

# The floodplain meadows with Great Burnet

*(Sanguisorba officinalis)* :

## a look across geographical gradient



Tatyana Parinova



I. Tatarenko, A. Volkov, E. Nescryabina, E. Pijikova, O. Cherednichenko, M. Tsyrenova, O. Perestoronina, K. Shchukina, N. Savinykh, S. Shabalkina



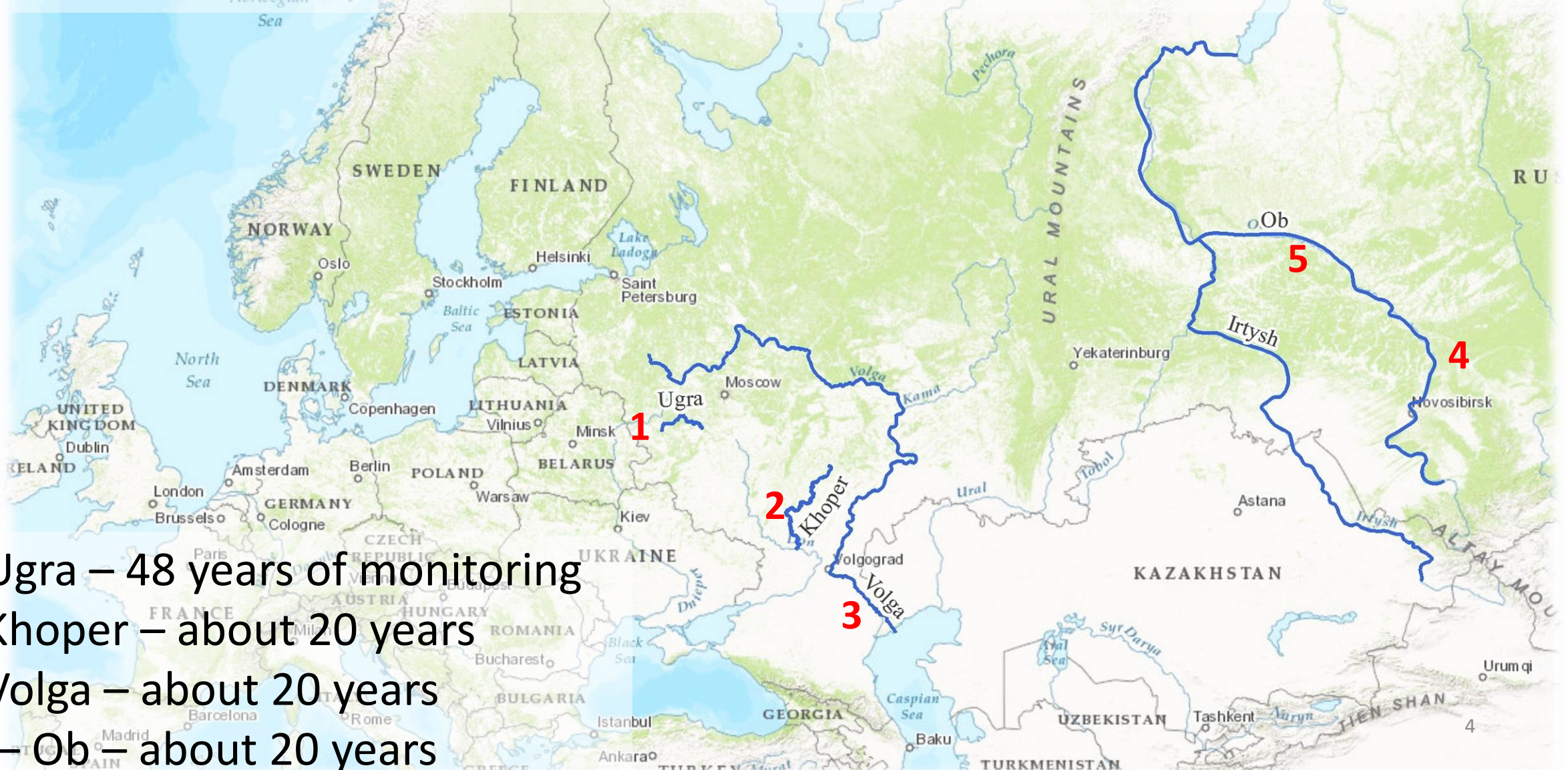
# I am going to talk about:

- Russian floodplains – ideal area to study meadows as intrazonal (azonal) vegetation type
- *Sanguisorba officinalis* – what is special about this meadow forb
- Communities with *Sanguisorba officinalis*:
  - ✓ Species richness
  - ✓ Productivity
  - ✓ Biogeographical diversity of *Sanguisorba* meadows

With 2 500 000 rivers, the floodplains in Russia cover over 200 000 square kilometres

