

CITIZEN SCIENCE AND MACROINVERTEBRATE MONITORING: KEY LEARNINGS FROM THE CS4RIVERS PROJECT

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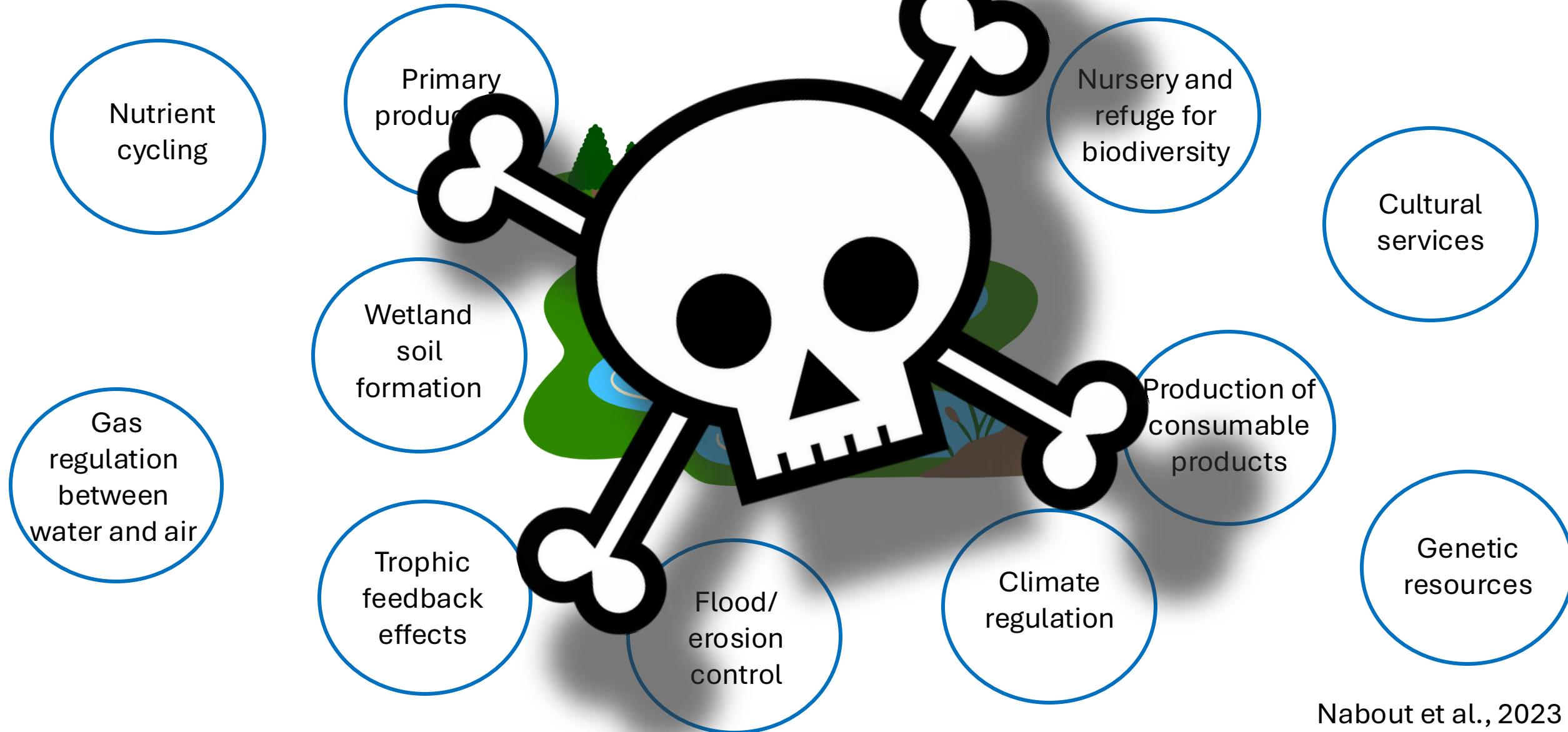
