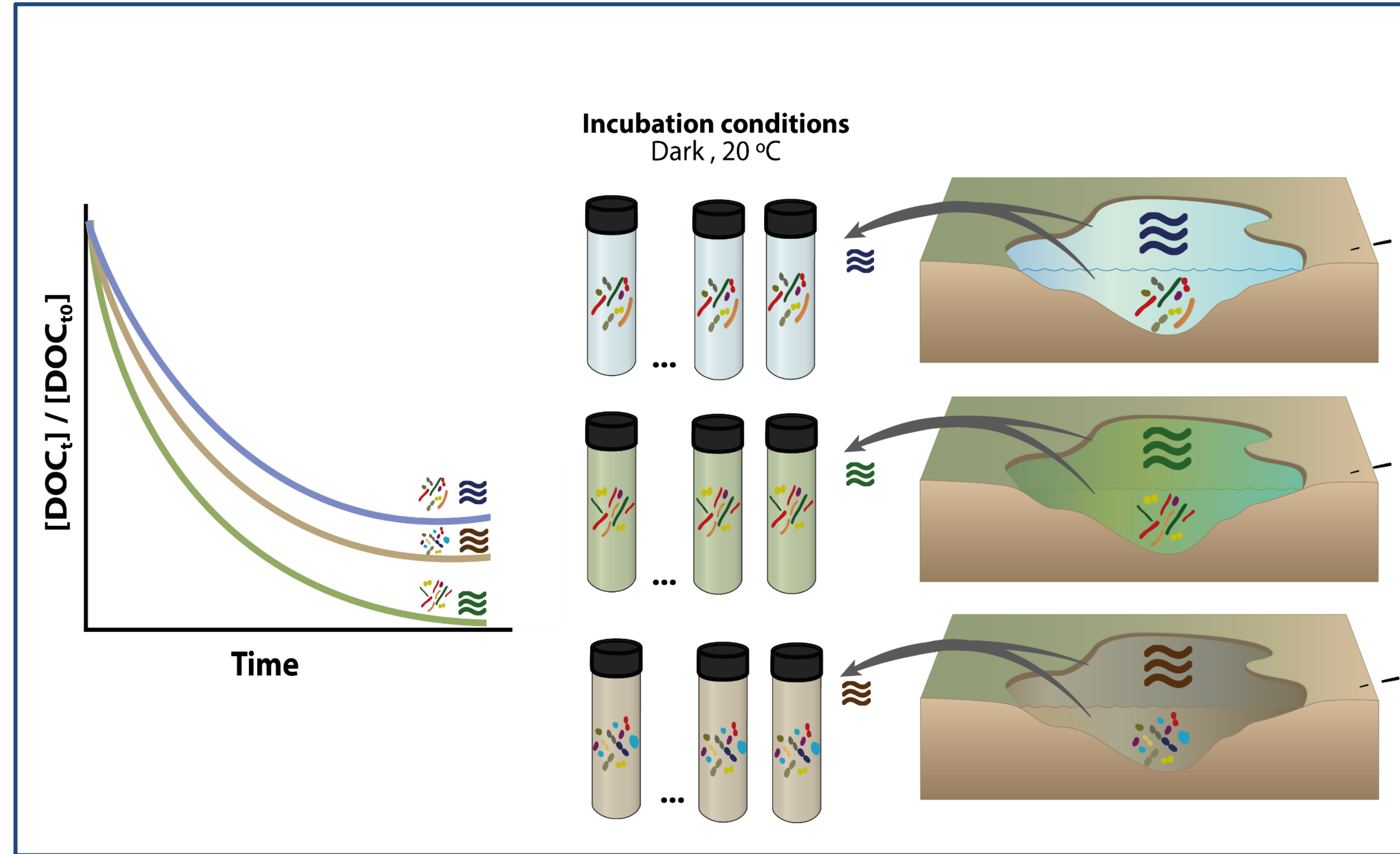


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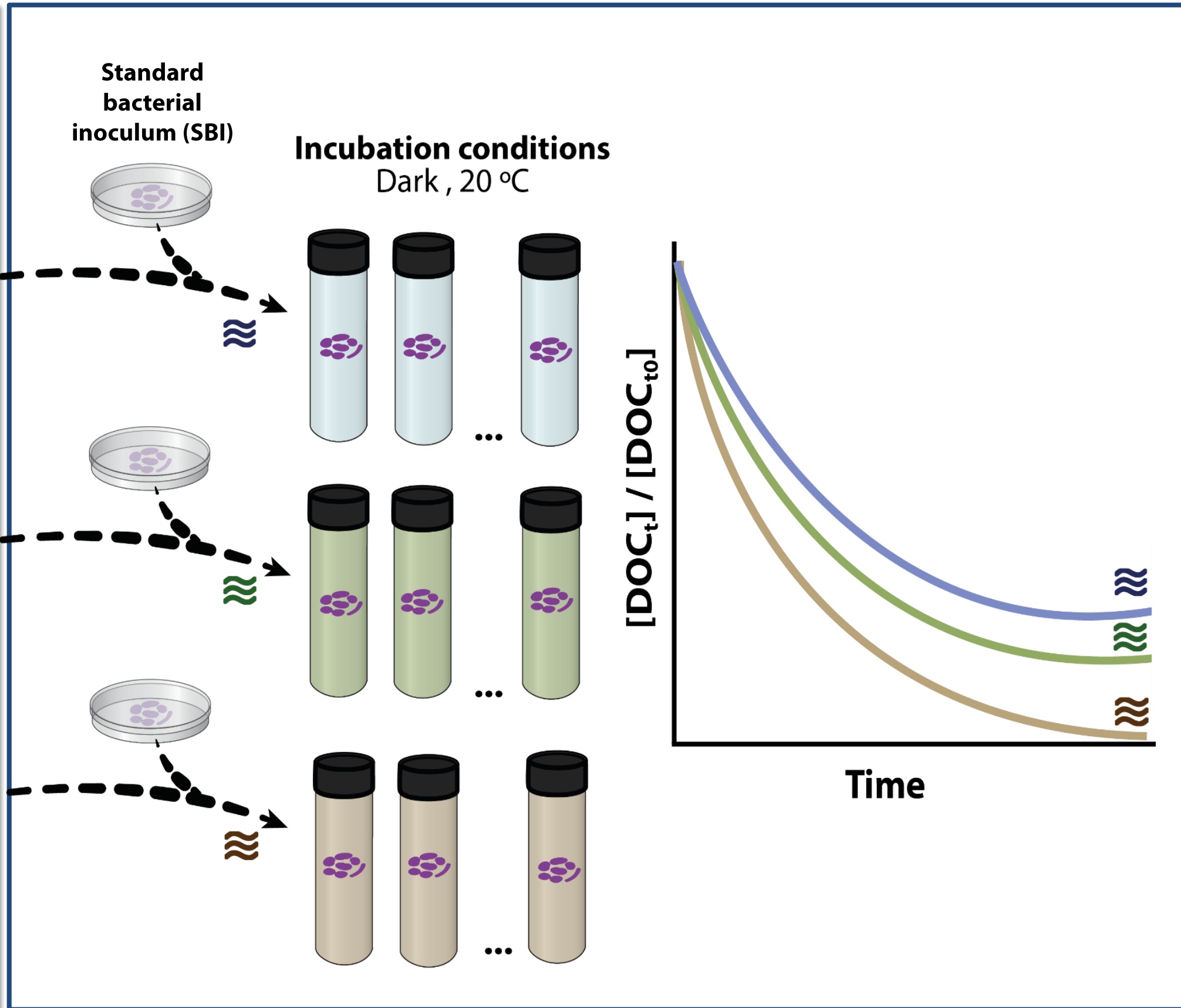
## Typical approach

Dissolved organic carbon (DOC) degradation kinetics are typically evaluated by using bioassay incubations inoculated with **native microbial inoculum**



## Our approach

We aim to provide a tool to **standardize the microbial community** in the bioassays incubations across ecosystems



## The Standard Bacterial Inoculum (SBI) should:

- ✓ be composed by strains **accessible from biological repositories** and easily grown in co-culture
- ✓ be **metabolically versatile** to degrade a wide range of organic compounds (i.e., high functional plasticity).
- ✓ operate under a **wide range of environmental conditions**
- ✓ the magnitude of DOC consumption by the SBI should be **replicable**

