

Aquatic Casiers Girardon's ecological functioning

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Post doc position – 1 year - 2015-2016

Objectives:

Inventory, evaluate and prioritize gains and risks related to Casiers Girardon restoration

Synthesize knowledges about Casiers Girardon from already carried out multidisciplinary studies

Promote a contradictory debate

Built a decision support conceptual model



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Regional Environmental Change
<https://doi.org/10.1007/s10113-018-1325-7>

ORIGINAL ARTICLE



Socio-environmental implications of process-based restoration strategies in large rivers: should we remove novel ecosystems along the Rhône (France)?

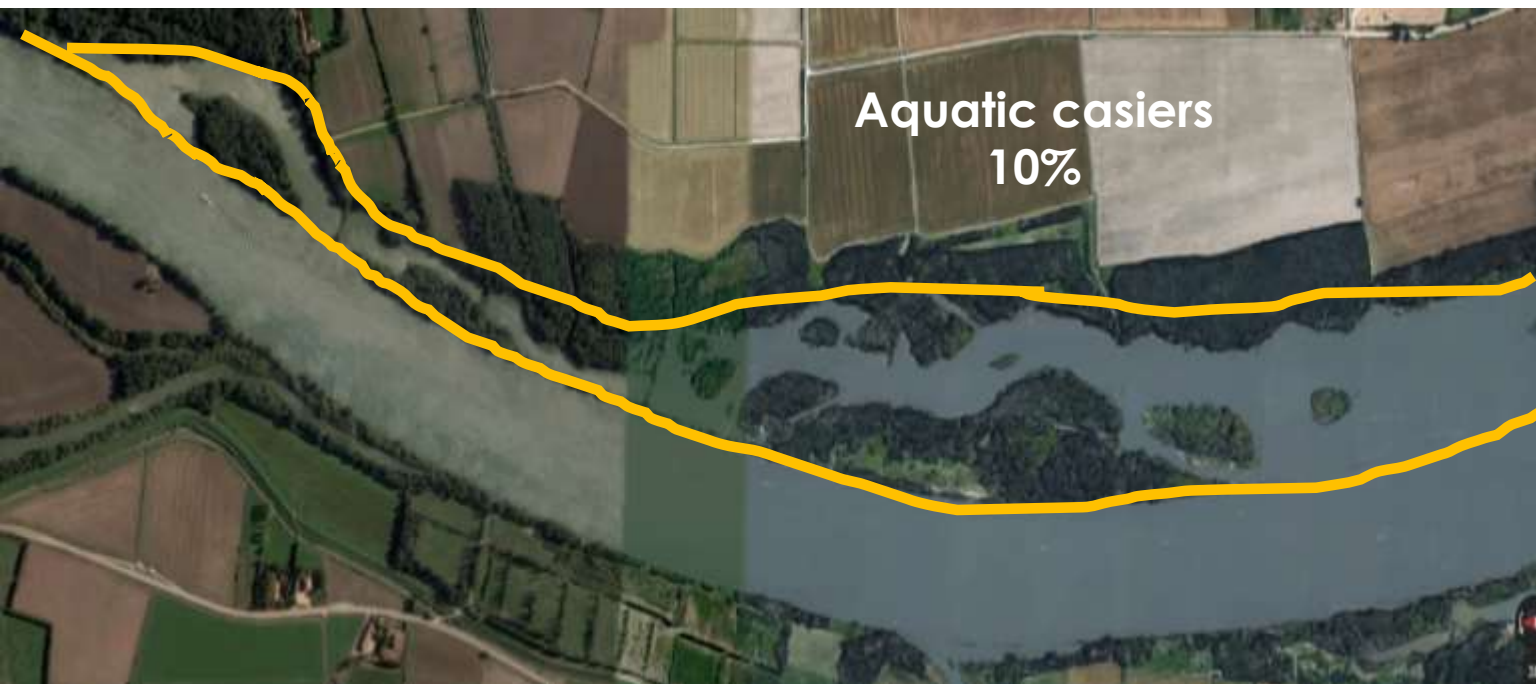
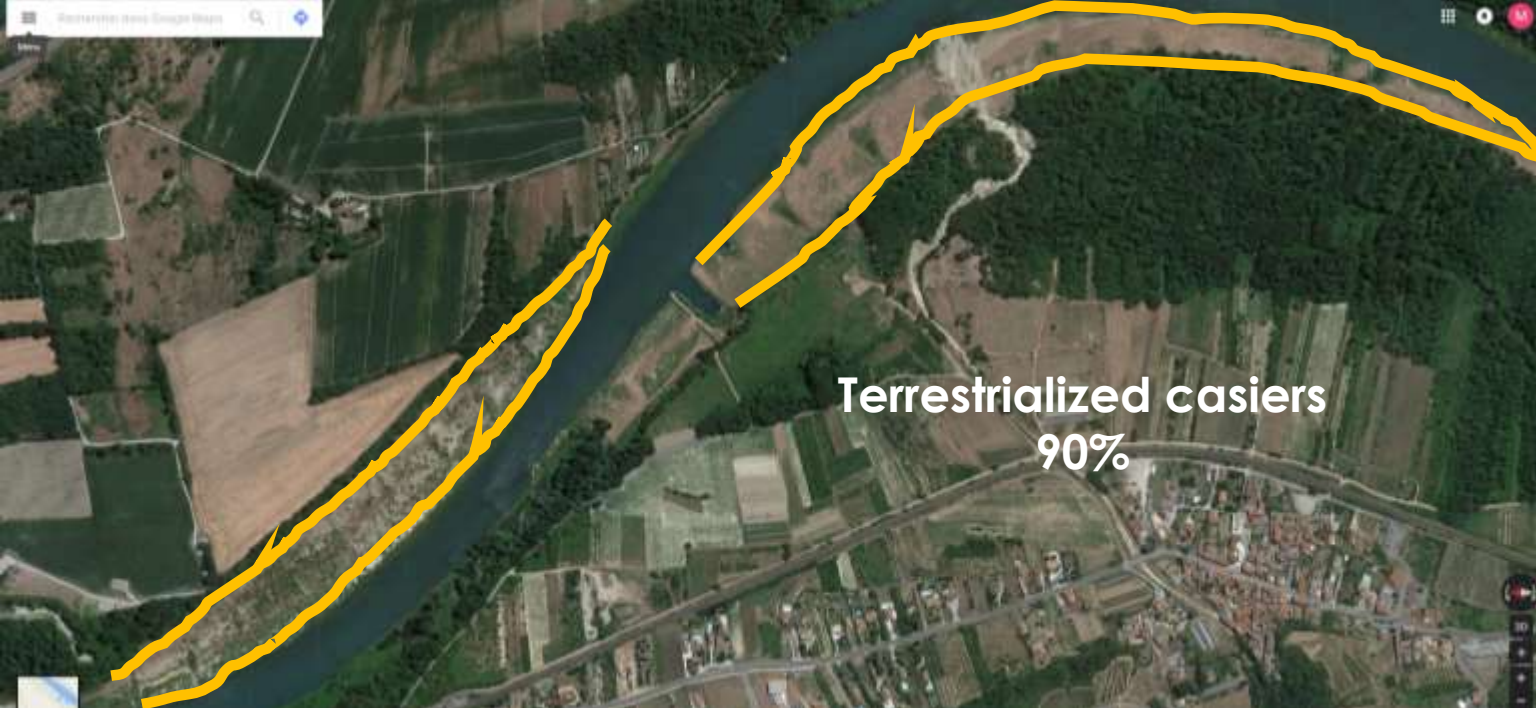
Maxine Thorel¹ • Herve Piégay² • Carole Barthelemy³ • Bianca Räßple² • Charles-Robin Gruel² • Pierre Marmonier⁴ • Thierry Winiarski⁵ • Jean-Philippe Bedell⁵ • Fanny Arnaud² • Gwenaelle Roux⁶ • Jonh C Stella⁷ • Gabrielle Seignemartin² • Alvaro Tena-Pagan² • Vincent Wawrzyniak^{2,8} • Dad Roux-Michollet⁹ • Benjamin Oursel¹⁰ • Stéphanie Fayolle¹⁰ • Céline Bertrand¹⁰ • Evelyne Franquet¹



Aix-Marseille université

ZABR





2 types of Casiers

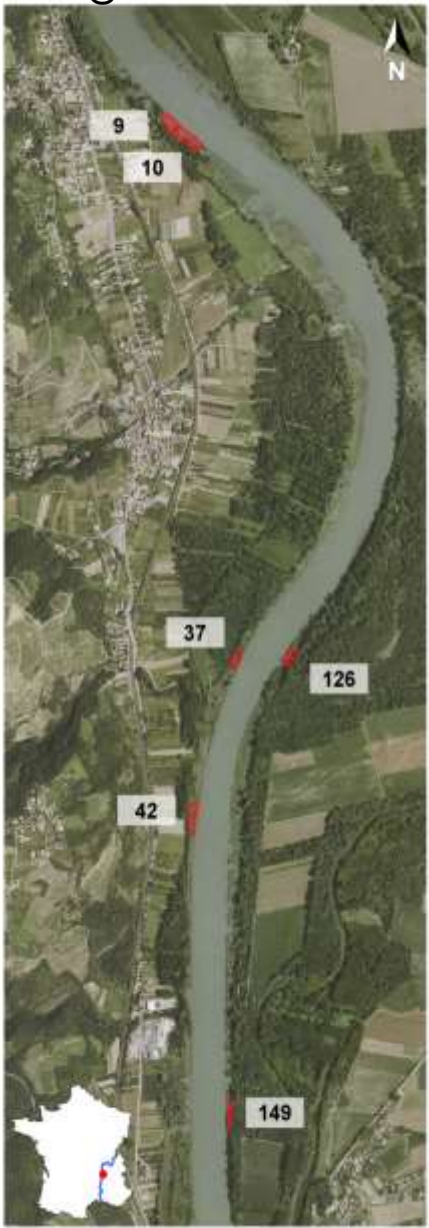
→ Terrestrialized ~ 90 %

→ Aquatic (still in water) ~ 10 %

Questions of management of these 2 types were answered in the multidisciplinary article relying on results of geomorphology, sediments pollution, diversity, sociology