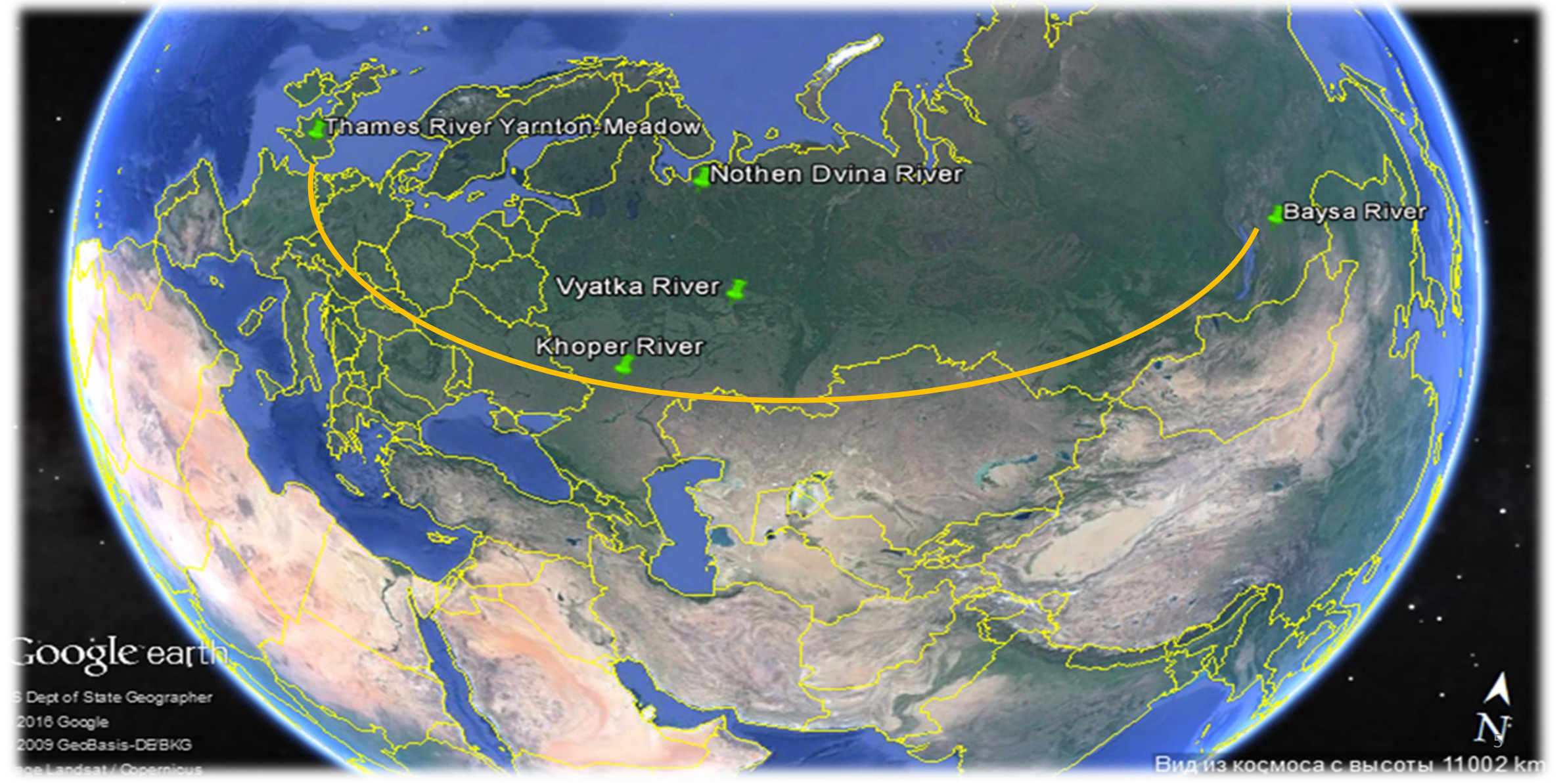


# Five rivers where long-term monitoring of the meadow vegetation was carried out

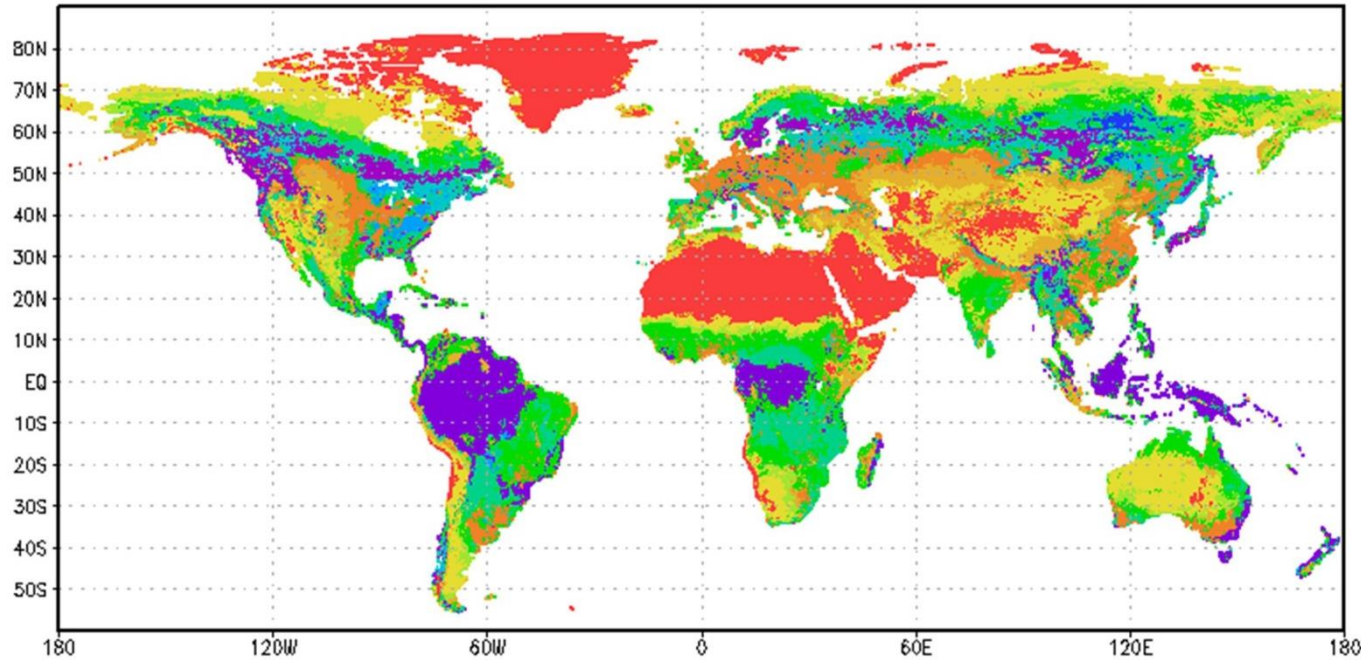


- 1 – Ugra – 48 years of monitoring
- 2 – Khoper – about 20 years
- 3 – Volga – about 20 years
- 4, 5 – Ob – about 20 years

