

Paying attention to the isolated pools phase in temporary rivers.

A challenge to the ecological quality assessment of temporary rivers.

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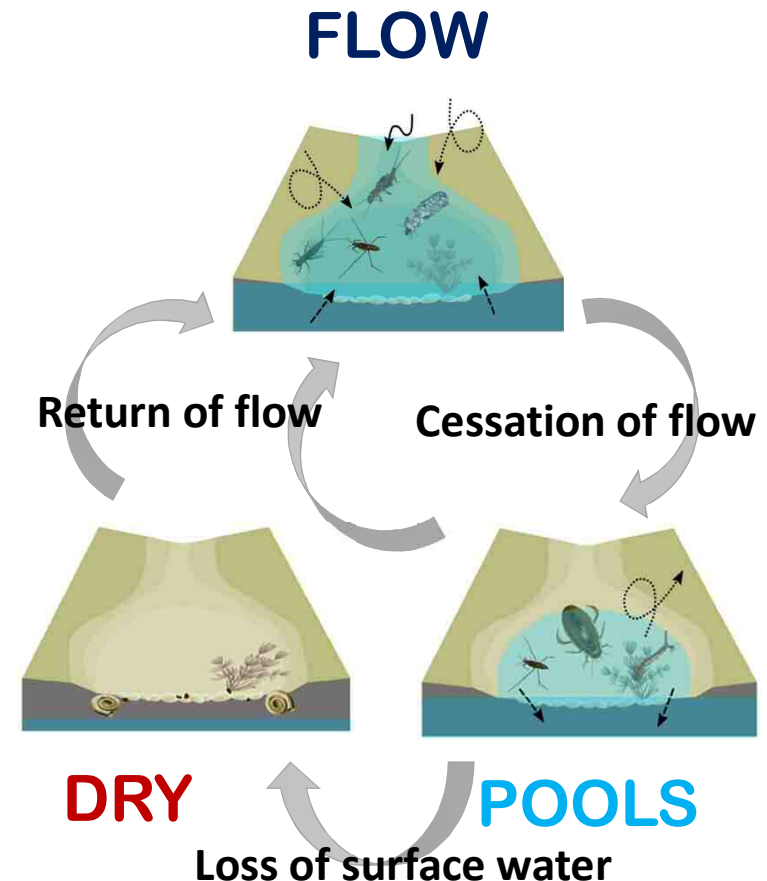
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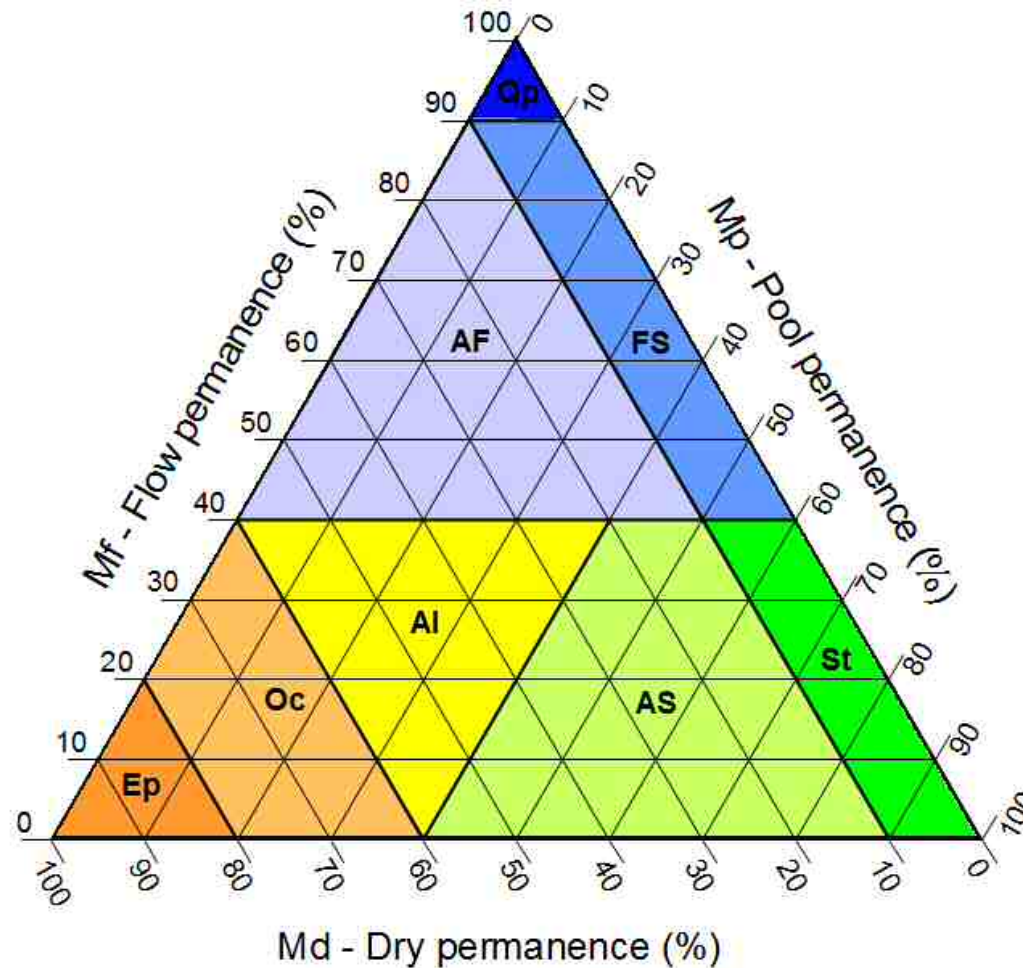
Rationale