Our part of work was interested in biology and ecological functioning of aquatic Casiers

Péage de Roussillon



Source : IGN

■ Délimitation des casiers Girardon échantonnés

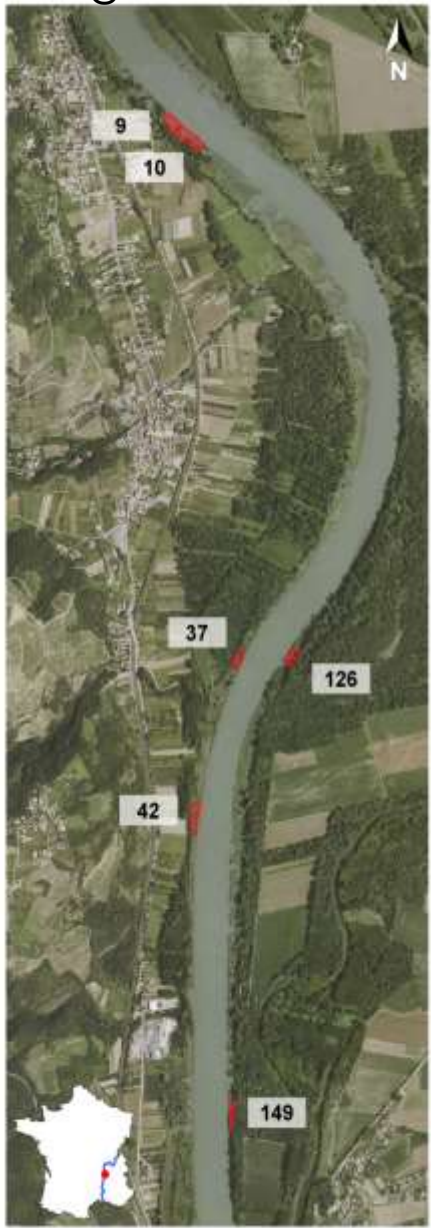
Arles



0 500 1000 m



Péage de Roussillon



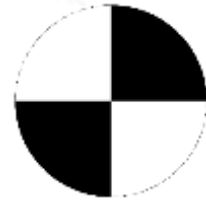
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Arles

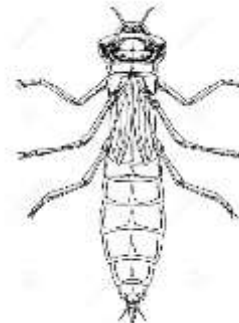
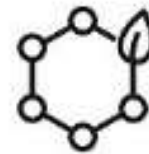


0 500 1000 m

 Délimitation des casiers Girardon échantillonnés



6 Ft



Studied parameters

Geomorphology
Connectivity/Submersion

Physical parameters
Transparency, Depth, Substrate

Physico-chemical parameters
T°C, Conductivity, Dissolved oxygen, Anions/Cations

Particulate elements
Microbial activity in sediment
Organic Matter

Phytoplankton & Benthos
Richness, Density, Community
functional structure

**Fonctionnement écologique des casiers Girardon :
Le cas des casiers aquatiques**

Rapport final

Action n° 41 du Programme 2010 au titre de l'accord cadre
Agence de l'Eau ZABR

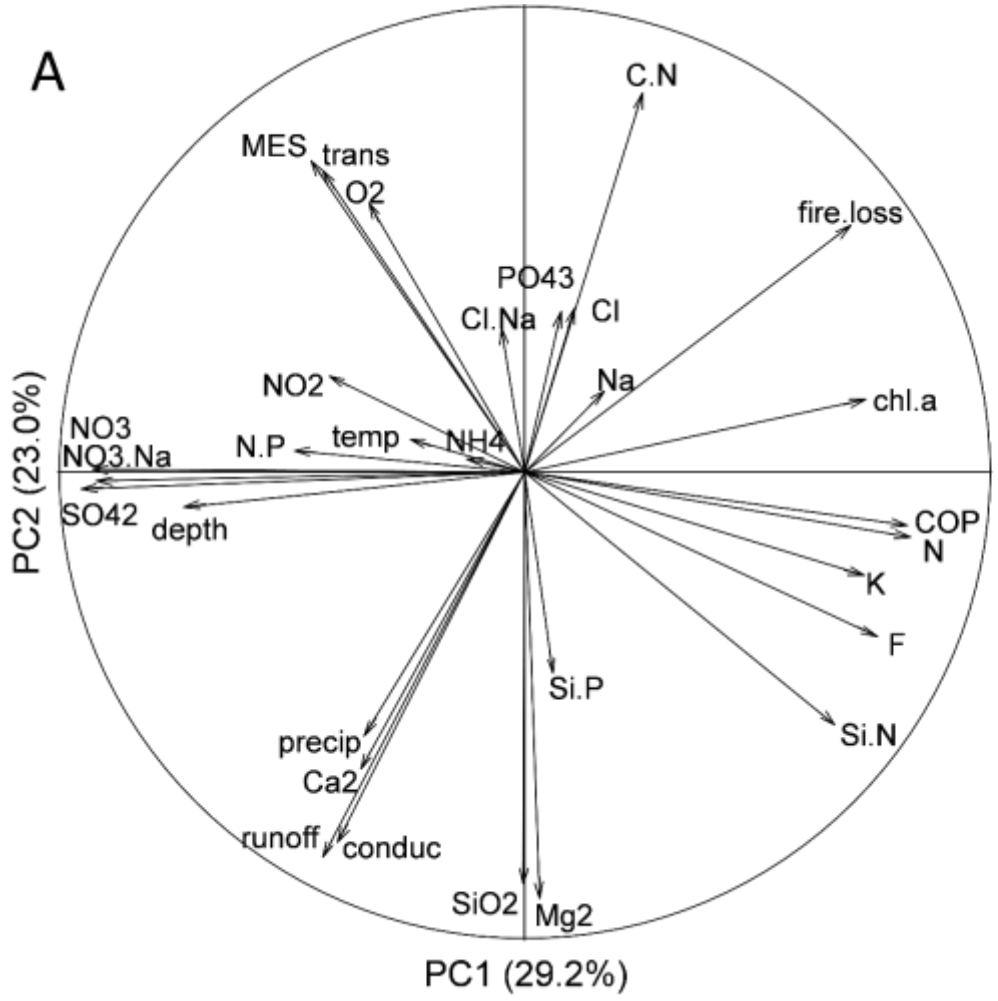
Evelyne FRANQUET et Pierre MARMONIER
En collaboration avec :