# Five sites where Sanguisorba meadows were studied in 2016



# Floodplain meadows are classified as azonal type of vegetation

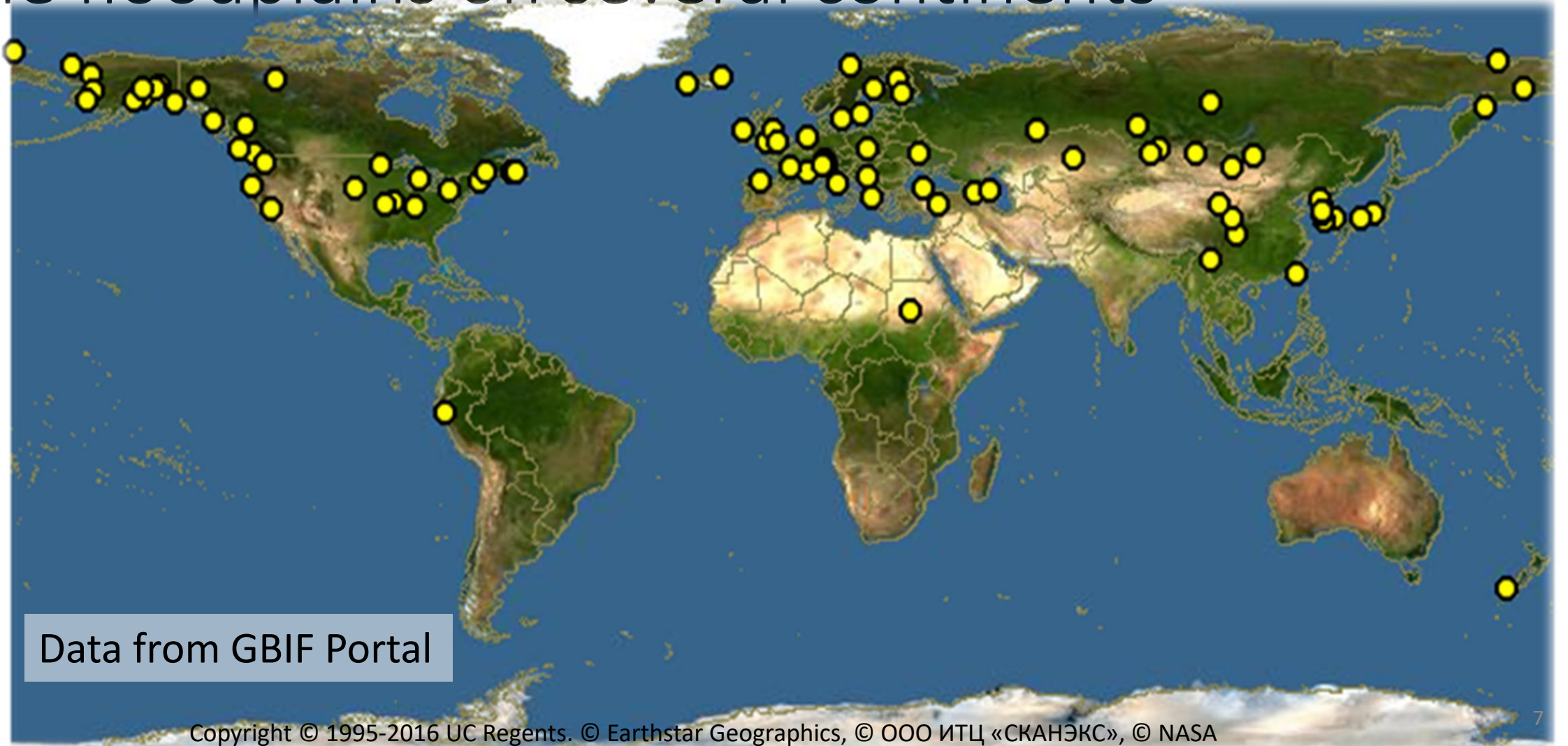


- |                                 |                                |
|---------------------------------|--------------------------------|
| 1 = Evergreen Needleleaf Forest | 2 = Evergreen Broadleaf Forest |
| 3 = Deciduous Needleleaf Forest | 4 = Deciduous Broadleaf Forest |
| 5 = Mixed Cover                 | 6 = Woodland                   |
| 7 = Wooded Grassland            | 8 = Closed Shrubland           |
| 9 = Open Shrubland              | 10 = Grassland                 |
| 11 = Cropland                   | 12 = Bare Ground               |
| 13 = Urban and Build-Up         |                                |

- Zonal vegetation reflects climate differences:
  - from tundra in Arctic to the south steppe and deserts in the South
  - From the ocean climate influenced by Atlantic to highly continental climate of Siberia

Meadows are not associated with any particular climate as local factors as floods and hay-making/pasture put much more powerful selective pressure on the plant communities.

*Sanguisorba officinalis* (Great Burnet) is almost a cosmopolitan species occurring from mountains to the floodplains on several continents



On the floodplains, *Sanguisorba* meadows can be found on a wide range of soils



sandy



loamy



silty clay



gleyed clay

Soils of different mechanical composition from sand to clay



# Seedlings of Great Burnet are very weak competitors...



*Sanguisorba officinalis* on the sand river bank,  
Surgut, Western Siberia, Russia  
Photo@Mike Dodd



*Sanguisorba officinalis* on the gravel-sand bar,  
Kamtchatka, Russia  
Photo@Boris Bolshakov