## Selected strains composing the SBI

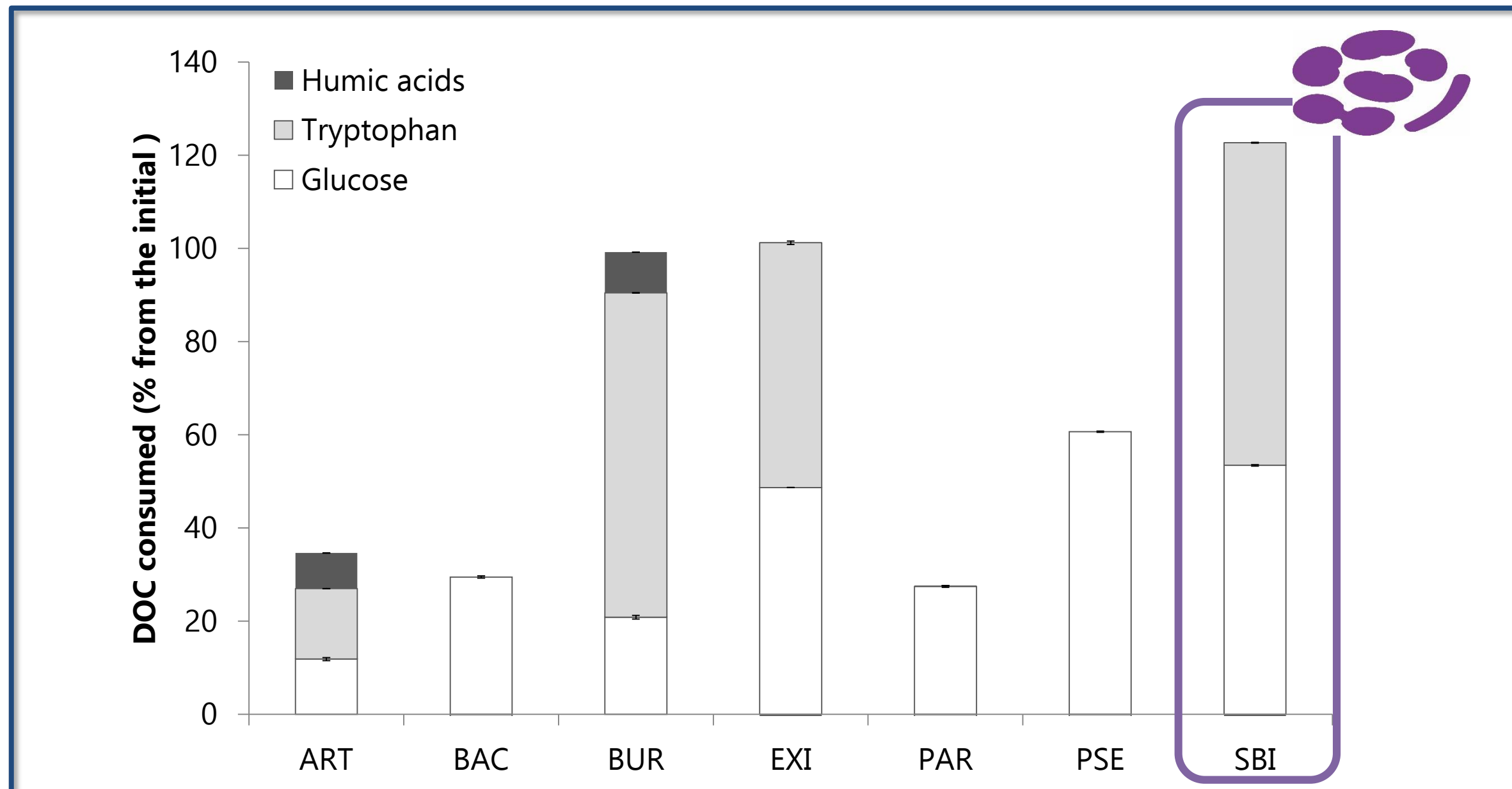
The six type strains selected are well-recognized easily grow in lab conditions