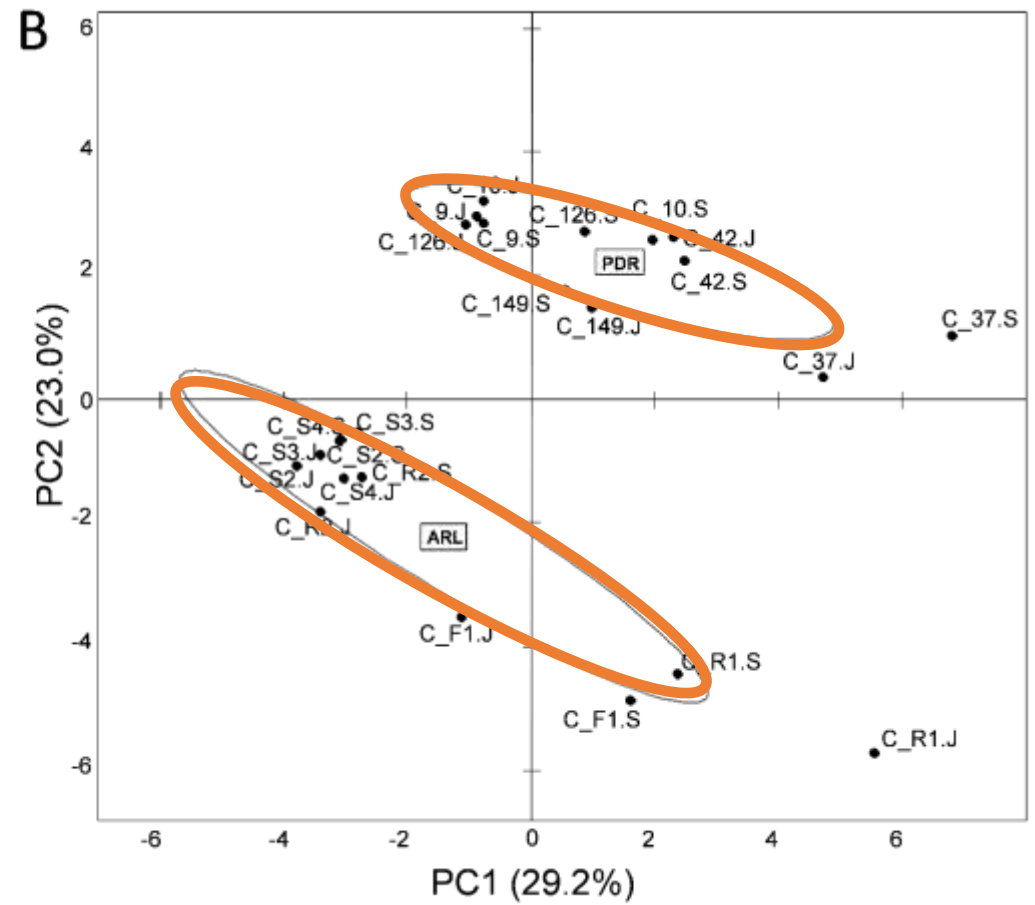
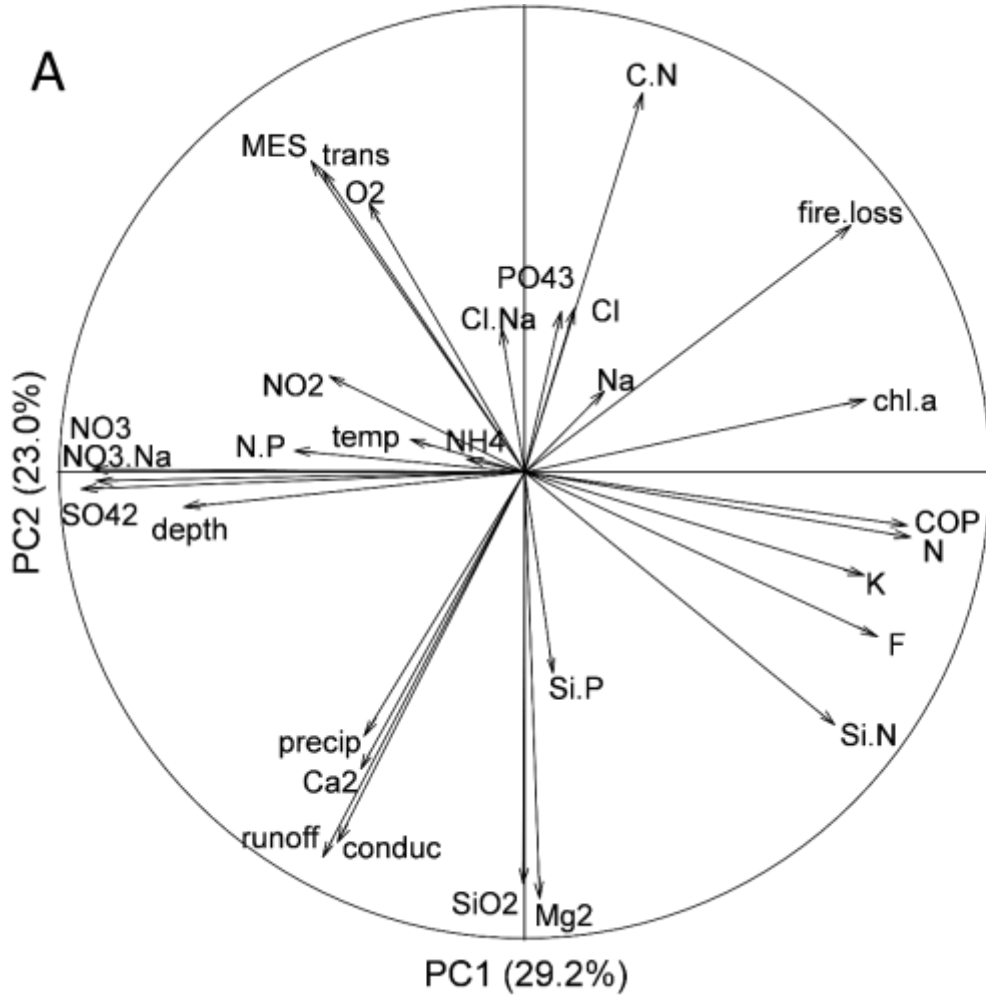
Céline BERTRAND, Cécile CLARET, Stéphanie FAYOLLE, Nicolas FLIPO,
Sophie GUILLON, Jules LEGERN, Maxime LOGEZ, Jean-Michel OLIVIER,
Benjamin OURSEL, Hervé PIEGAY, Lucile PRIOUR, Bianca RAPPLE, Michal
TAL, Maxime THOREL, Antonin VIENNEY.

Octobre 2016

Study of different parameters allowed to a better understanding of hydrologic, geomorphologic and ecologic functioning of aquatic casiers

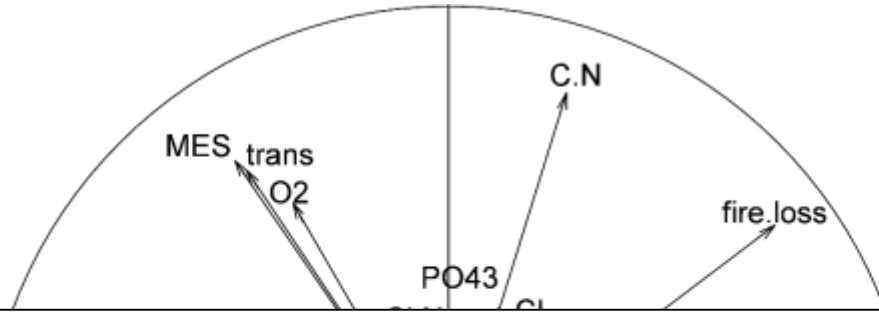
A



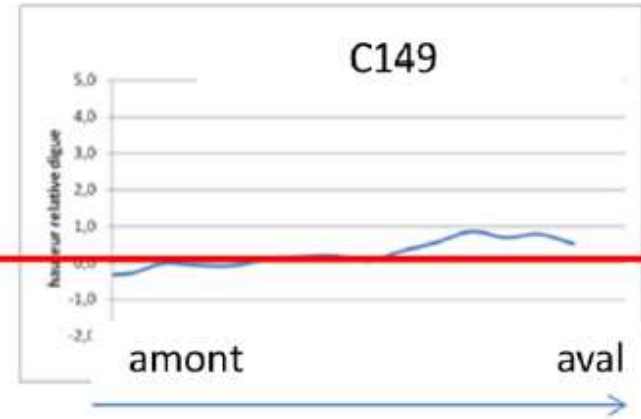
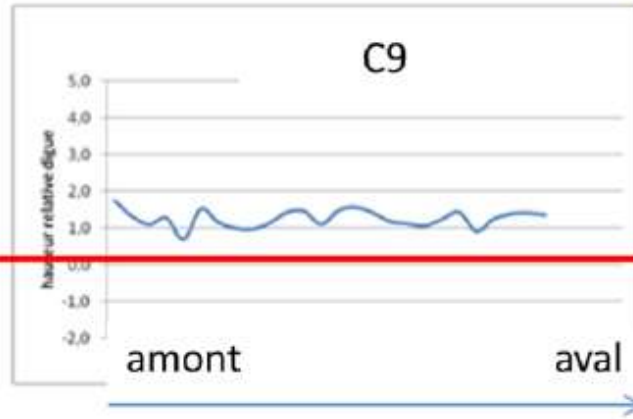
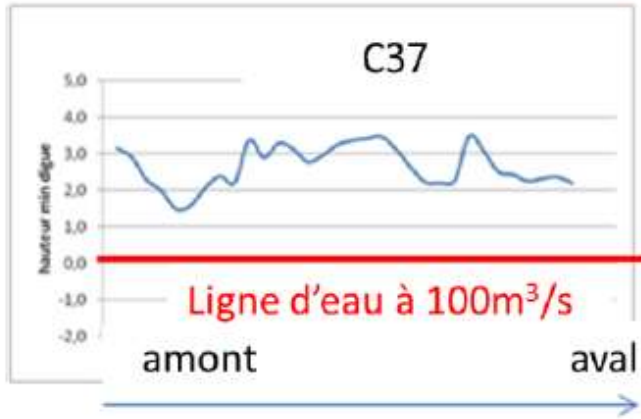
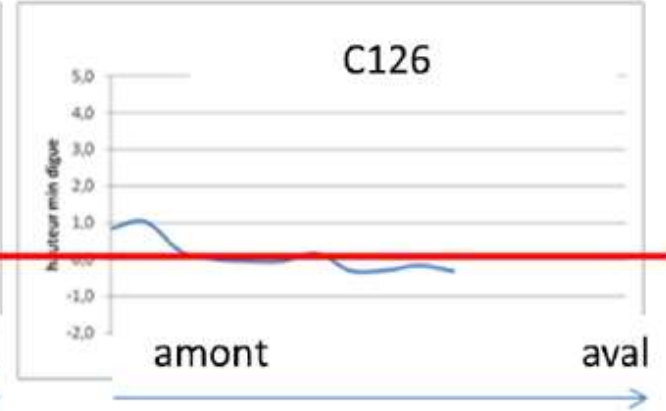
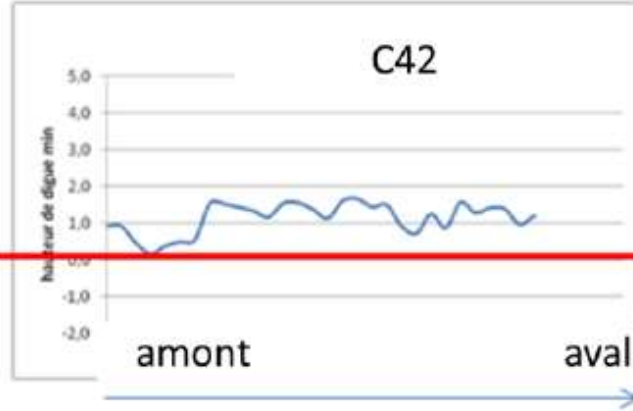
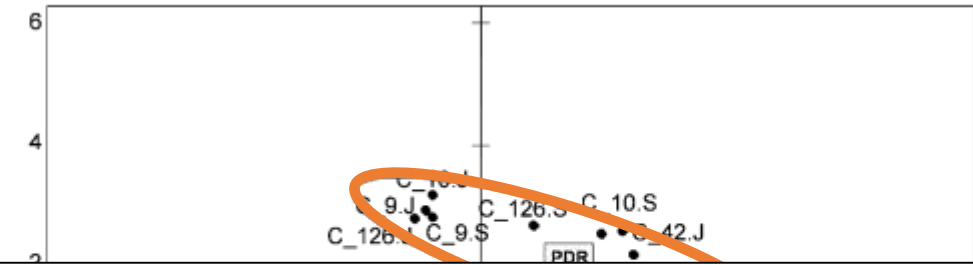