... whereas adult plants persist in the fully-formed communities for a long time

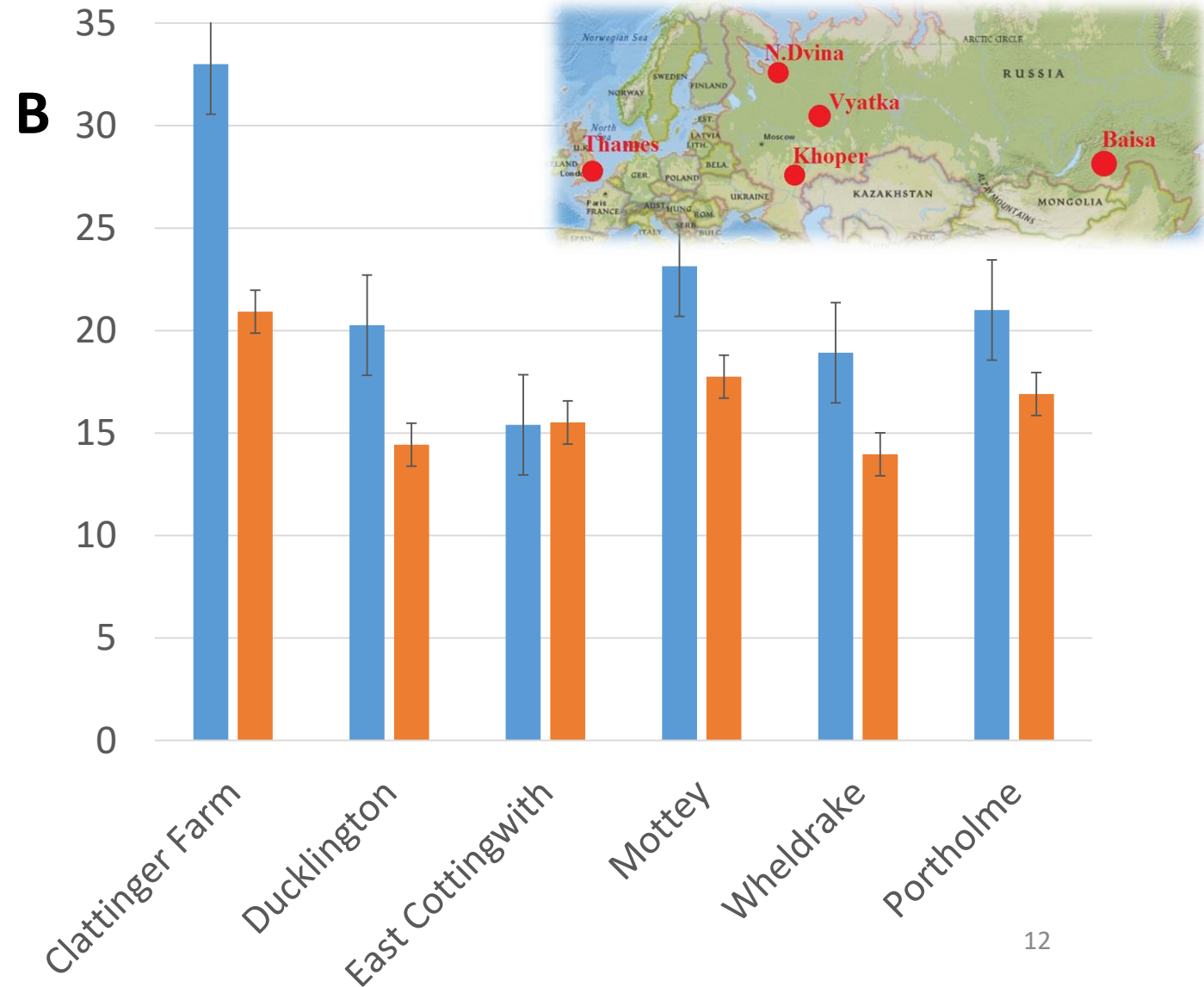
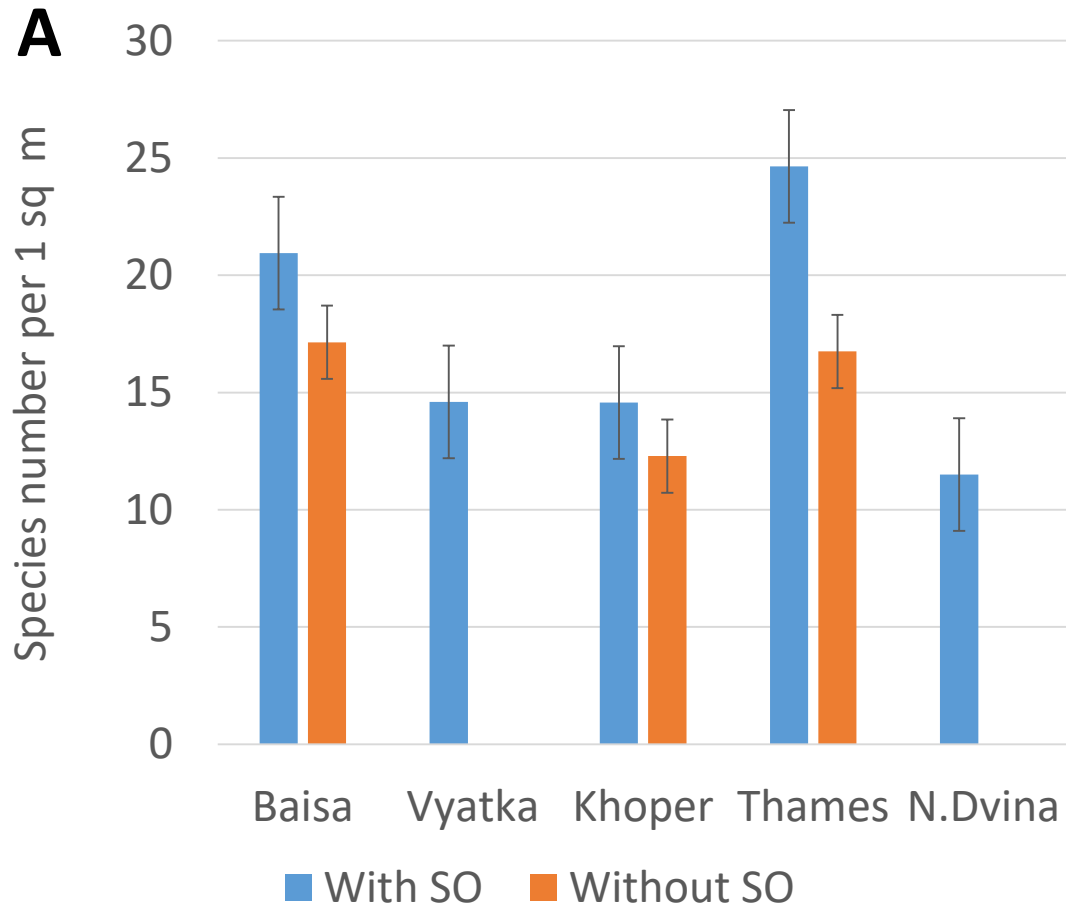


Hypothesis 1: Communities with *Sanguisorba officinalis* are the most species rich among others on the floodplains