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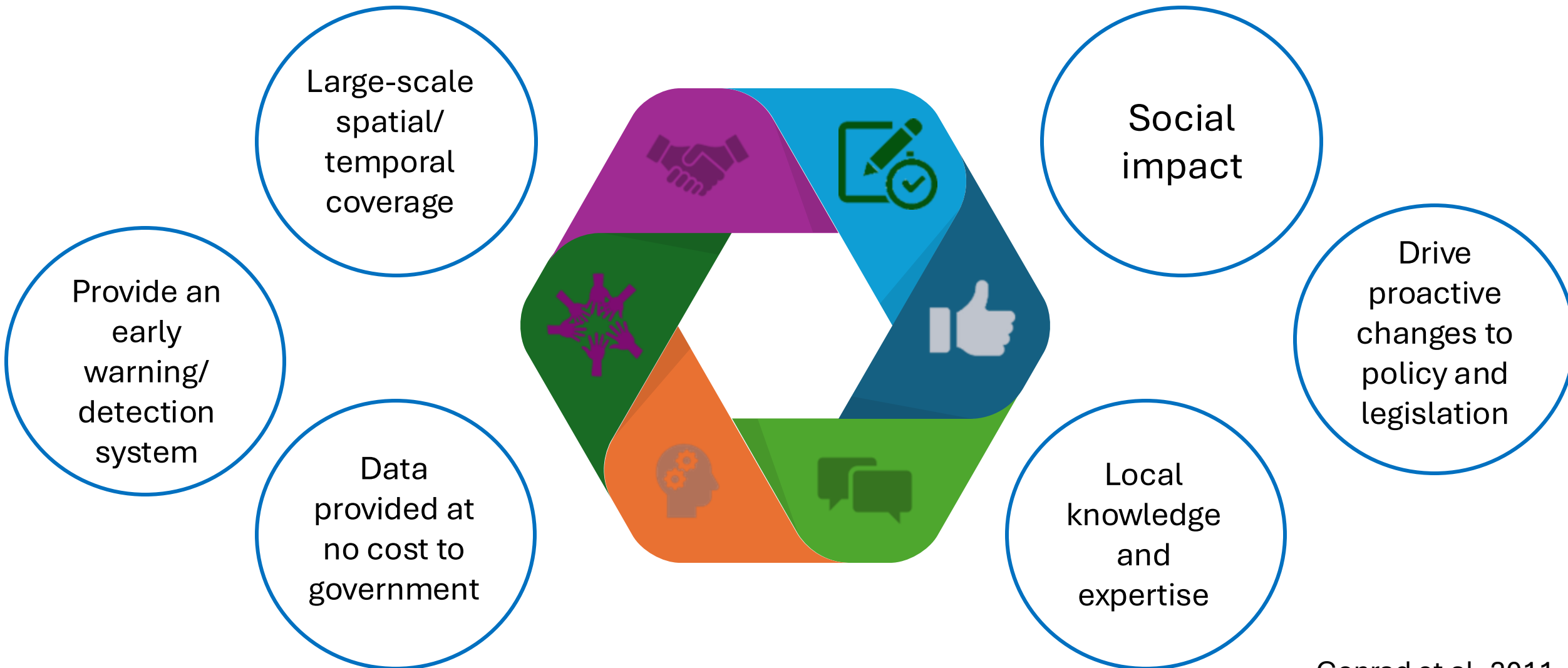
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Freshwater ecosystems: ecosystem services