Bacterial species	Oxygen relationship	Temp. range (°C)	pH range	Carbon sources	Occurrence	Ref
<i>ARThrobacter phenanthrenivorans</i>	Aerobe	4–37	6.5–8.5	various organic substrates including phenanthrene and anthracene	Soil	[1, 2]
<i>BACillus licheniformis</i>	Facultative anaerobe (denitrification)	15–55	5.7–6.8	various organic substrates including pectin and plant polysaccharides	Soil, Water, Sludge, Food	[3]
<i>EXIguobacterium sibiricum</i>	Facultative anaerobe (denitrification)	–2.5 to 40	7.0–7.2	wide variety of organic compounds	Permafrost	[4]
<i>PARacoccus denitrificans</i>	Facultative anaerobe (denitrification)	25–37	6.5–9.0	wide variety of organic compounds	Water, Soil, Sewage, Sludge,	[5,6]
<i>BURholderia multivorans</i>	Aerobe	9–42	6.5–7.5	wide variety of organic compounds	Soil, rhizosphere, plants, clinical specimens	[5, 7]
<i>PSEudomonas putida</i>	Facultative anaerobe (denitrification)	25–30	6.5–7.5	wide variety of organic compounds including aromatics	Ubiquitous in water and soil.	[5, 8]

Ref.: [1] Kallimanis A, et al. (2009) *Int. J. Syst. Evol. Microbiol.* 59: 275–279 [2] Whitman WB, et al. (eds., 2012). *Bergey's Manual of Systematic Bacteriology*, Springer-Verlag, [3] Vos P, et al. (eds., 2009). *Bergey's Manual of Systematic Bacteriology*, [4] Rodrigues DF, et al. (2006) 10:285–294, [5] Brenner DJ, et al. (eds., 2005). *Bergey's Manual of Systematic Bacteriology*, [6] Hahnke SM, et al. (2014) *Front. Microbiol.* 5 [7] Palleroni NJ and Holmes B (1981) *Int. J. Syst. Bacteriol.* 31(4): 479–481, [8] Deshwal VK and Kumar P (2013) *J. Acad. Industrial Res.* 2(6): 353–356.

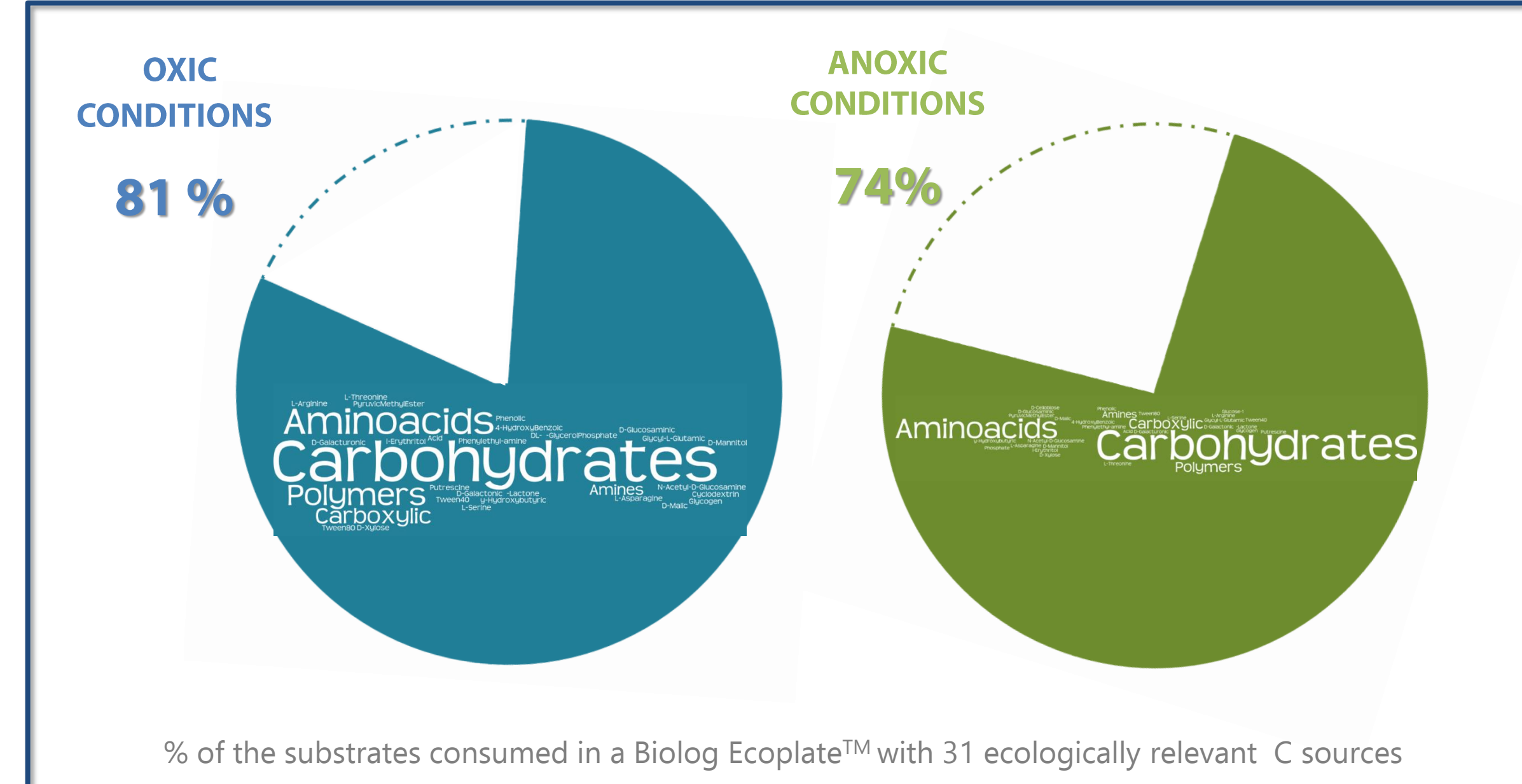
## Selected strains grow well in co-culture