- Most temporary rivers have regimes with alternating flow, pools and dry phases.
- Aquatic life undergoes successions that follow these habitat changes.
- Pools phases shelter key habitats for biodiversity conservation and may ensure surface water all year round
- The hydrology of pools is complex and poorly documented and investigated
- Biological communities in pools depend on both time since flow cessation and environmental quality
- River Basin Authorities do not assess water biological quality when streams are in the pools phase



Challenges

Many temporary rivers exhibit a long duration of the pools phase
But this is seldom reported (not informed by hydrographs)

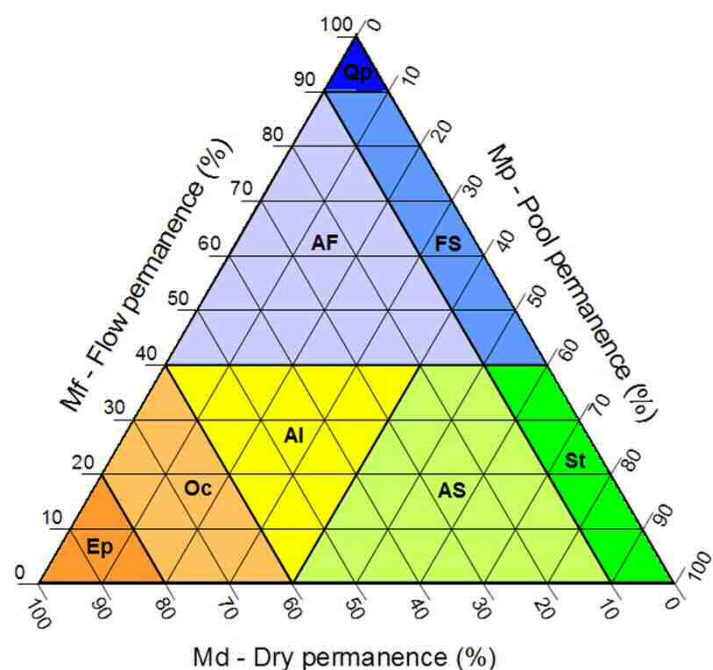


Pe = Perennial
Qp = Quasi perennial
FS = Fluent-Stagnant
AF = Alternate-Fluent
St = Stagnant
AS = Alternate-Stagnant
AL = Alternate
Oc = Occasional
EP = Episodic

Modified from
Gallart et al. (2017) STOTEN, 607-608: 519-540

Challenges

New ecotypes must be defined for developing biological references in temporary rivers



Hydrotypes:

Qp = Quasi perennial

FS = Fluent-Stagnant

AF = Alternate-Fluent

St = Stagnant

AS = Alternate-Stagnant

AL = Alternate

Oc = Occasional

EP = Episodic

Ecotypes:



Keep its current type

New type:

Temporary fluent rivers

New type:

Temporary rivers with pools

New type:

Occasional or episodic rivers

3 new ecotypes:

TR fluent

TR with pools

TR ocasionals o episodic



Agència Catalana
de l'Aigua

Challenges

New ecotypes proposed for temporary rivers



TR fluent

→ adapting reference and quality classes



TR with pools

→ New indexes needed

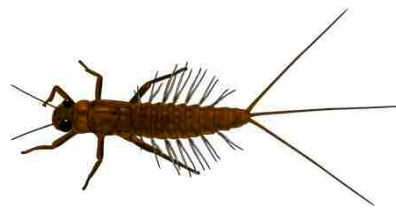


TR occasional or episodic

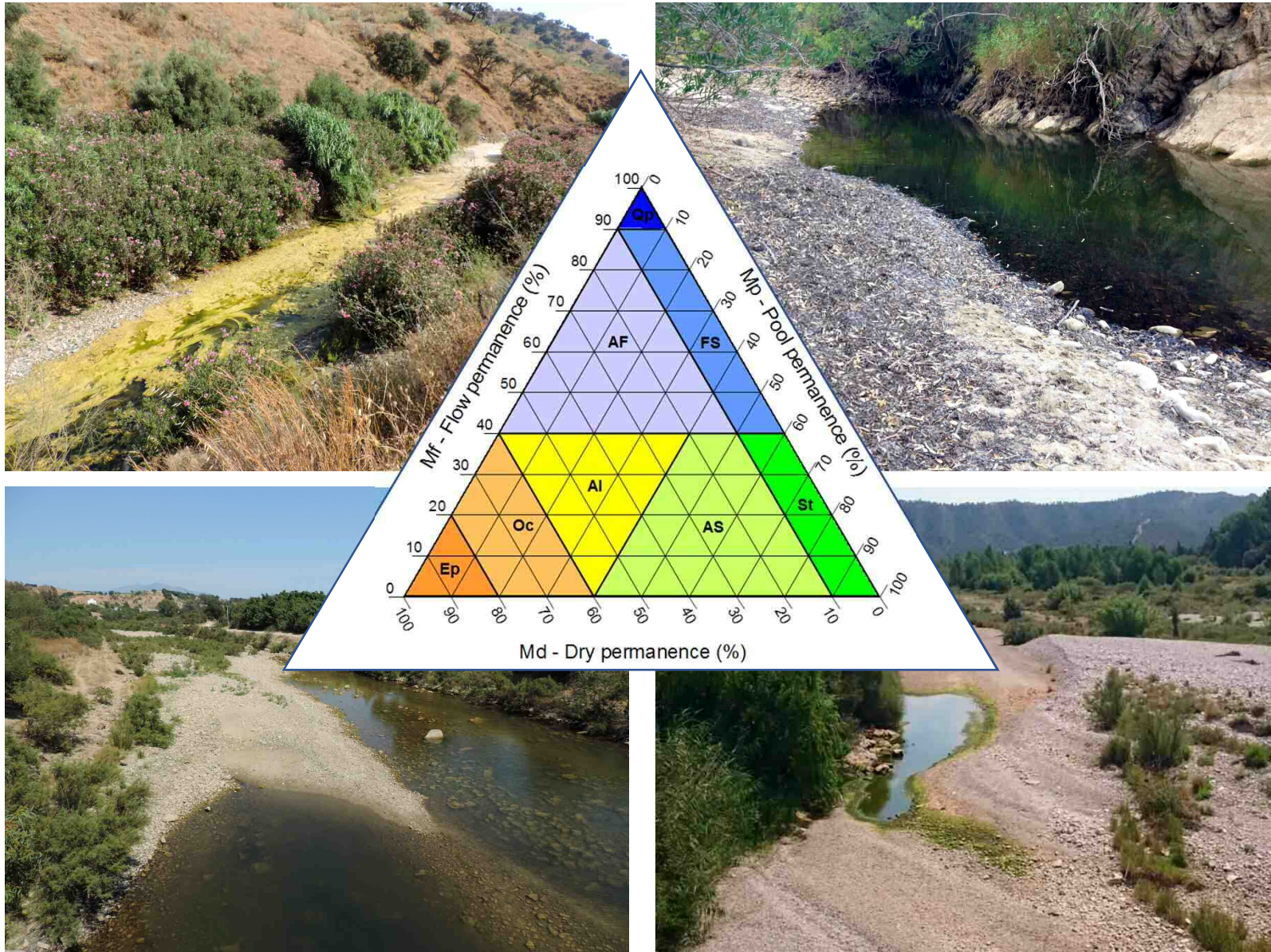
→ Hydromorphological indexes

Objective

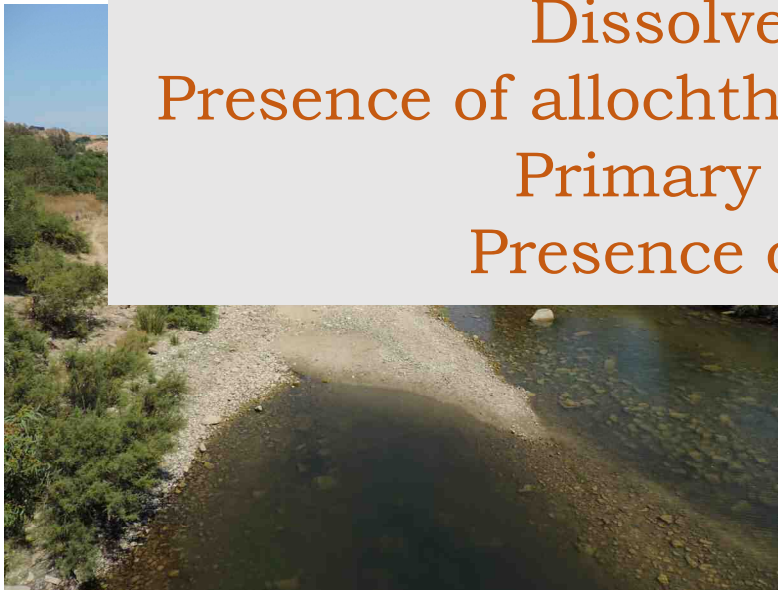
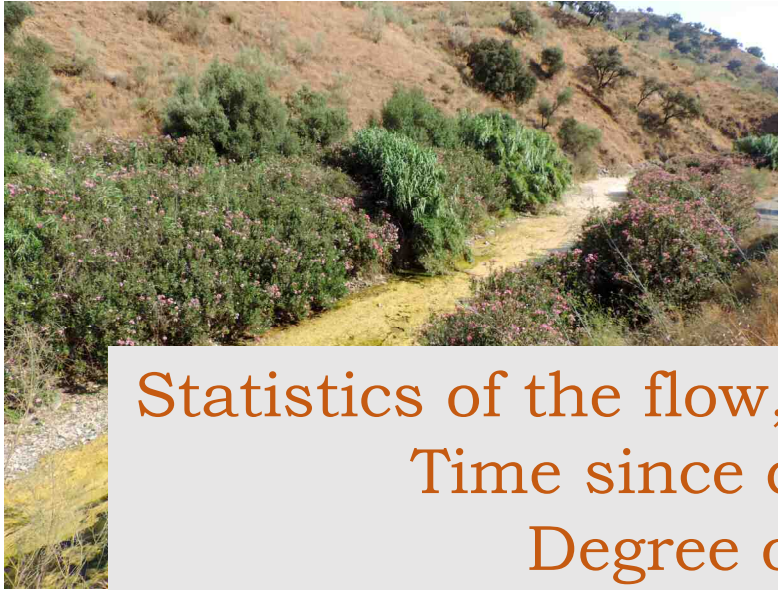
Developing an operational procedure for assessing the ecological status of rivers with substantial pools phase