Citizen Science: benefits



Macroinvertebrate community

Excellent
bioindicators,
well studied
community

First CS
project in Italy

“Unknown
world”

First-rate
project around
EU (Spain,
Ireland, UK)



CS4Rivers project



- **UniSi CS project**, developed in NBFC with NRRP funds

- Objectives: monitoring **habitat quality** and **biodiversity** of riverine ecosystems

- Study area: **Ombrone River basin** and main tributaries

- Activities:
 - Water chemical quality
 - **Macroinvertebrates**
 - Riparian vegetation

Objectives

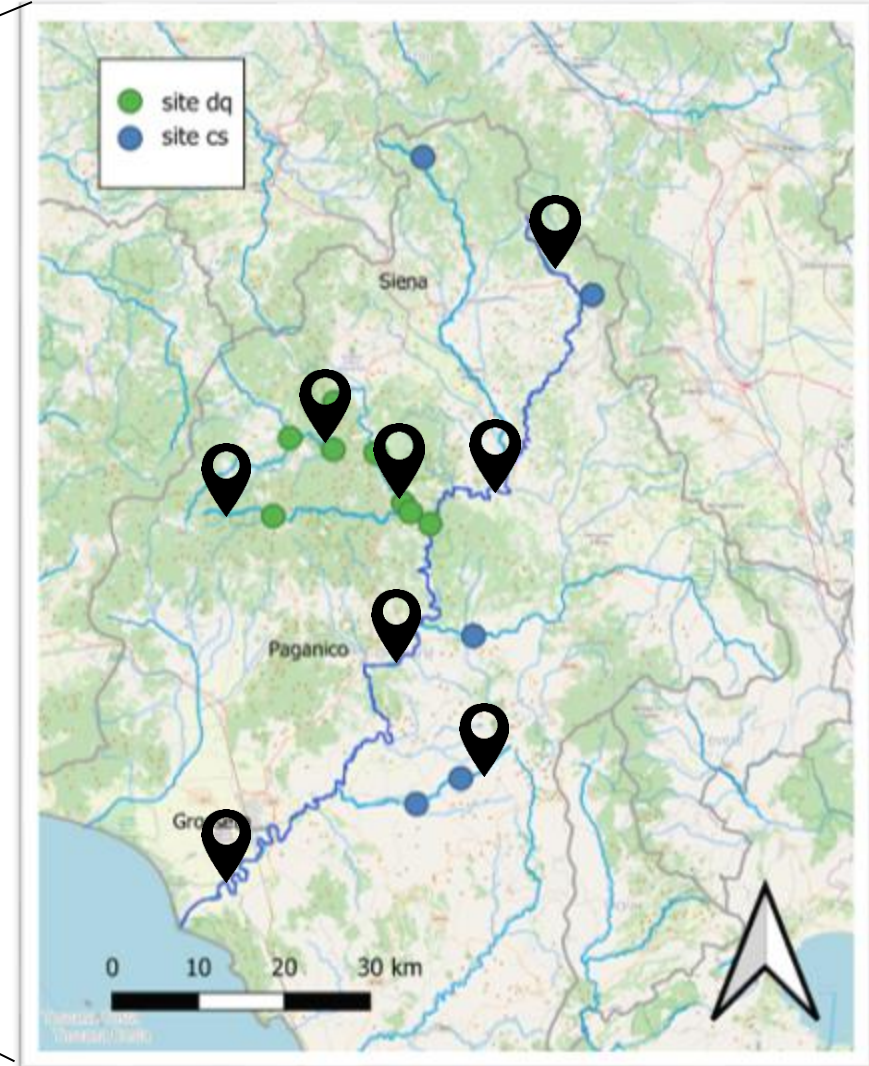
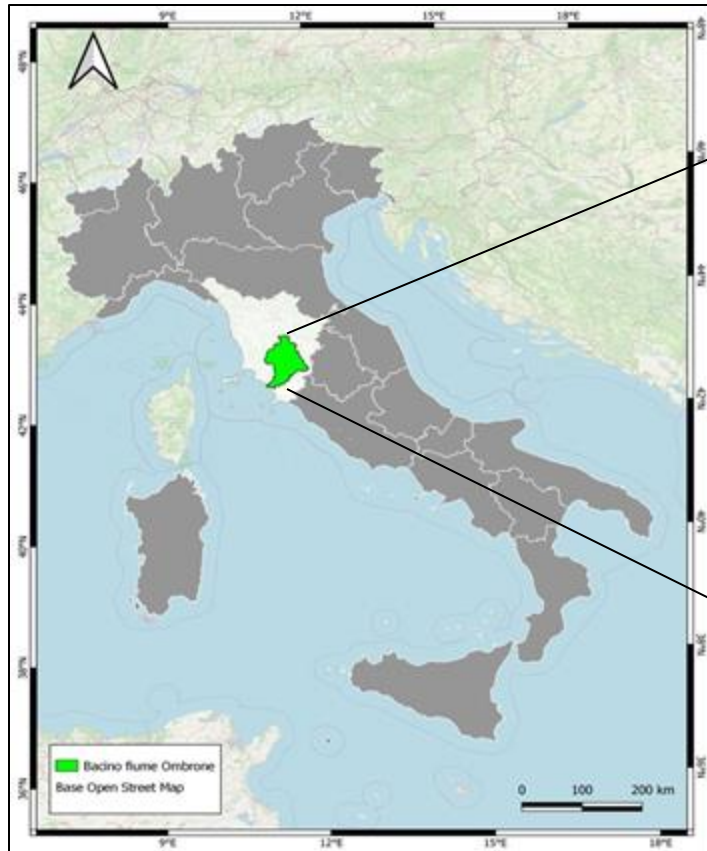
1. Overview on our experience in CS4Rivers project