Strains **easily grow in the lab** (medium broth nutrient; 30°C) and have **complementary metabolic capacities**



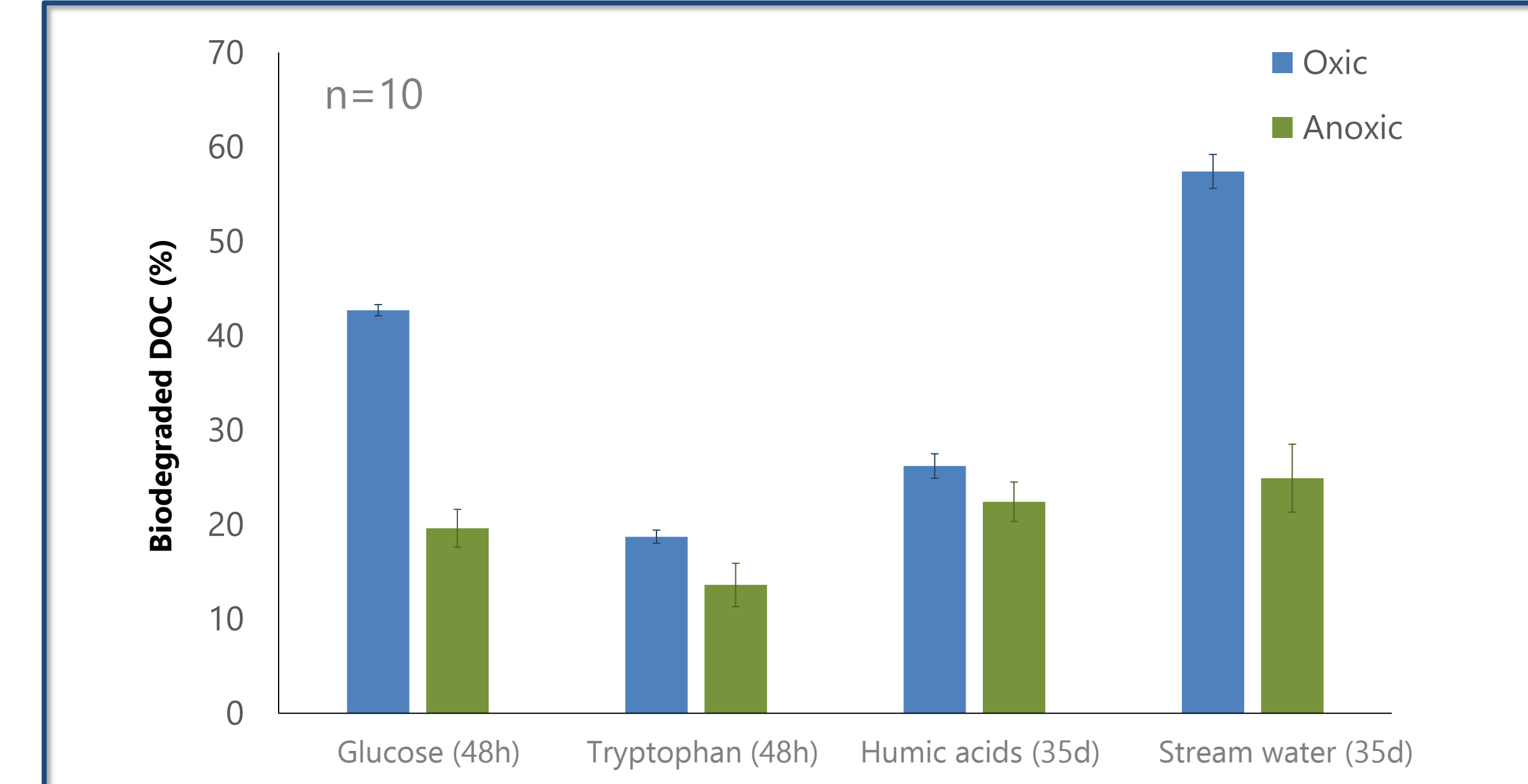
## SBI is metabolically and functionally versatile

