

Les macroinvertébrés en tant que témoins de l'érosion de la biodiversité des cours d'eau

Mise en place d'une synergie entre la Directive Cadre Eau et la Directive Habitat au Luxembourg

Alain Dohet



HABITAT AND BIRD DIRECTIVES:

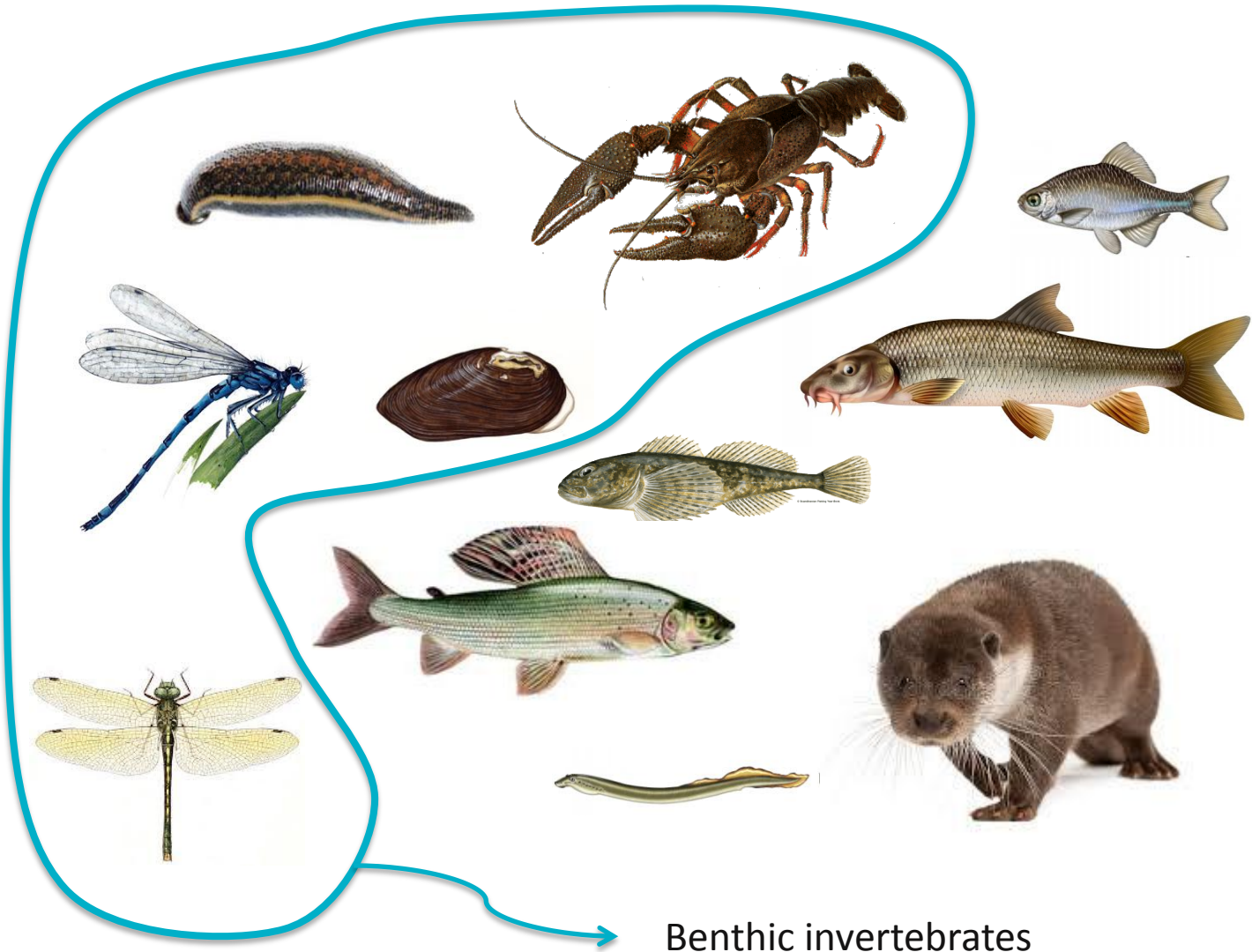
Flagship species: sociocultural considerations