2. Focus on Data Quality



Study Area



SBI: Simplified Biotic Index

- Simplified EBI protocol
 - Citizens:
 - collect general information about the ecosystem;
 - sample proportionally to the microhabitat's presence with a standard net (250 mm frame, 500 mm deep net bag, 1 mm mesh);
 - sort the organisms;
 - fill in the SBI form: double-entry matrix: rows target groups with decreasing sensitivity; columns total number of taxa
- ➡ **useful data to identify the row of the EBI matrix;**
- take photos of the target groups and send them to the expert
- ➡ **to calculate the total amount of taxa (family).**



citizen science FOR RIVERS

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Osservatorio Citizen Science

data _____
luogo _____

> 10

Tricotteri		> 1	
		1	
Gammaridi			
Asellidi			
Chironomidi o Oligocheiti		> 1	
		1	
Altri Odonati, Coleotteri adulti e Ditteri			

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Osservatorio Citizen Science

Materials and Training

Scheda monitoraggio comunità macrobentica

Scatta almeno 2 foto georeferenziate della zona presa in esame (1 verso valle, 1 verso monte) da

Nome osservatore _____

E-mail _____

Data monitoraggio _____ Condizioni meteo _____

Nome della località _____ Nome del fiume _____

Latitudine _____ Longitudine _____

Lunghezza del tratto monitorato (minimo 10 m - massimo 50 m) _____

1 Come si presenta l'acqua nell'alveo?

- ☐ portata minima
☐ portata media

2 Qual è la larghezza dell'alveo bagnato, rispetto all'alveo totale?

Larghezza dell'alveo bagnato _____ Alveo totale _____
metri metri

3 Come si presenta la vegetazione riparia?

- ☐ la fascia riparia è costituita prevalentemente da specie arborea (ampi)
☐ la fascia riparia è costituita prevalentemente da specie arborea (strett)
☐ la fascia riparia è costituita prevalentemente da specie arbustive
☐ la fascia riparia è costituita prevalentemente da specie erbacee
☐ non è presente nessuna fascia riparia

