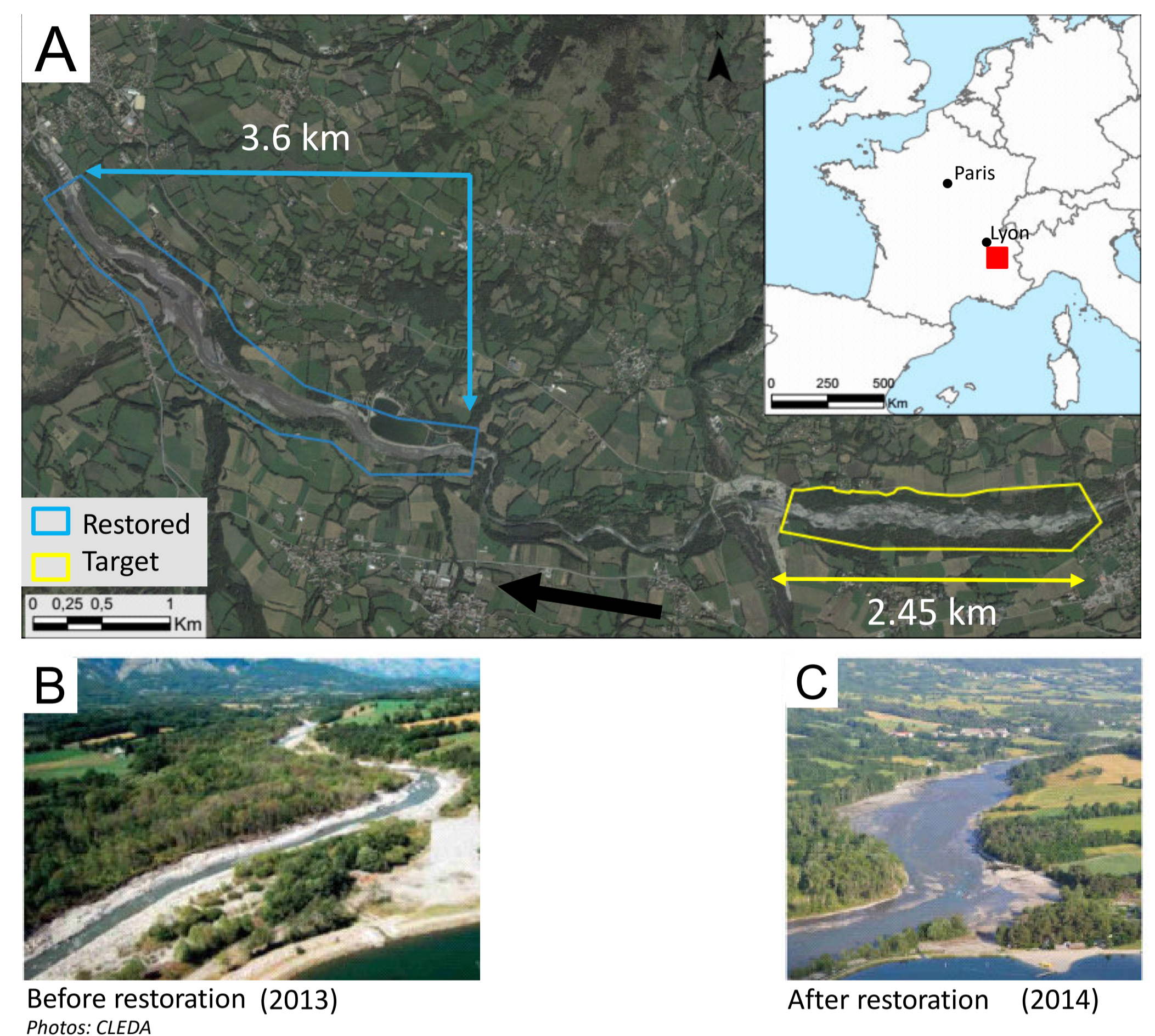


Fig 2: A) Localisation of the restored and target reach on the Drac, B) Photo of the restored reach before restoration, C) Photo of the restored reach after restoration.

Two study reaches have been selected on the Drac:

- Restored reach before restoration<sup>4</sup>:
  - Narrow and incised active channel (~ 4 m)
  - Single-thread channel
  - Groundwater table disconnection
  - Habitats alteration
  - Landslide and dykes failure risks
- Restoration operation (2013-2014):
  - Active channel widening (+ ~ 65 m)
  - Gravel augmentation (360,000m<sup>4</sup>)
- Target reach: well developed braided morphology, rich mosaic of habitats, few human impacts.