« Sector » and « casier » effects

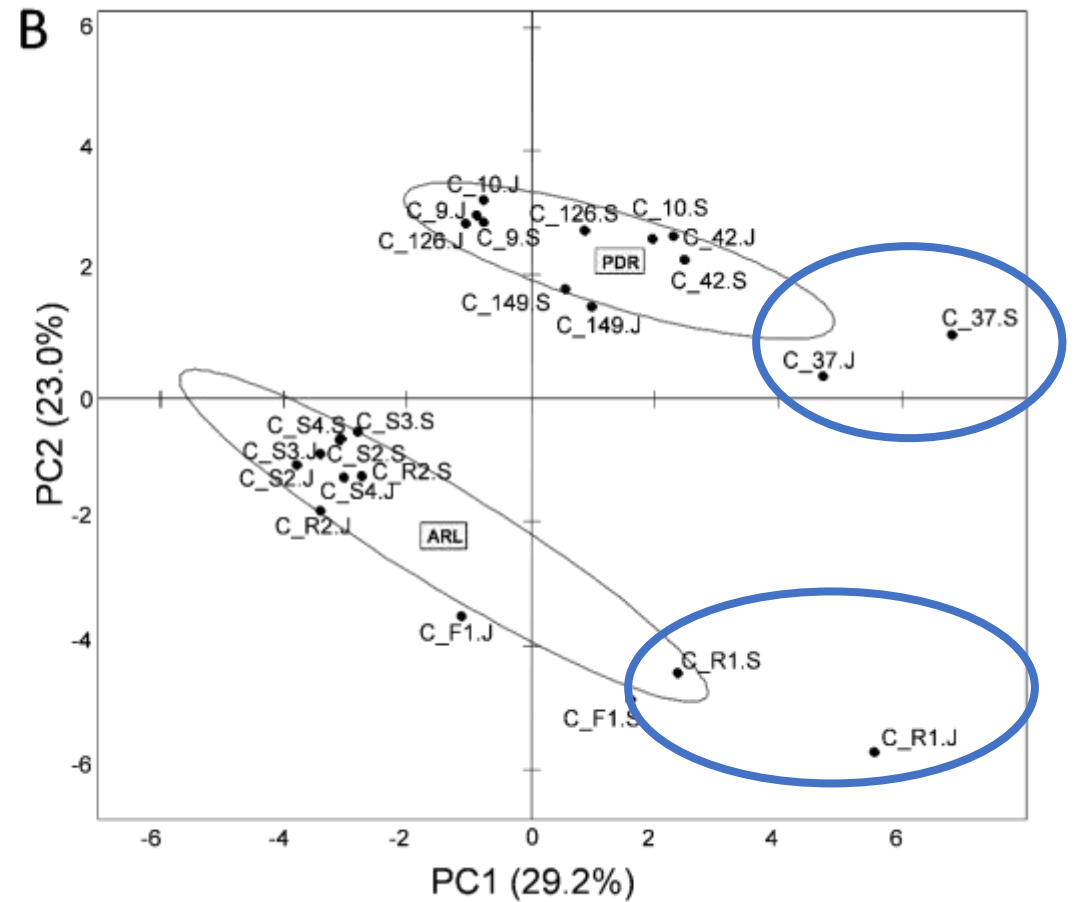
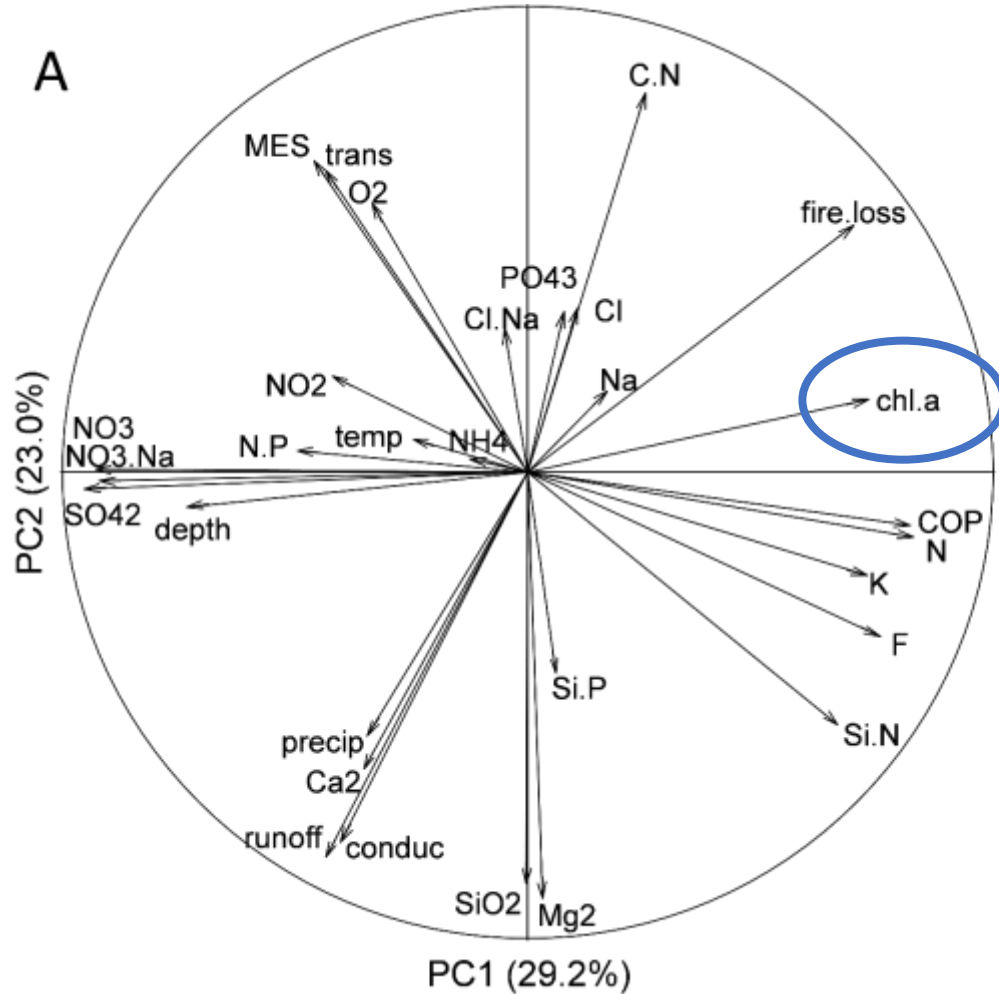
A