- Hydrological Characterisation



- Hydrological Characterisation

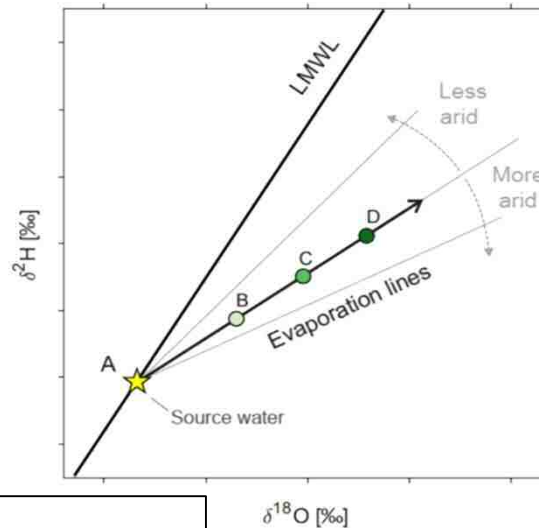
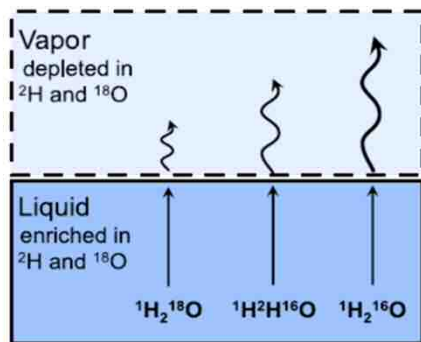


Statistics of the flow, pools and dry phases
Time since disconnection
Degree of isolation
Dissolved Oxygen
Presence of allochthonous organic matter
Primary producers
Presence of predators

- Hydrological Characterisation

OBJECTIVE

Developing a model to estimate pool disconnection duration at the time of sampling, using water isotopy examination.