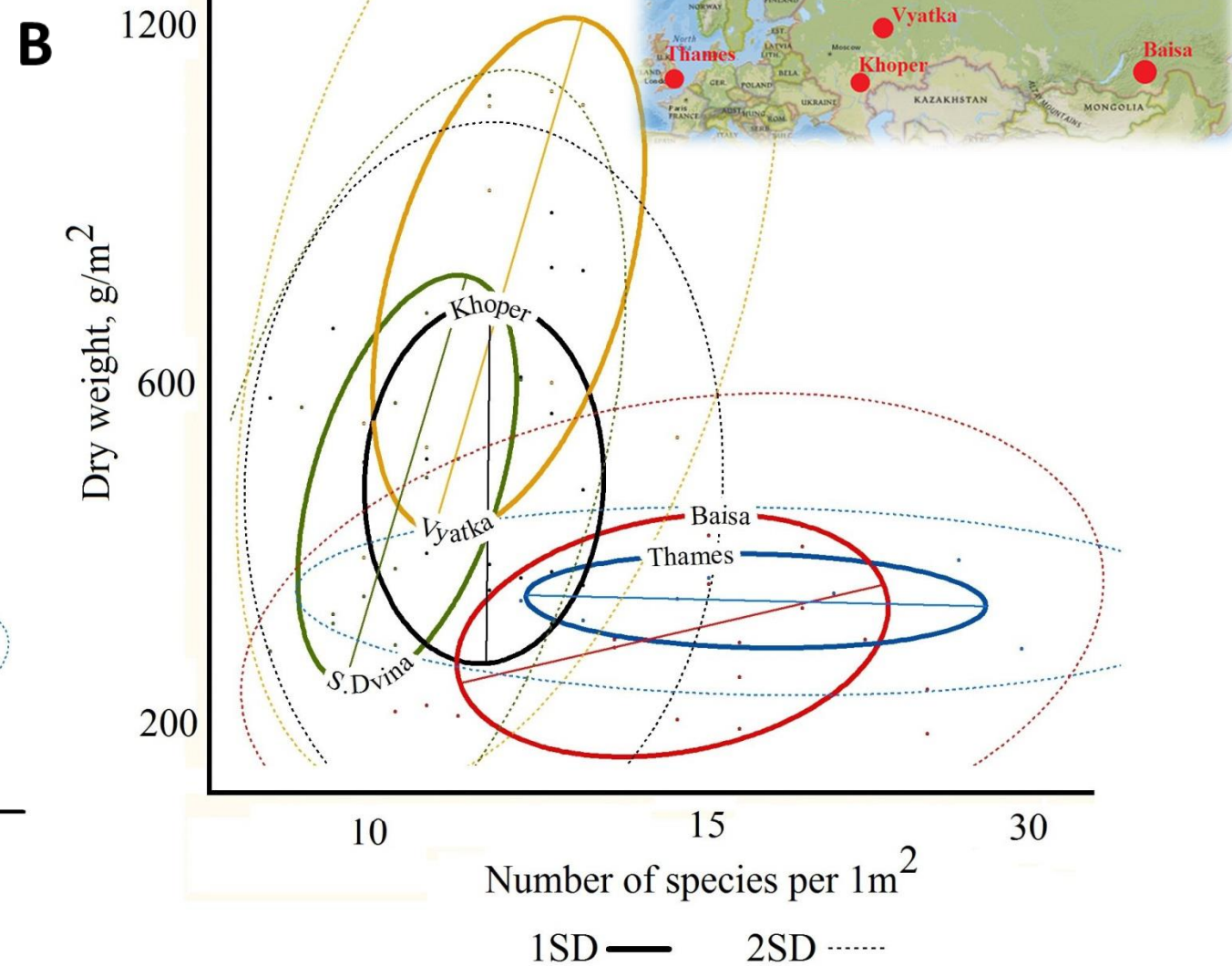
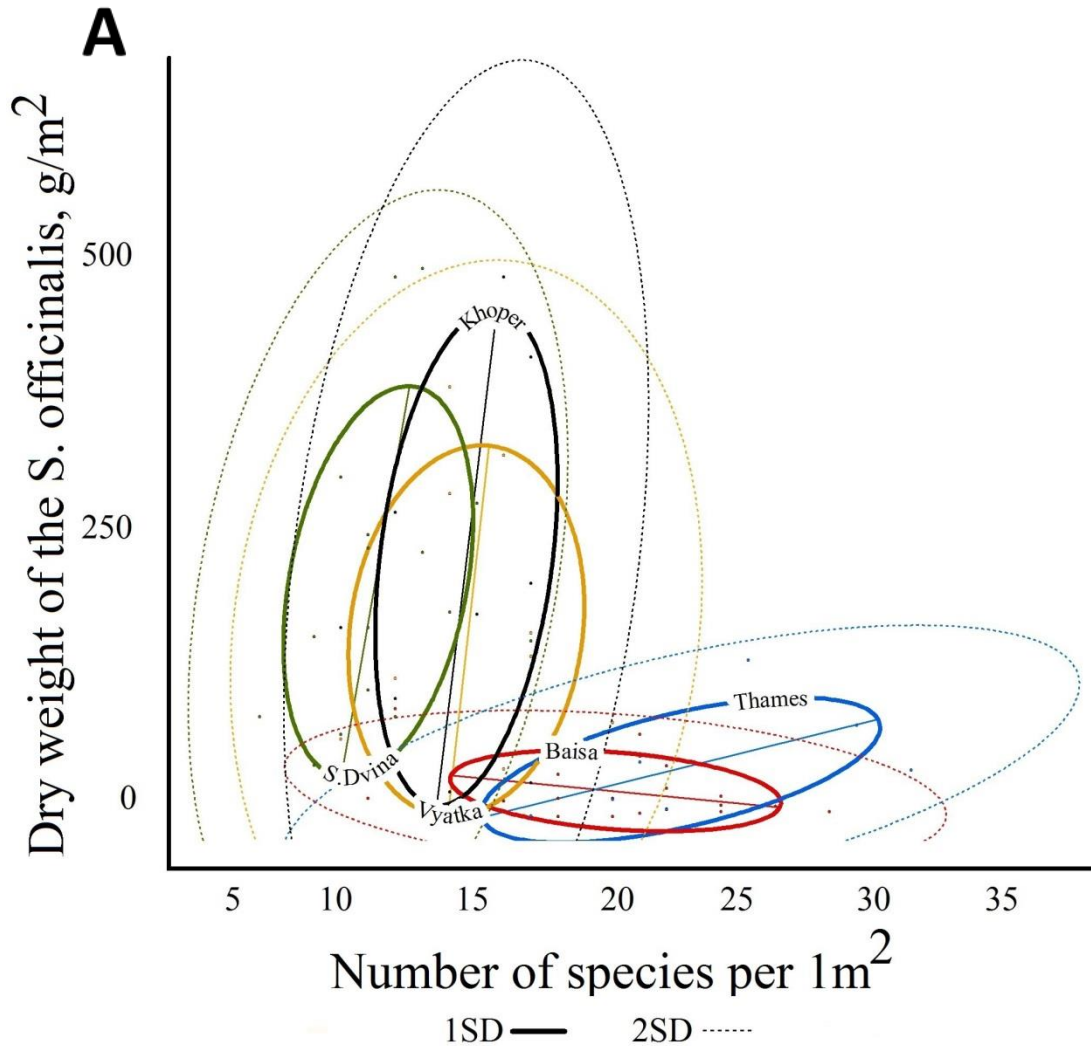