4 Sono presenti indizi di attività antropiche nei pressi del fiume?

- ☐ sì
☐ no

Se sì, specificare quale: _____

5 Qual è la velocità media della corrente?

- ☐ impercettibile o molto lenta
☐ lenta
☐ veloce
☐ turbolenta

6 Stimolo

Microb
Argilla
Ghiaia
Ciottoli
Ciottoli
Pietre c
Lastre
Artificia

7 Sono

Substr
Alghe f
Radici
Foglie
Muschi
Detriti

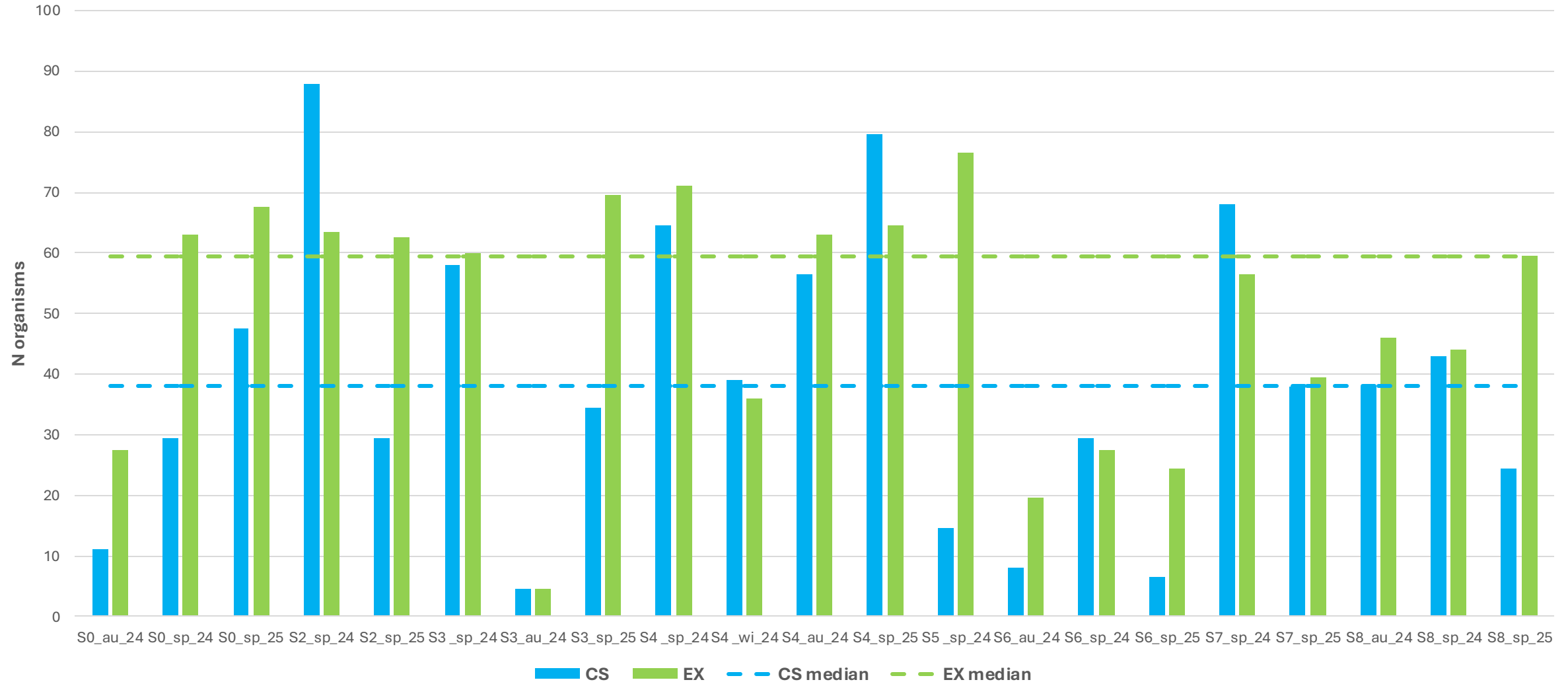
8 Se è p

Specie
Myriop
Elodea
Potamo

Nota



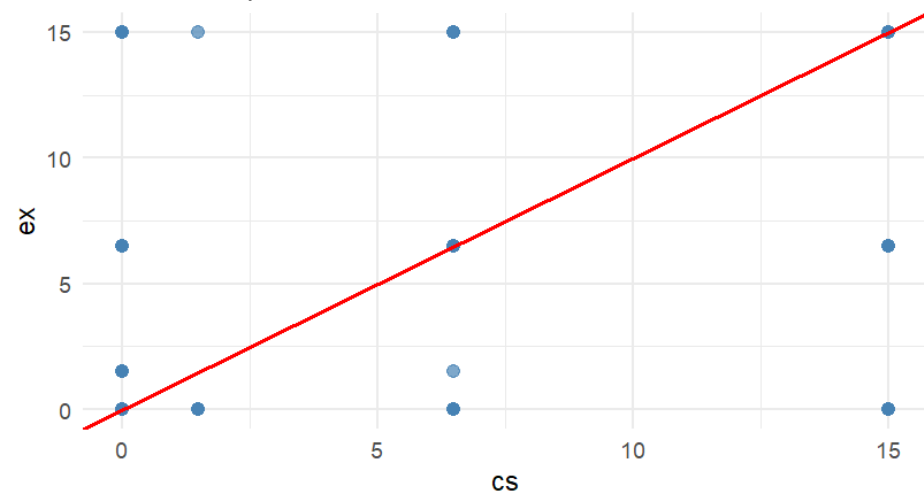
Sampling comparison



Spring 2024:

Wilcoxon test: $p > 0.05$

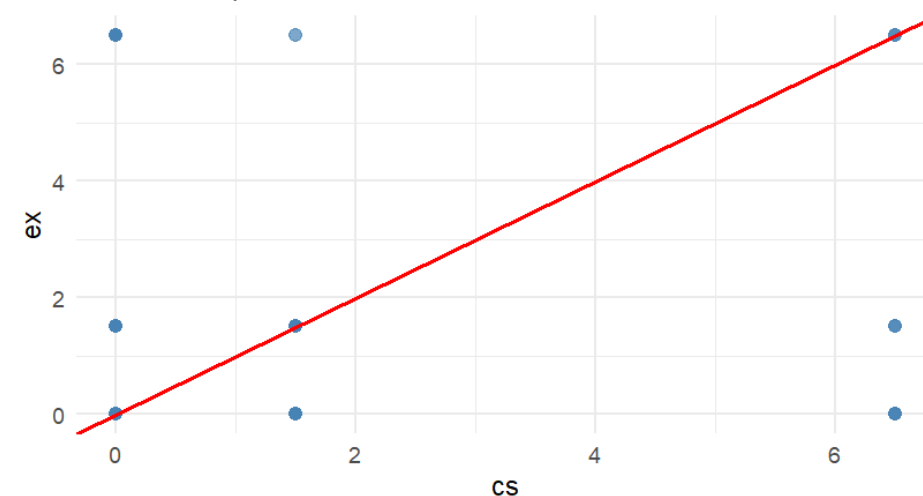
$\rho = 0.274$, $p < 0.001^{***}$



Autumn 2024:

Wilcoxon test: $p > 0.05$

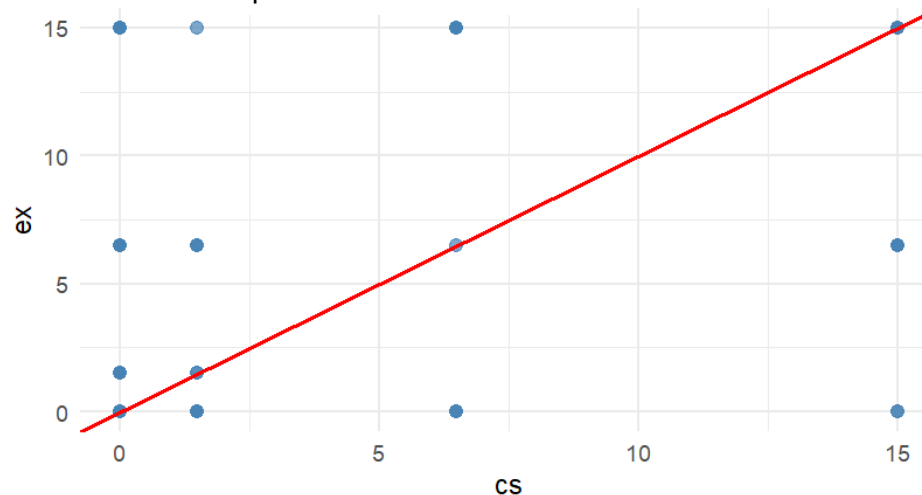
$\rho = 0.307$, $p < 0.001^{***}$



Spring 2025:

Wilcoxon test: $p < 0.05^*$

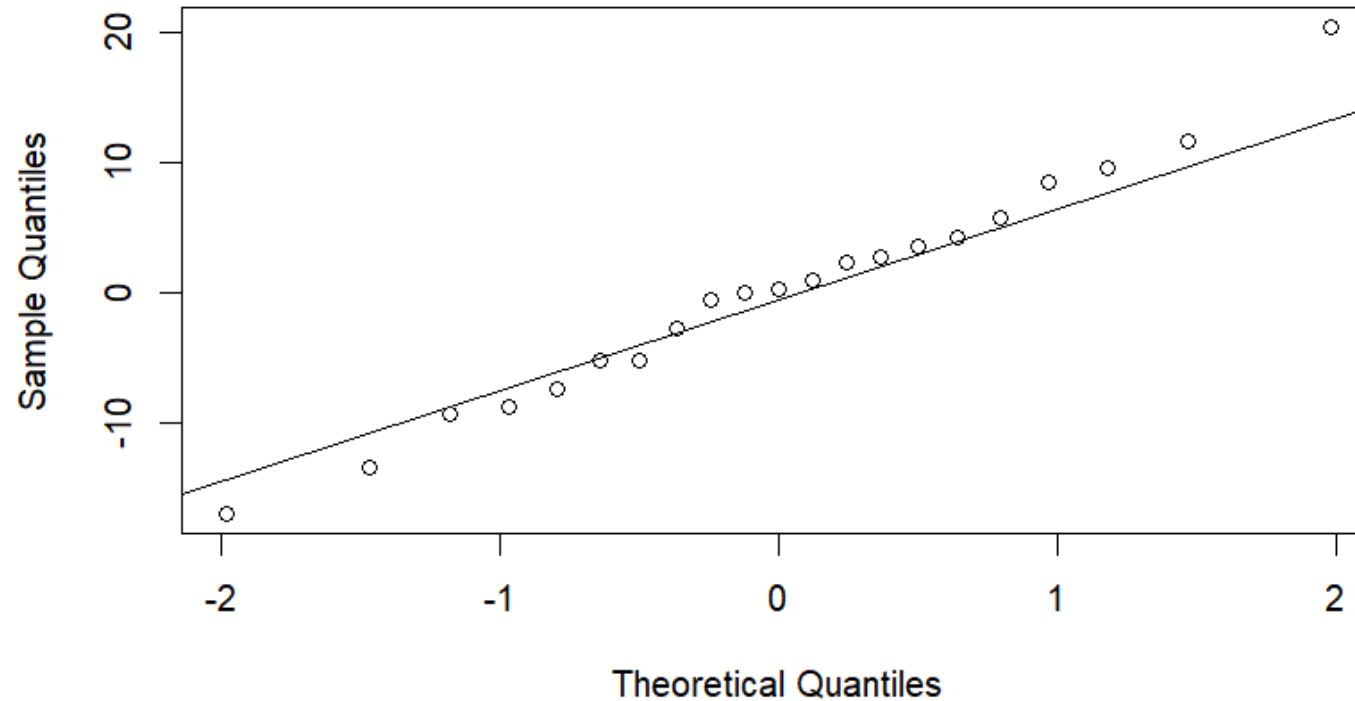
$\rho = 0.473$, $p < 0.001^{***}$



Time interval	mean $\pm$ sd
Spring 2024	37.25 $\pm$ 17.03
Autumn 2024	2.24 $\pm$ 3.36
Spring 2025	51.71 $\pm$ 20.92