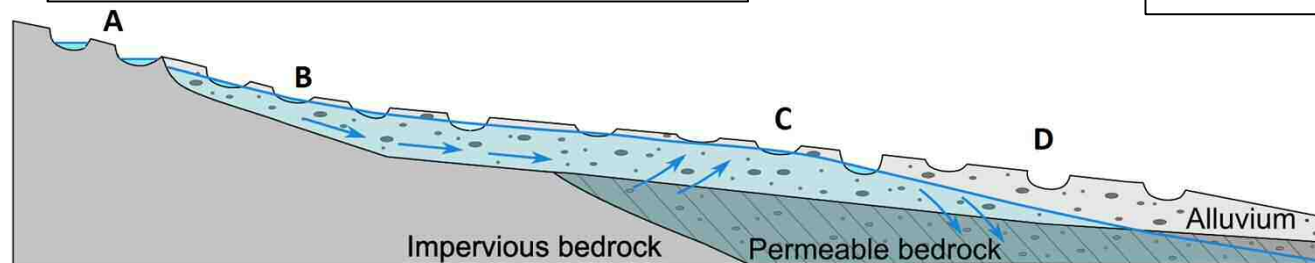


Reproduced from
Benettin et al. (2018), HESS, 22, 2881-2890

Evaluation of relative water volume evaporated using the separation from the LMWL.

Pools hydrological types:

- A. Perched pools
- B. Through-flow pools
- C. Influent groundwater pools
- D. Effluent groundwater pools



Hamilton et al. (2005) L&O 50(3): 743-754
Skrzypek et al. (2015) JH, 523: 781-789
Bourke et al. (2020), HESSd, 2020-133

- Hydrological Characterisation

OBJECTIVE

Developing a model to estimate pool disconnection duration at the time of sampling, using water isotopy examination.

DEVELOPMENT

Vallcebre: sub-humid



VALIDATION & APPLICATION

Talamanca & Daró: Mediterranean



Chapin et al. (2014) WRR

70TR (50 reference & 20 impacted)

Disconnection time (model \leftrightarrow HOBO temperature & e. conductivity)
Auxiliary environmental data

- Biological Characterisation

OBJECTIVE

Establishing a methodology for sampling and processing biological specimens from disconnected samples to obtain representative exhaustive lists of aquatic species and determining community composition

METABARCODING → eDNA

1. Sampling and processing of the specimens
 - e DNA
 - Bulk sample
2. DNA extraction and *cox1* amplification
3. Sequencing and Bioinformatics

Non-invasive sampling

Species level

More precise metrics

Development of general protocols

Bonada et al. (2006) JNABS,25: 32-43
Hill & Milner (2018) STOTEN 628-629: 1308-1316
Stubbington et al. (2017) WIREs Water, e 1223

- Biological Characterisation

OBJECTIVE

Establishing a methodology for sampling and processing biological specimens from disconnected samples to obtain representative exhaustive lists of aquatic species and determining community composition



70TR (50 reference & 20 impacted)

Biological samples



- Predictive model

OBJECTIVE

Developing a model to evaluate the biological quality of the disconnected pools

70TR (50 reference & 20 impacted)

- ✓ Time since flow disconnection
- ✓ Auxiliary environmental data
- ✓ List of species

Intercalibrated metrics (IPS, IBMR, IBMWP, IMMi-T, IBICAT2010)
New metrics (TAXONOMIC, FUNCTIONAL, species-level)



- Ecological status assessment

OBJECTIVE

Developing an integrated procedure for assessing the ecological status of water bodies corresponding to temporary rivers with disconnected pools, by combining hydromorphological and biological indicators.



HYDROMORPHOLOGICAL QUALITY

- TREHS hydrologic alteration
- Adjusted QBR & ECELS
- Morphological alteration (QBR)

BIOLOGICAL QUALITY

- Biological model results
- Alternative to “one-out-all-out”

GENERAL PHYSICO-CHEMISTRY

- Evaluating elements to be pondered

Thank you for your attention



Acknowledgement: this research is part of the Trivers-P project, ACA21 0/18/00022, funded by The Catalan Water Agency, Generalitat de Catalunya