B

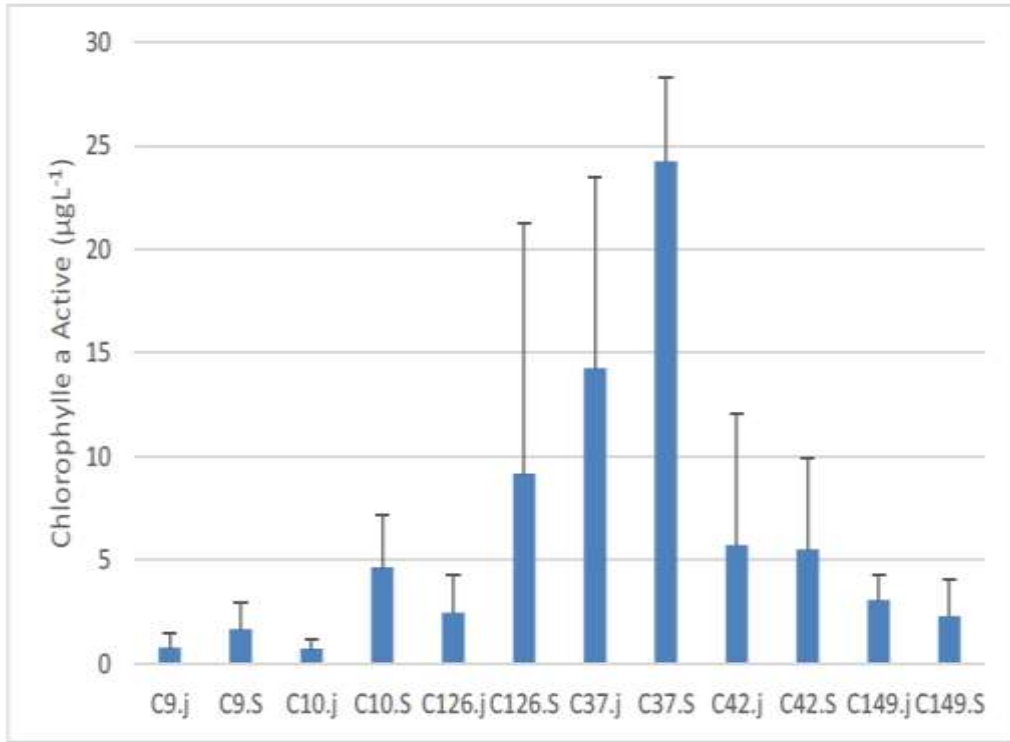
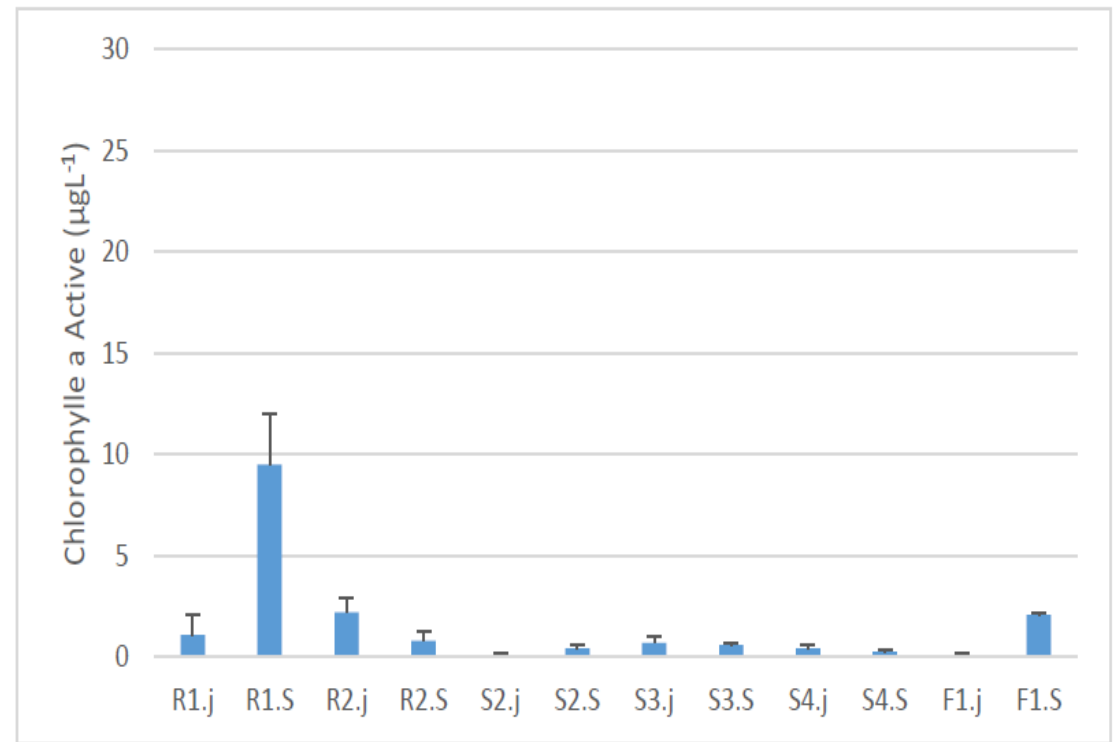
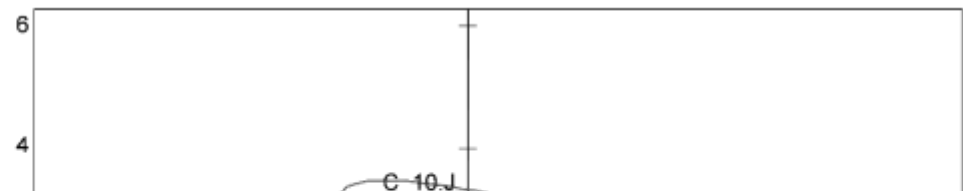


« Sector »



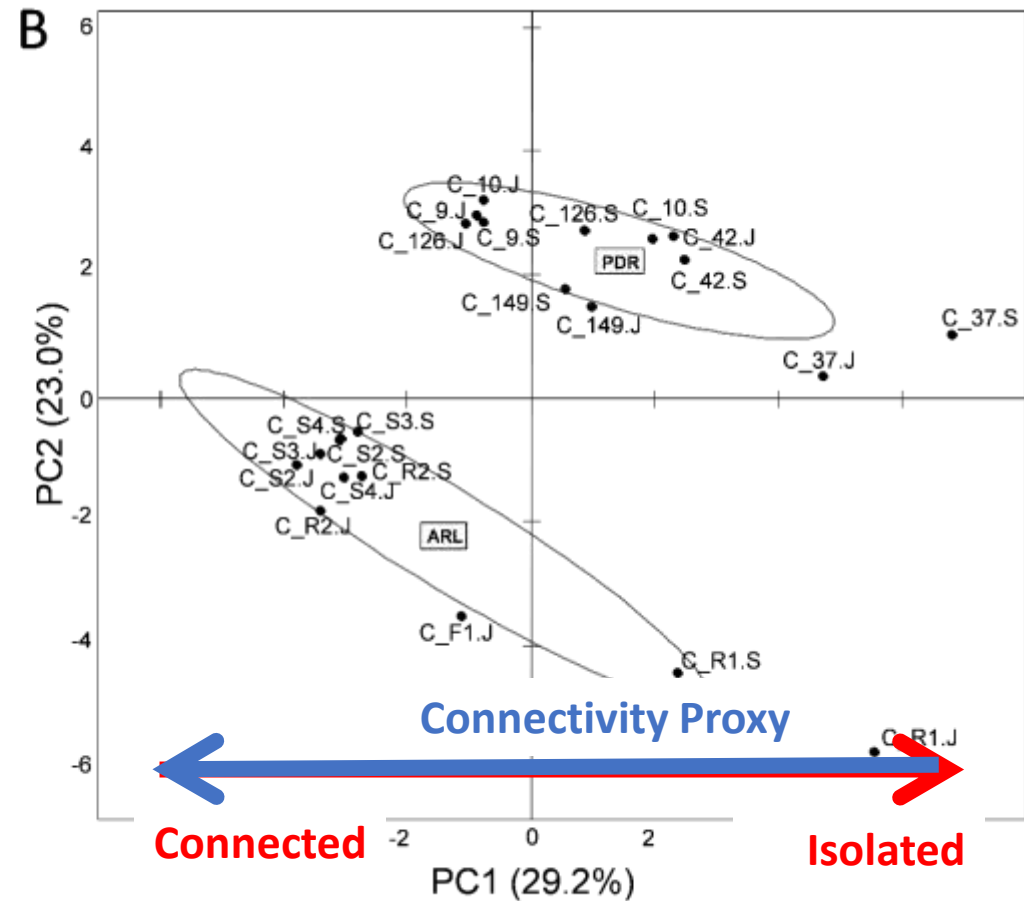
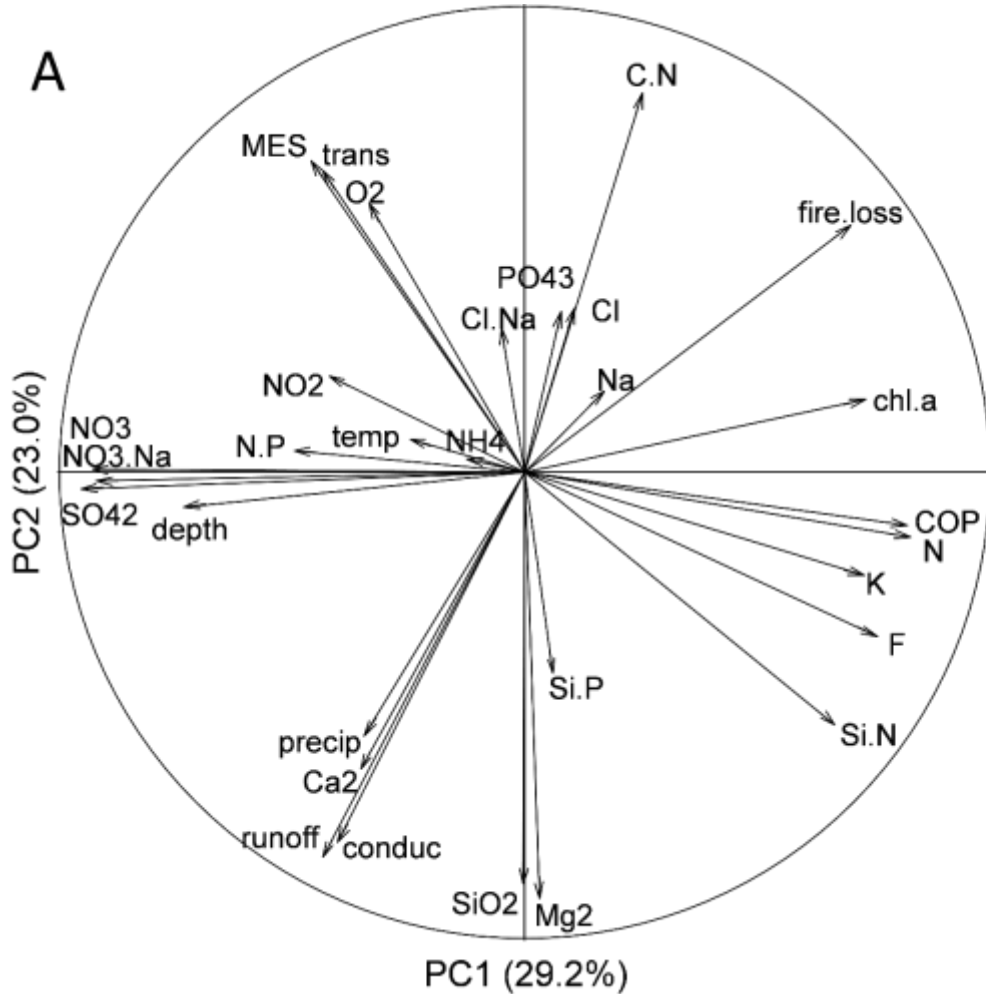
« Sector » and « casier » effects

C_37 and C_R1 = Casiers presenting a structure causing an isolation to the Rhône channel in both study sites, highly linked with high chl a concentrations