Species rich MG4 plant community of the North Meadow, Cricklade, Photo@Mike Dodd

# Species richness on the plots with and without Great Burnet on international (A) and British (B) meadows

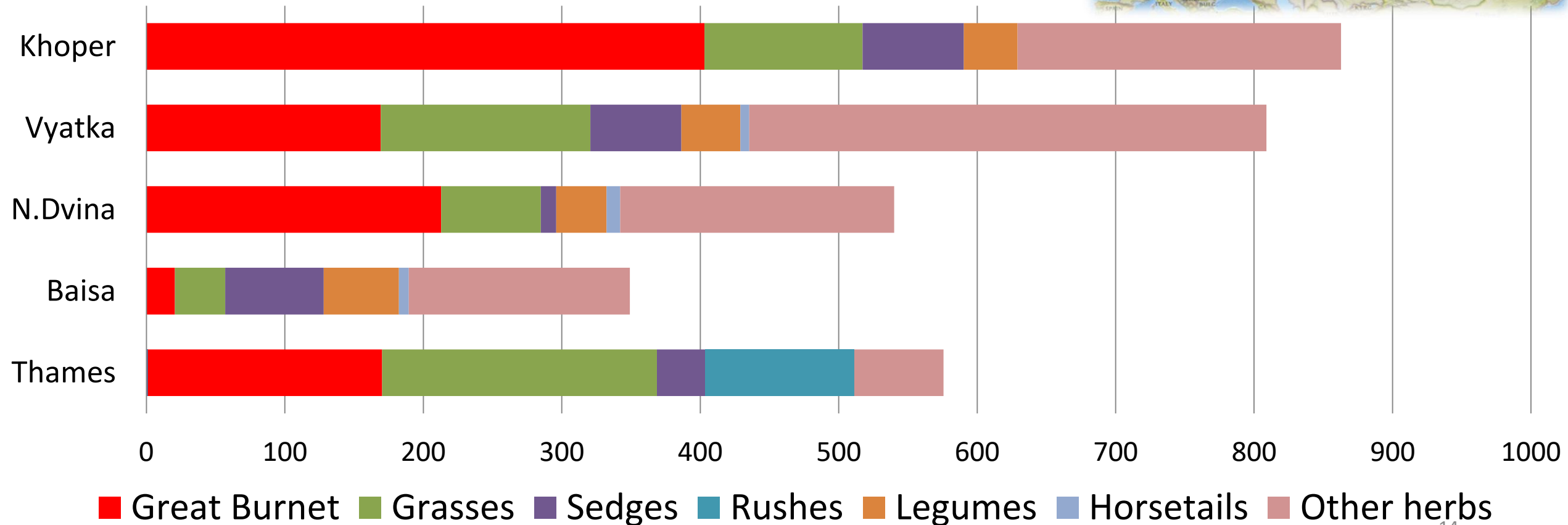


Species richness of the communities does not positively correlate either with the biomass of *Sanguisorba officinalis* (A) or with productivity of the communities (B)