LMM: time effect on presence estimation

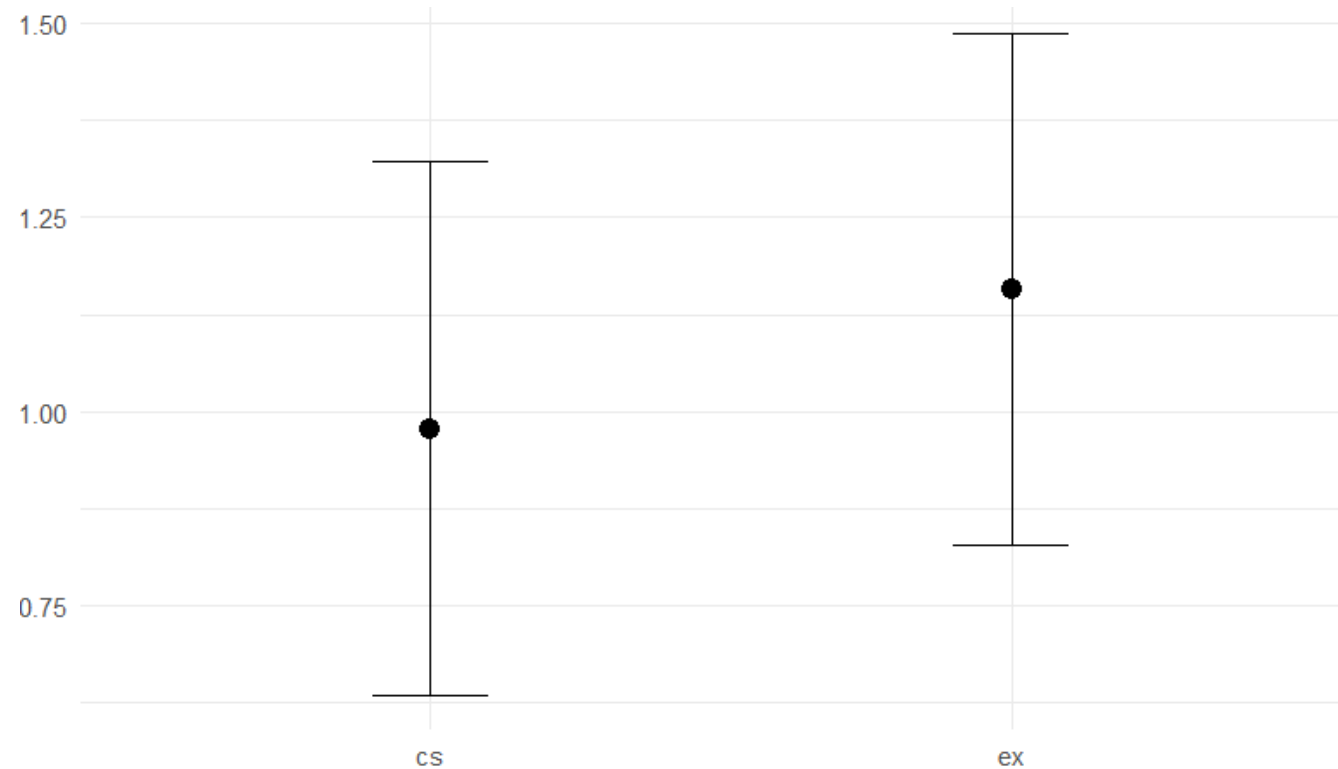
Normal Q-Q Plot



Fixed effects:

	Estimate	Std. Error	df	t value	Pr(> t)
(Intercept)	8.26678	5.08632	8.25087	1.625	0.1416
time	0.27858	0.09482	7.00865	2.938	0.0217 *

GLMM: cs/ex on presence estimation (sp24+au24)



Conditional model:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	0.9776	0.1762	5.548	2.88e-08	***
typeex	0.1795	0.1857	0.967	0.334	

Analysis of Deviance Table (Type III Wald chisquare tests)