A**B**

« Sector » and « casier » effects

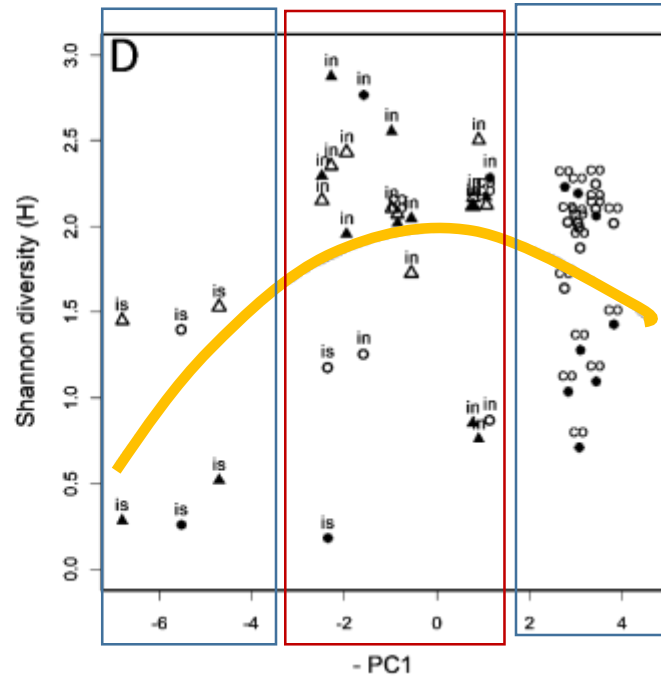
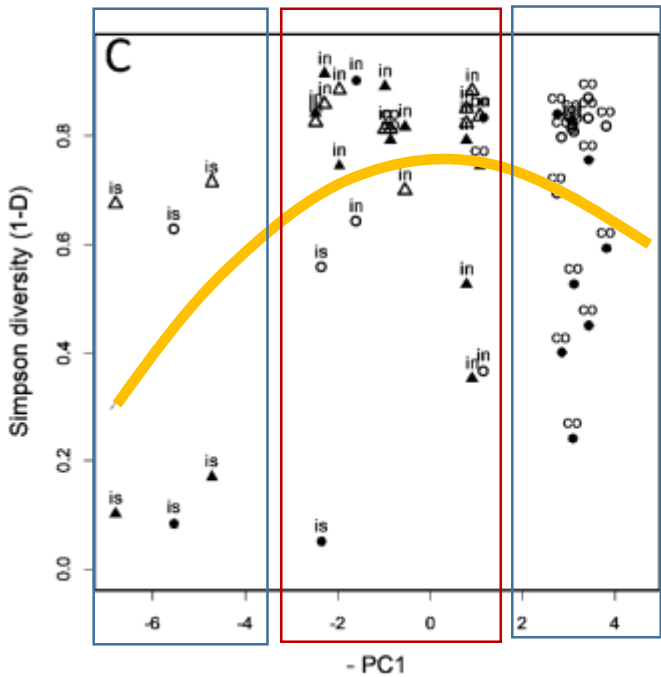
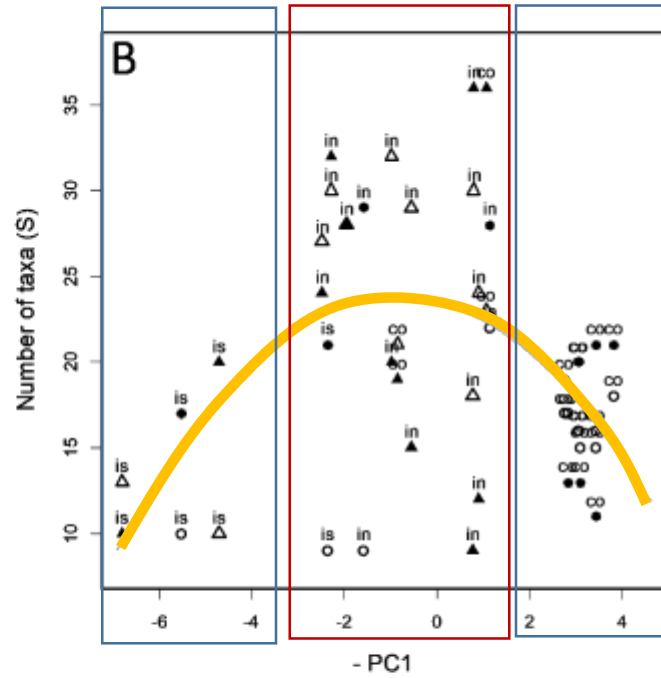
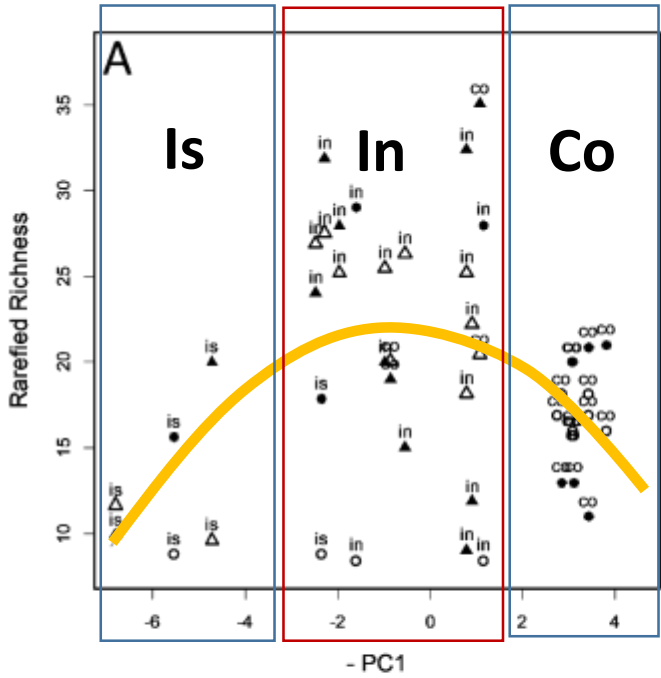
C_37 and C_R1 = Casiers presenting a structure causing an isolation to the Rhône channel in both study sites, highly linked with high chl a concentrations



« Sector » and « casier » effects

C_37 and C_R1 = Casiers presenting a structure causing an isolation to the Rhône channel in both study sites, highly linked with high chl a concentrations

Stations were ordered along the PC1 from the frequently connected stations (R2, S2, S3, S4 and 126) to the most isolated stations (R1 and 37) \leftrightarrow Increasing connectivity gradient = $-PC1$ = Proxy

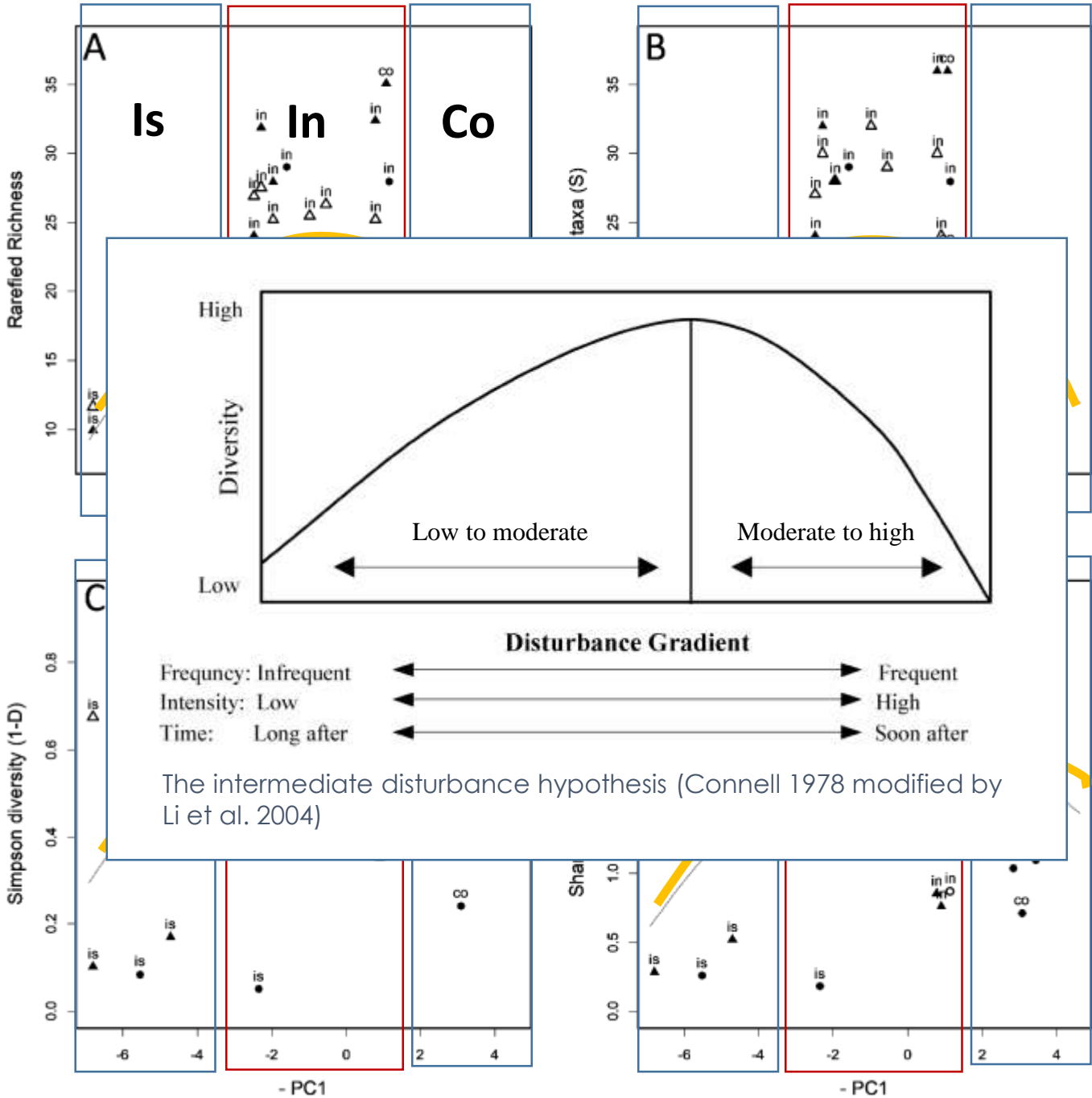


Study of biological diversity : Rarefied richness, Number of taxa, Simpson and Shannon index