### Preliminary results and discussion

- 40 samples have been collected in July 2019 (1st application)
- Better representation of the aquatic habitats mosaic
- 30% of the sampled habitats are traditionally neglected
- Less channel types are present on the restored reach compared to the target one
- 3 main geomorphic unit types were sampled on both reaches

Table 1: Sampled channels and geomorphic units

Reach	Channel type	Geomorphic unit	Number
Restored	MC	Riffle	4
		Glide	2
	SC	Riffle	4
		Pool	8
Target	MC	Riffle	2
		Glide	2
	SC	Riffle	2
		Pool	2
	SC	Riffle	4
		Glide	2
	AL	Riffle	2
		Pool	2
MIX	Riffle	2	
	Pool	2	
P	Riffle	2	
	Pool	2	

- Differences in benthic community composition and diversity between the restored and target reaches
- Higher beta diversity on the target reach
- Different composition between totally or partially disconnected channels (AL, MIX and P) and connected channels (MC and SC)

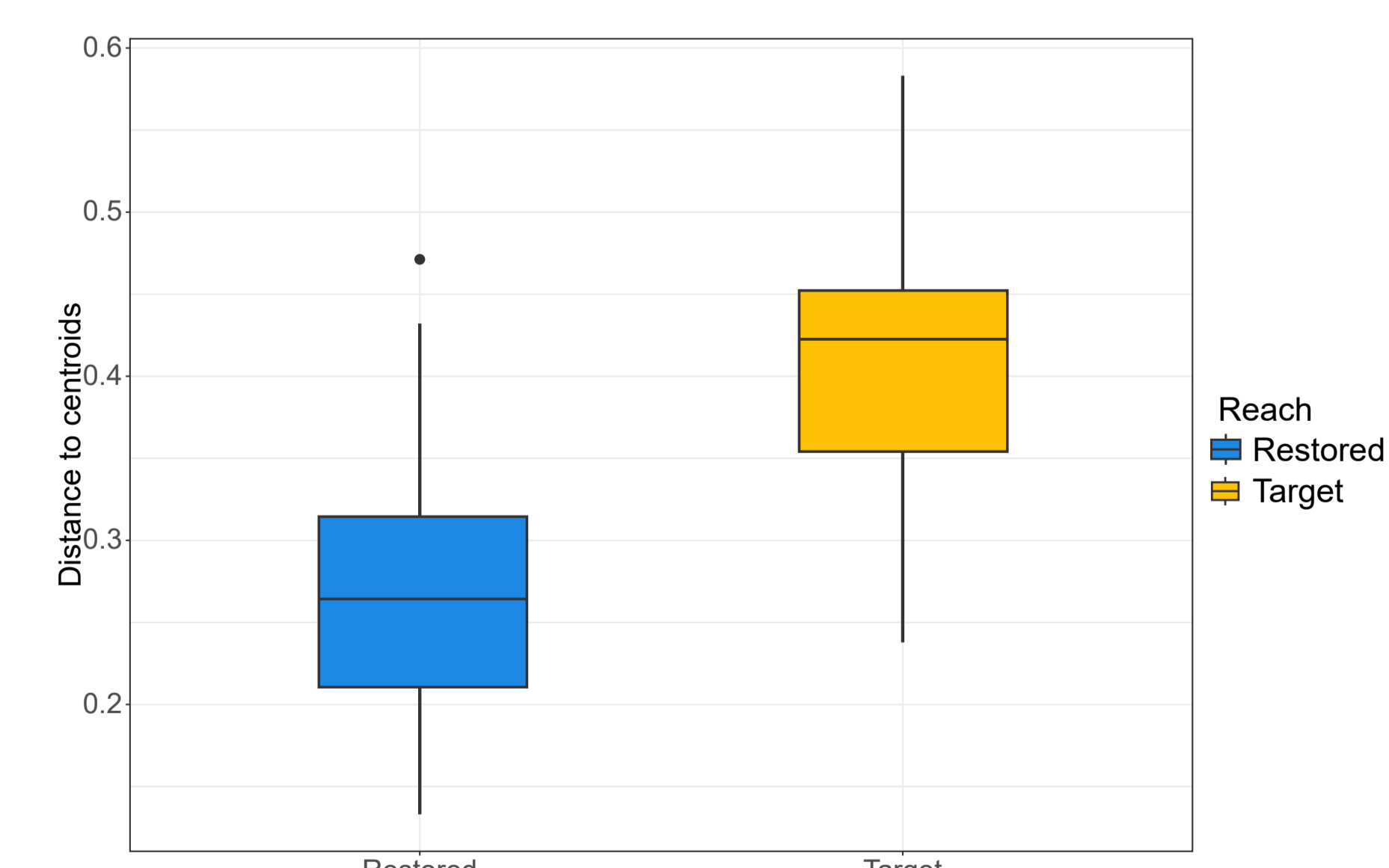


Fig. 2: Beta diversity on the restored and target reaches

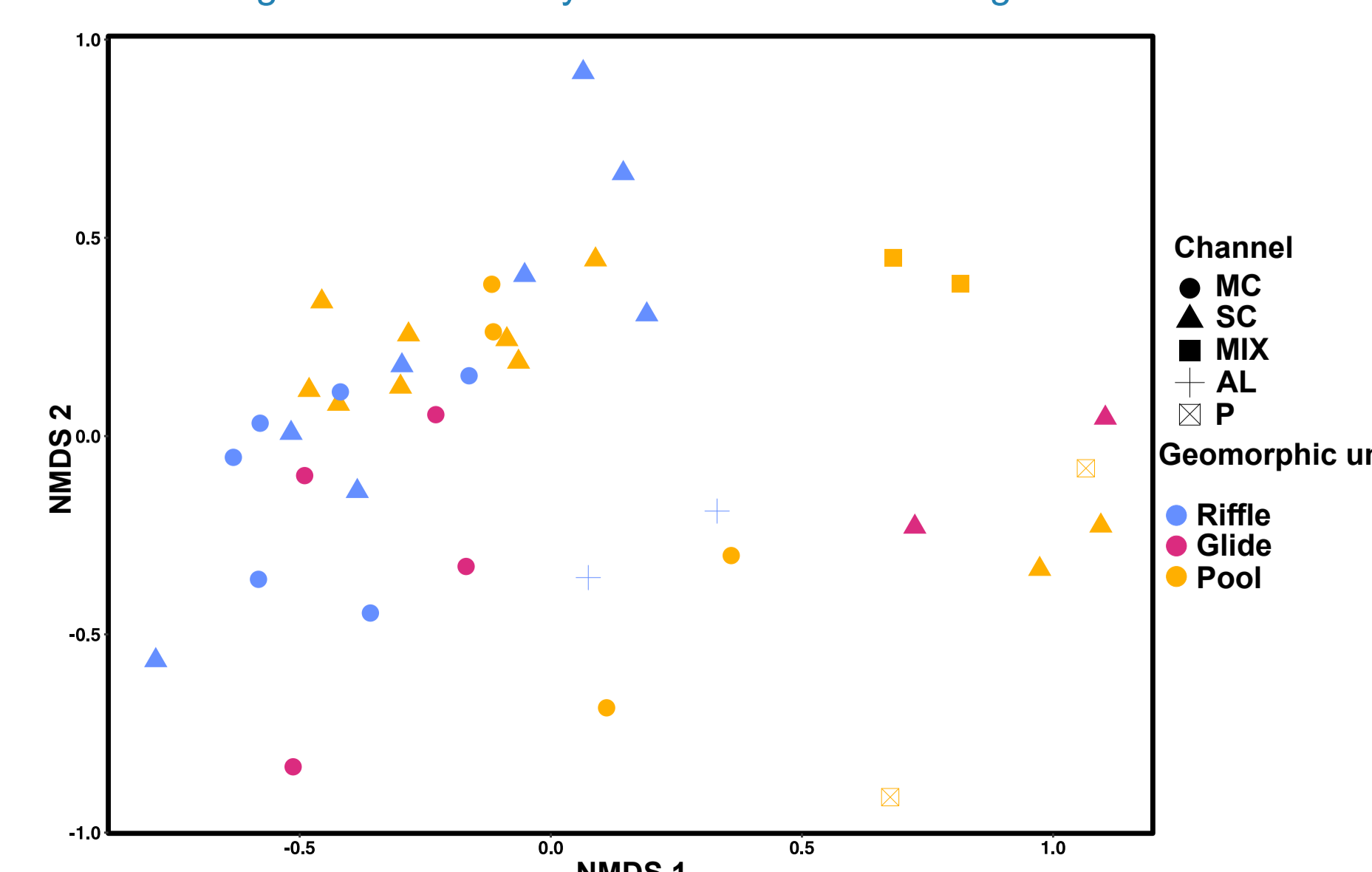


Fig 3: nMDS on the composition of the communities of the restored and target reaches

This new sampling methodology allows to collect informations that are usually neglected and to **exhaustively** represent the aquatic habitats mosaic and the benthic community. The **first applications of this method have been conclusive**. To complete, the method should be applied on other braided rivers.

#### References:

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