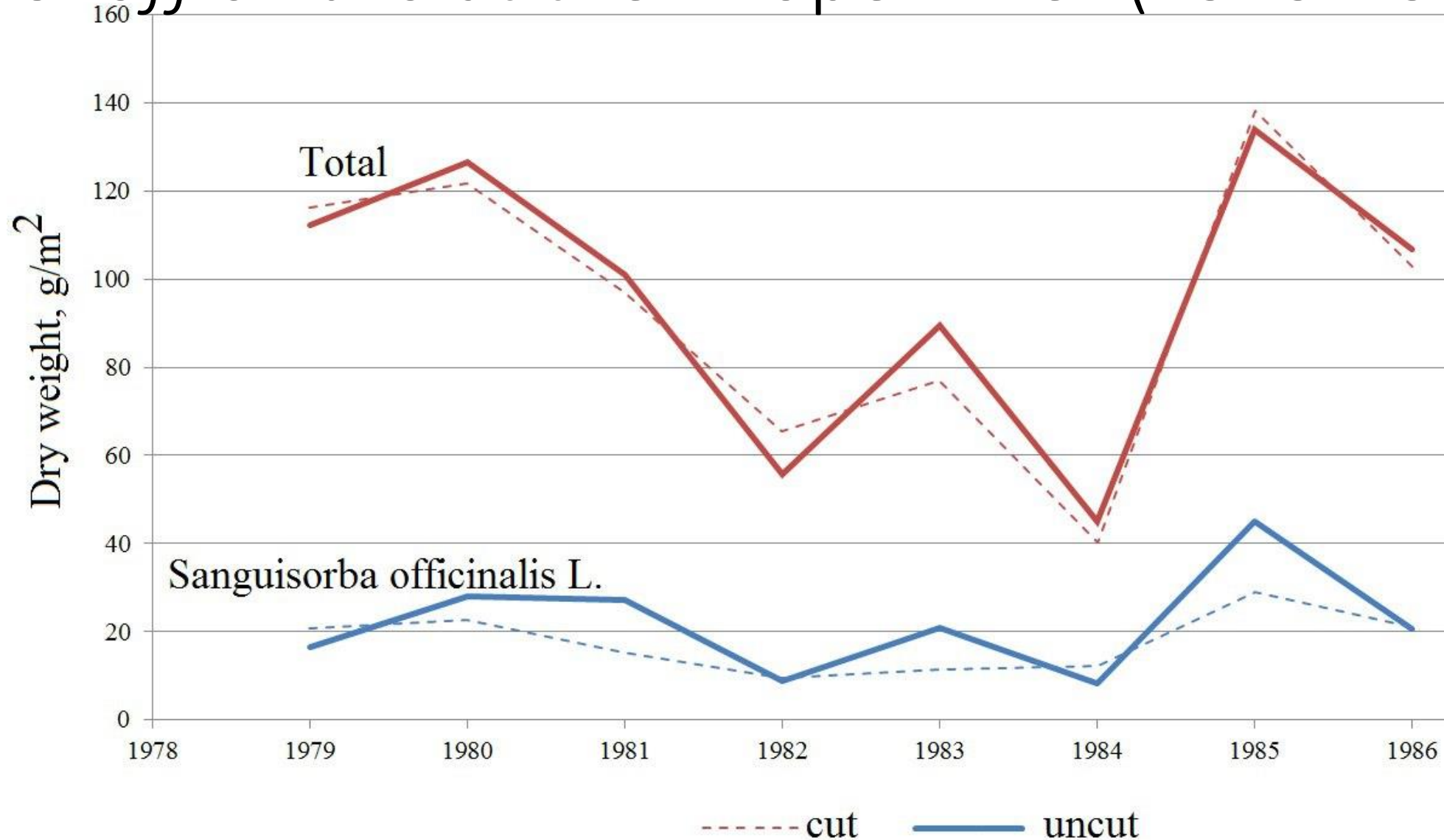


# Hypothesis 2: Productivity of the meadows with *S. officinalis* is more sustainable comparing to other floodplain communities

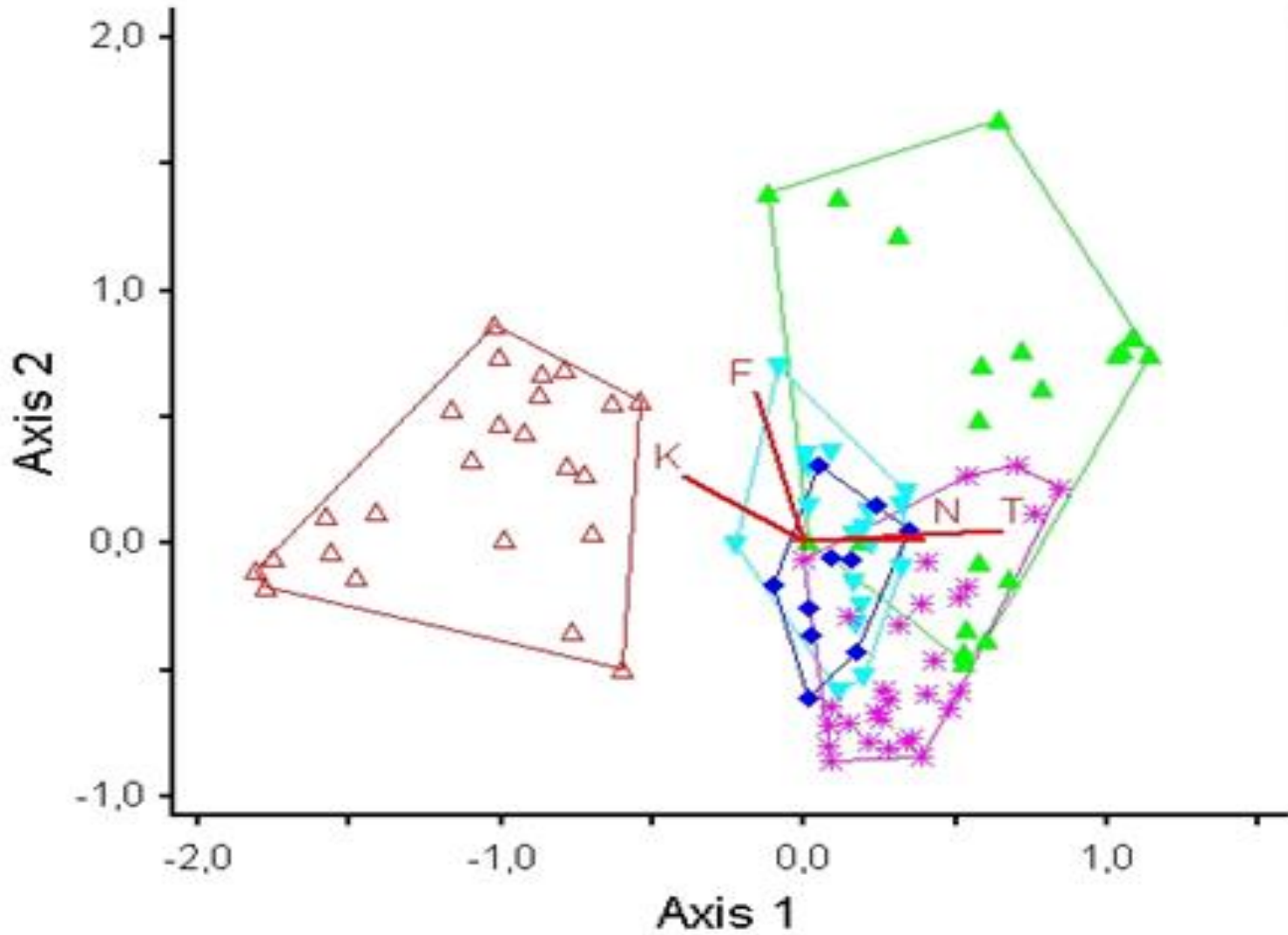
Composition of the hay samples on 5 sites studied in 2016 (g/m<sup>2</sup>)



# Long-term changes in biomass of *S. officinalis* at the Khoper river (1979-1986)



# NMS Analysis of the data using Ellenberg indicator scores



- | River | Symbol |
|-------|--------|
| 1     | △      |
| 2     | ▲      |
| 3     | ▼      |
| 4     | *      |
| 5     | ◆      |
- 1 – Baisa  
2 – Koper  
3 – Northern Dvina  
4 – Thames  
5 – Vyatka

- F – soil moisture  
N – soil nutrients  
T – temperature (climate)  
K – continentality of the climate (related to the distance from the sea)



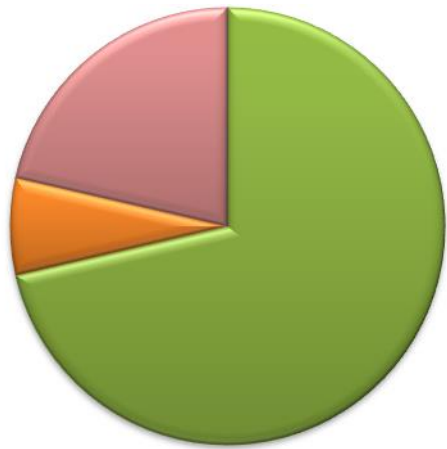
# Floristic latitudinal groups in Sanguisorba meadows:



- Arctic alpine
- Arctic boreal
- Boreal (taiga)
- Boreal mountain
- Subarctic
- Forest-steppe
- Broad-leaved forest
- Azonal
- Steppe



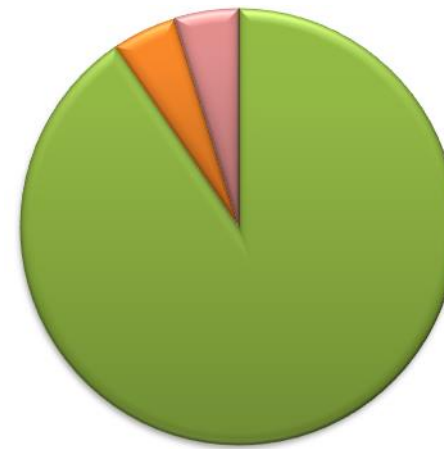
Thames



Khoper



Northern Dvina



Vyatka

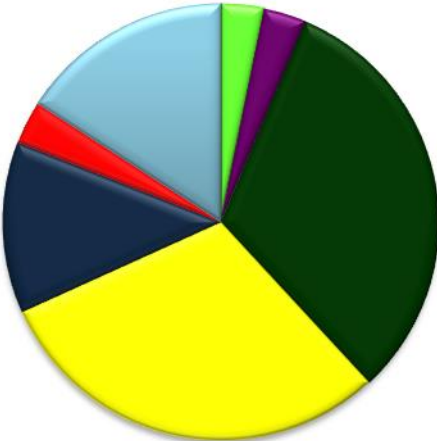


Baisa

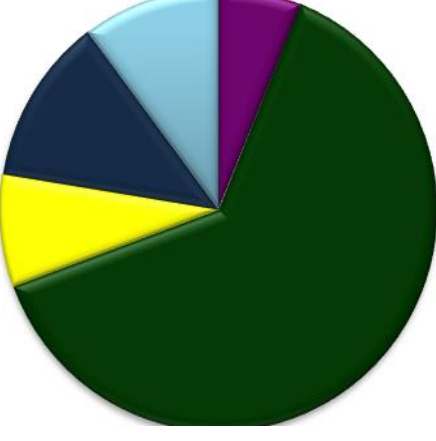
# Floristic longitudinal groups in Sanguisorba meadows:



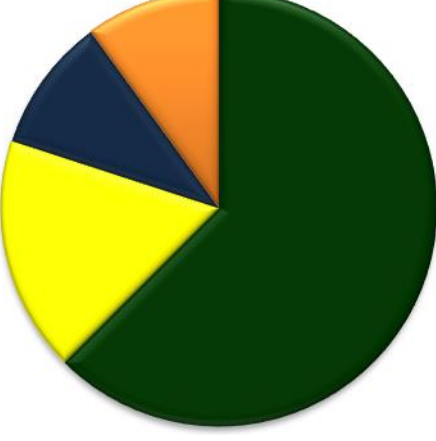
- Asian
- Asian-American
- Amphi-Atlantic
- Eurasian-American
- Eurasian
- European
- Euro-Siberian
- Euro-American
- Siberian
- Circumboreal
- Circumpolar



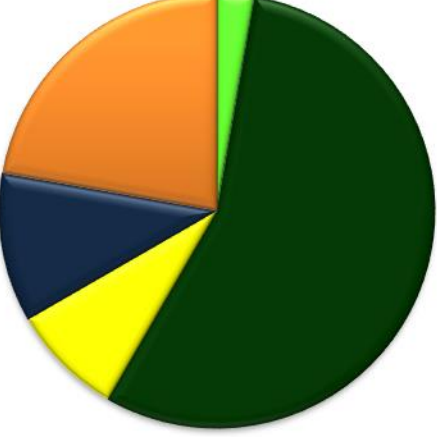
Thames



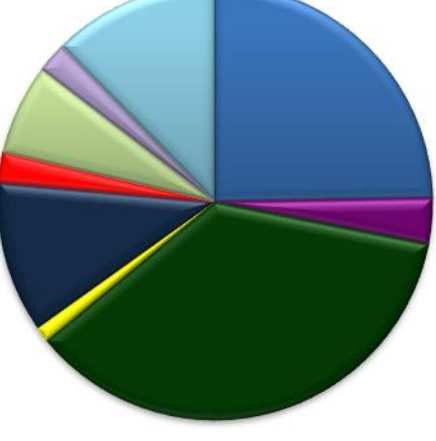
Koper



Northern Dvina



Vyatka



Baisa

# Floristic similarity of Sanguisorba meadows at three taxonomical levels (ranges of Jaccard Coefficient (%) between the sites)



	Thames	Khoper	Vyatka	Northern Dvina	Baisa
Species	8-15	8-20	9-11	8-11	3-8
Genera	17-27	17-38	17-25	17-27	17-18
Families	43-50	39-50	47-57	50-52	40-52

# Conclusion

- Sanguisorba meadows can be found on the floodplains across Europe and Asia, from Arctic and Subarctic latitudes down to the south for several thousand kilometres. They represent the species-rich and highly productive plant communities of hay meadows.
- Sanguisorba meadows can be considered as an azonal vegetation type however, influence of surrounding biomes on the floristic composition is apparent both in latitudinal and longitudinal directions.
- Floristic similarity between pairs of sites reaches about 10% at the species level, 20% at the genera level, and up to 50% at the family level.
- Plant communities with *Sanguisorba officinalis* are shown to be more species-rich comparing to other parts of the same meadow.
- High level of species diversity does not positively correlate with productivity of Sanguisorba meadows. The communities with medium number of species appeared to be most productive.

A wide-angle photograph of a lush green field filled with various plants, including several prominent red, cone-shaped flowers in the foreground. The field extends to a line of trees in the distance under a bright sky with scattered white and grey clouds. A semi-transparent blue rectangular box is positioned in the upper right corner of the image.

Thank you

## Acknowledgements

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