Relation between diversity and connectivity → Significant quadratic relation

Isolated and connected casiers → Low biodiversity

Intermediary onnected casiers → higher values of diversity



Study of biological diversity : Rarefied richness, Number of taxa, Simpson and Shannon index

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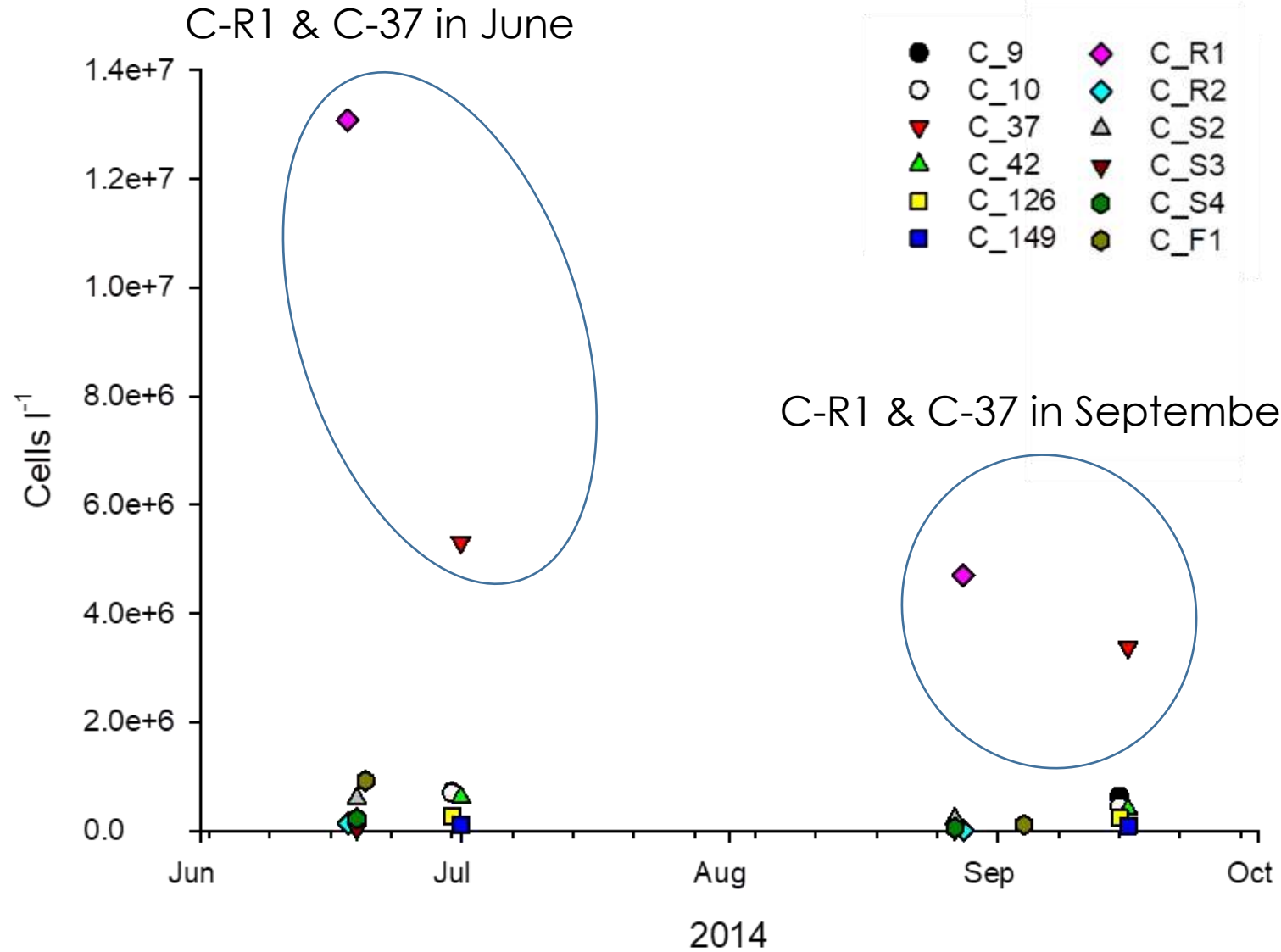
Isolated and connected casiers → Low biodiversity

Intermediary onnected casiers → higher values of diversity

Diversity is in agreement with Intermediate Disturbance Hypothesis (IDH) in aquatic Casiers

Diversity results translated 3 types of Casier's functioning depending on hydrological connectivity with the main channel of the Rhone River

Phytoplankton cell concentrations



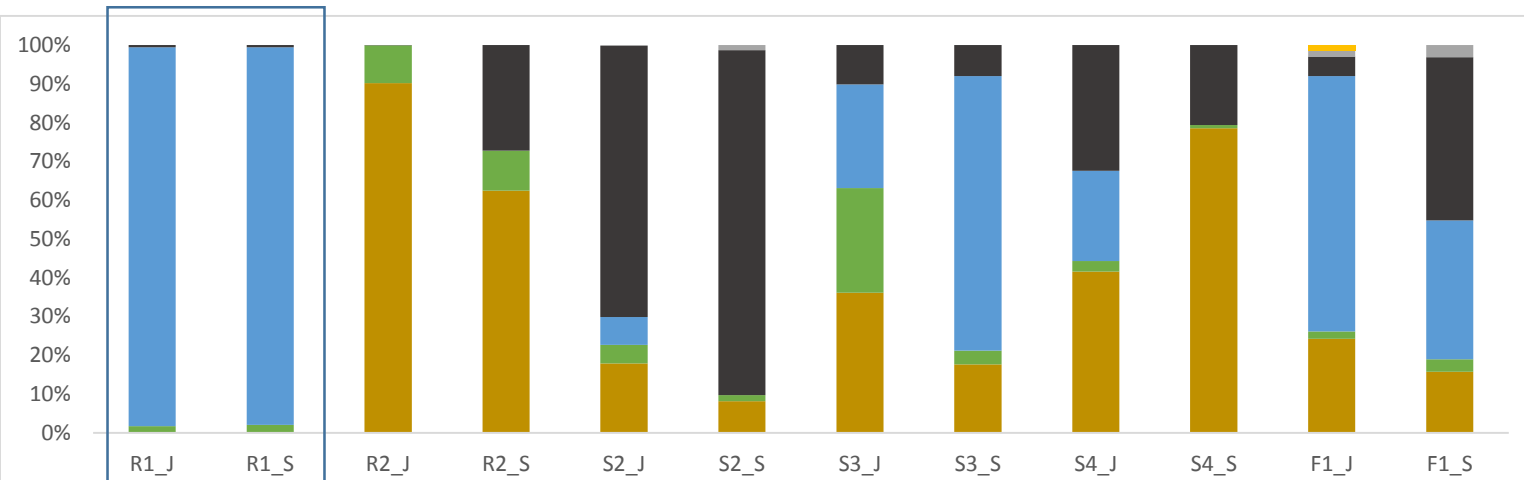
Abundances were rather low in aquatic casiers except for isolated casiers C-37 and C-R1

Concentrations appear higher in June than in September → Summer dynamics in aquatic systems

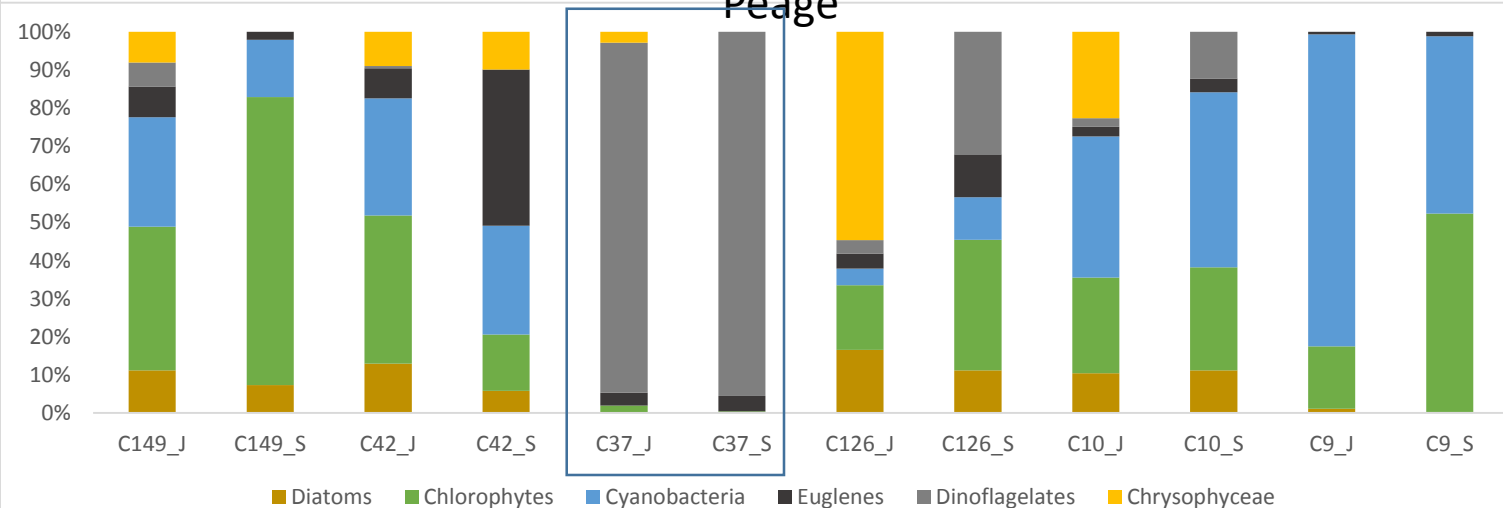
High concentrations explain high chl a concentrations