SBI degrade a **wide range of organic compounds** under **contrasting oxygen availability**



## DOC consumption by the SBI is highly replicable

The **SD** was especially **low (<2 %)** under **oxic conditions**



## CONCLUSIONS

- ✓ The SBI is a new methodological tool to compare **DOC biodegradation dynamics** across inland water systems
- ✓ We **excluded the effects of diverse native microbial communities** by using the SBI
- ✓ The SBI completely **fulfils the essential requirements needed to be a useful and easily applicable tool**

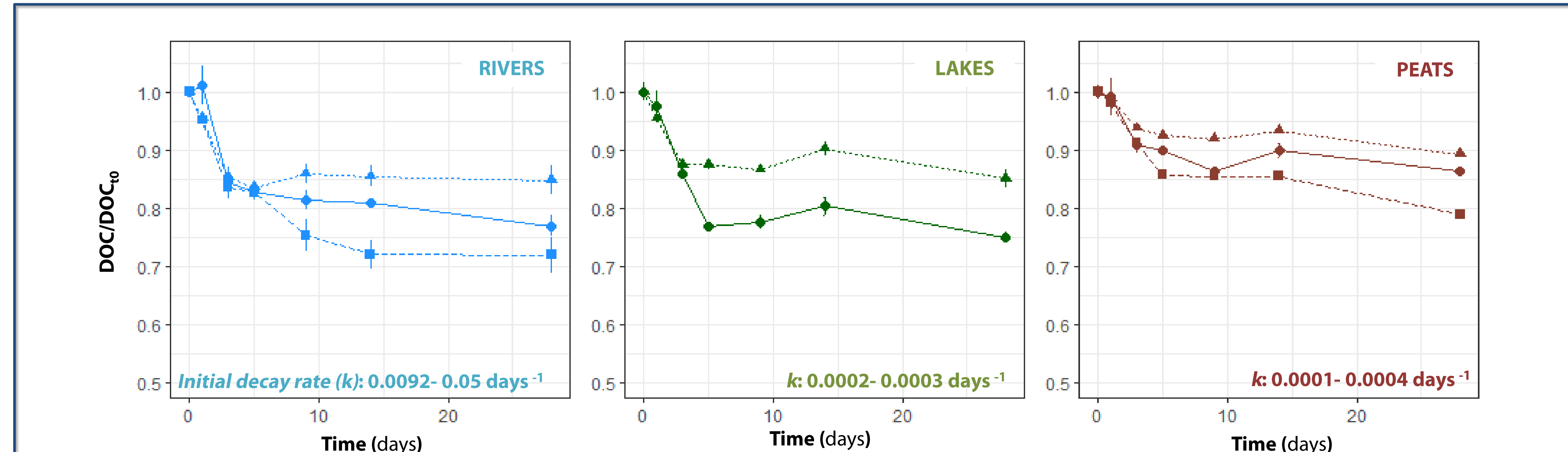
## THE SBI IN A “REAL-WORLD” EXPERIMENT



We used water with **contrasting initial DOC concentrations and properties** sampled in **boreal Sweden**.

**RIVERS** 9.3 -13.8 mg C/L  
**LAKES** 13.6 -17.4 mg C/L  
**PEATS** 30.5 – 38.8 mg C/L

## DOC consumed by the SBI was useful to determine biodegradation dynamics across ecosystems



## NEW AVENUES in C freshwater research

- ✓ The use of the SBI should provide insights into **drivers of DOC biodegradation dynamics**, especially those which have been, typically overlooked (**environmental controls**) .
- ✓ The SBI methodology can be **simply adapted to the needs of the researcher's question** (e.g. adjusting the bacterial abundance).