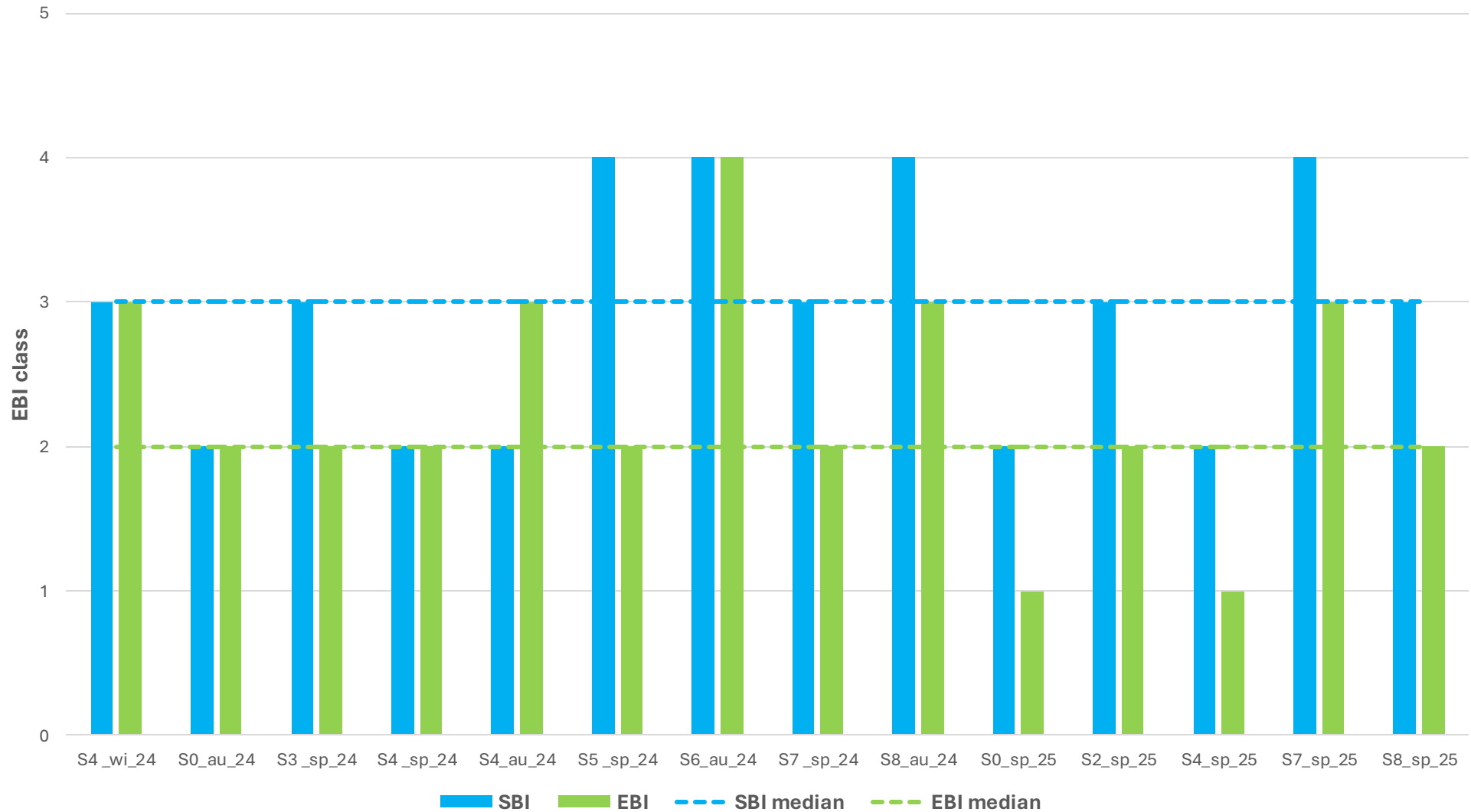
Response: pr_est

	Chisq	Df	Pr(>Chisq)	
(Intercept)	30.7836	1	2.885e-08	***
type	0.9345	1	0.3337	

ID errors



SBI vs EBI





“Taking care between us participants and the environment in which we operate is a form of care not focused exclusively on humans but also on water bodies in their ecological location, overcoming a binary vision of learning of human subjects and environmental objects”



“The CS4Rivers experience/project is Ecology that becomes Culture and vice versa, Culture that get turn Ecology; in a fair and unpretentious exchange between the river and the citizen”



Conclusions...so far!

- Data collected by CS are sufficiently reliable, even if an underestimation bias is observed
- *Ad hoc* training
- Take into account challenges!
- Further comparisons with a larger amount of data, volunteers, experts and communities
- Our volunteers seem to be happy 😊

Thank you for your attention!

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