Hydraulic connectivity influences cell concentrations with high connectivity-low cell concentrations and low connectivity-high cell concentrations

Arles



Péage



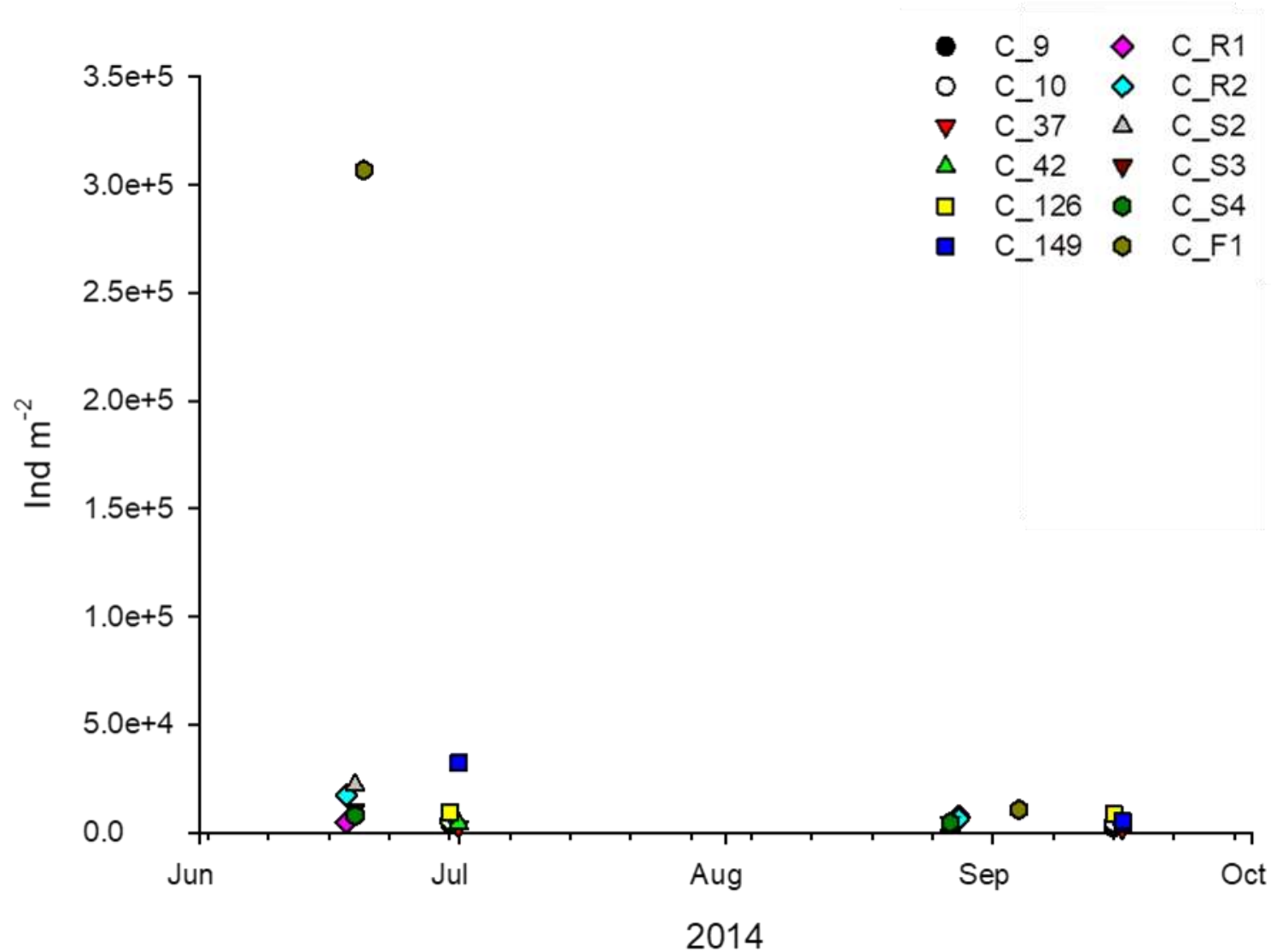
Cyanobacteria and Dinoflagellates were the principal groups

High heterogeneity between both sites and among casiers

Cyanobacteria were more present in Arles, especially in C-R1 (*Planktothrix agadhii* - PSP)

Dinoflagellates were more present in Péage, especially in C-37 (*Ceratium hirundinella*)

Zoobenthos densities



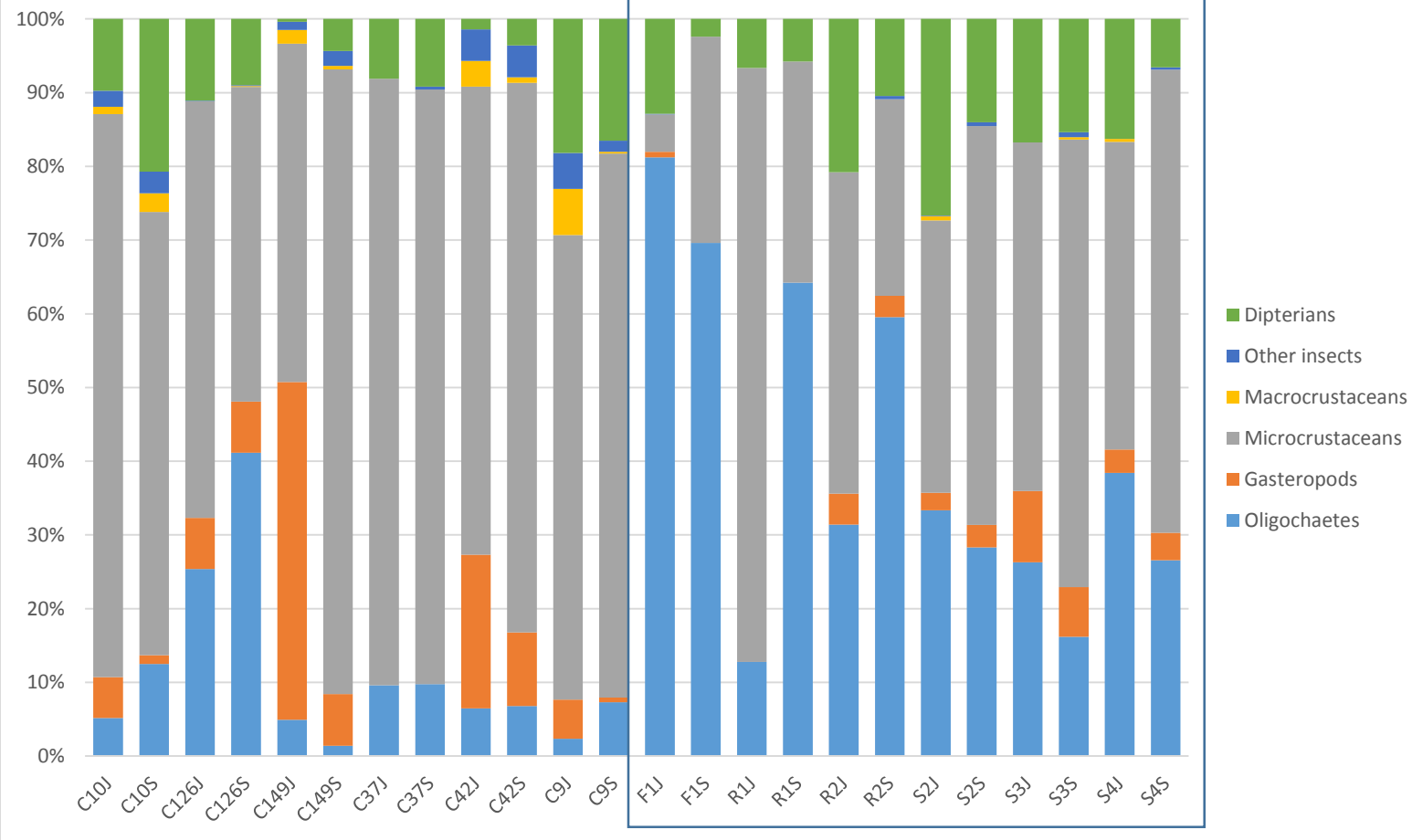
Maxima in C-149 and C-F1 but special conditions may have biased the sampling

The most populated casiers are connected in contrary to isolated casiers which are the least populated

Aquatic casiers can therefore be a significant source of prey for certain predators

Péage

Arles



Different assemblages between both sites and among casiers

Microcrustaceans dominated Péage

Oligochaetes dominated Arles, especially C-F1

Conclusions

- 3 Types of aquatic casiers linked to the connectivity following the IDH concept
- Casiers with intermediary connectivity present higher diversity of phytoplankton and zoobenthos and it appears that this type of connectivity is the most interesting
- However, this type of casiers does not integrate the full range of taxa that can contribute to the global diversity of an area
- Isolated casiers can presented interesting nutritive function linked to their high primary production. They can also contribute to assimilative of water like other wetlands
- Connected casiers can be interesting with the high abundances of zoobenthos as source of prey

To conclude, it seems relevant to preserve the large diversity of casiers still in water because they contribute to taxonomic and fonctionnal diversity of the river system

I'm looking for a job!



Maxine THOREL

30 years old

**PhD in Marine Biology – Ecology and Ecophysiology of
phytoplankton**

Post-doc in Hydrobiology

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