Umbrella species: ecological criteria



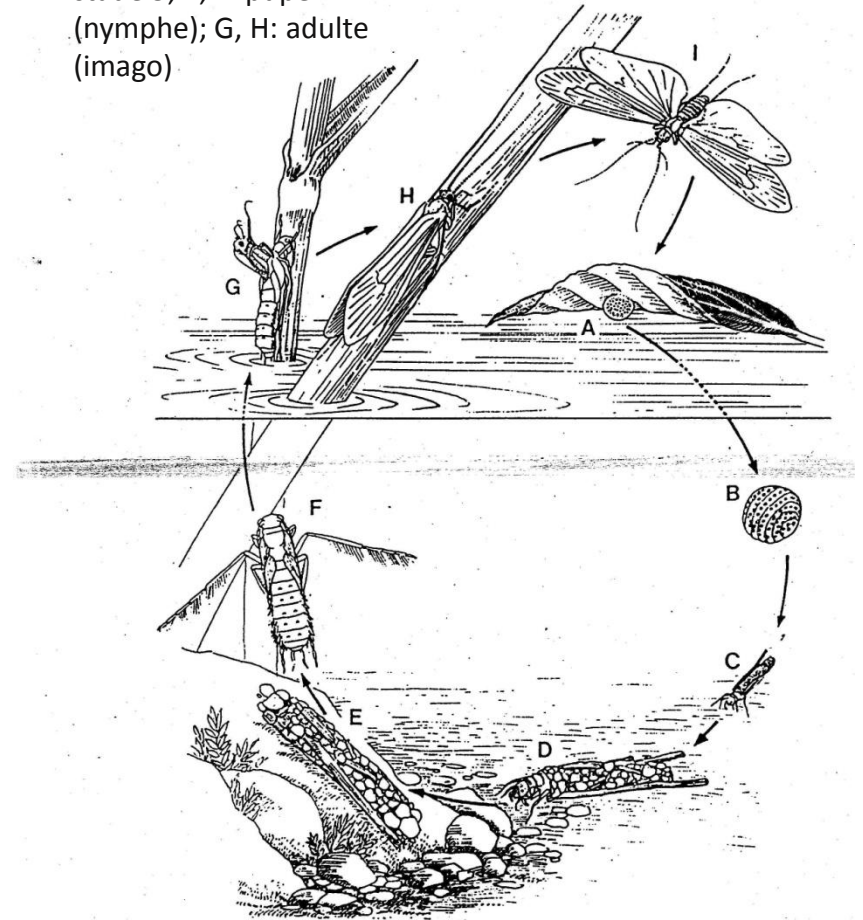
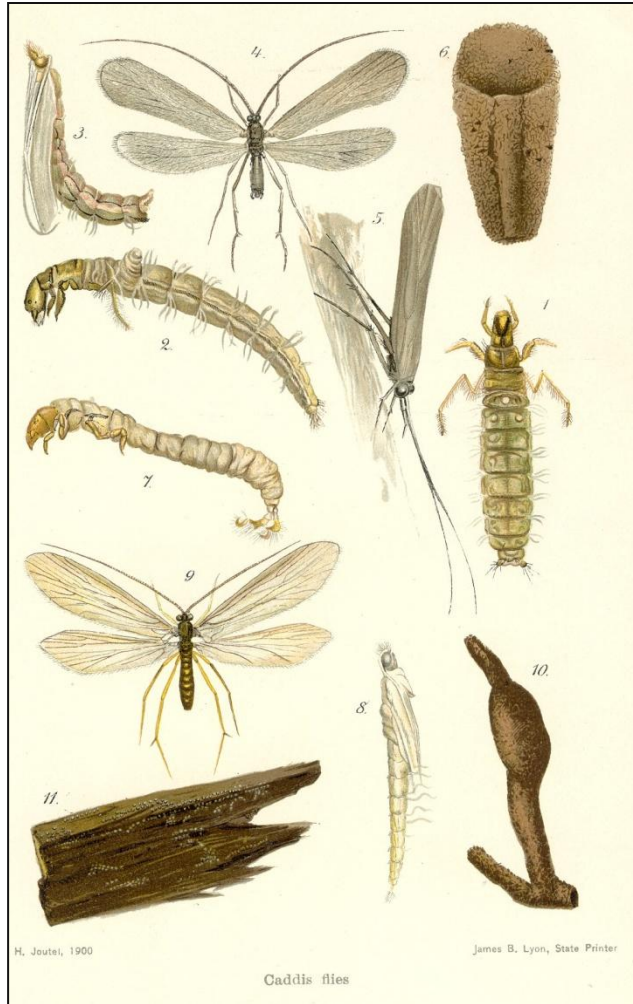
HABITAT AND BIRD DIRECTIVES:

Flagship (and/or umbrella) species inhabiting running waters



Among Macroinvertebrates : The caddisflies (Trichoptera)

Cycle vital: A, B: oeuf;
C: larve stade 1; D: larve
stade 5; E, F: pupe
(nymphé); G, H: adulte
(imago)



[From Betten, C. (1901). Order Trichoptera, caddisflies. Bulletin of the New York State Museum 47: 383-612, plates 1-36.]

Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

| | | |
|---|--------------|------------------|
| Proc. 10 th Int. Symp. Trichoptera - Nova Suppl. Ent., Keltern | | ISSN 0948 - 6038 |
| 15 (2002) | S. 507 - 520 | 31.01.2002 |

Are caddisflies an ideal group for the biological assessment of water quality in streams?

ALAIN DOHET

CRP - Gabriel LIPPMANN, CREBS (Research Unit in Environmental Science and Biotechnology), 162a,
avenue de la Faiencerie, L-1511 Luxembourg, Grand-duchy of Luxembourg

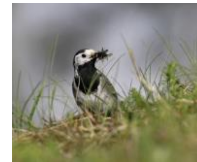
Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

11.000 species in the world (Morse 2001)

180 species in Luxembourg (Schrankel et al. 2008)

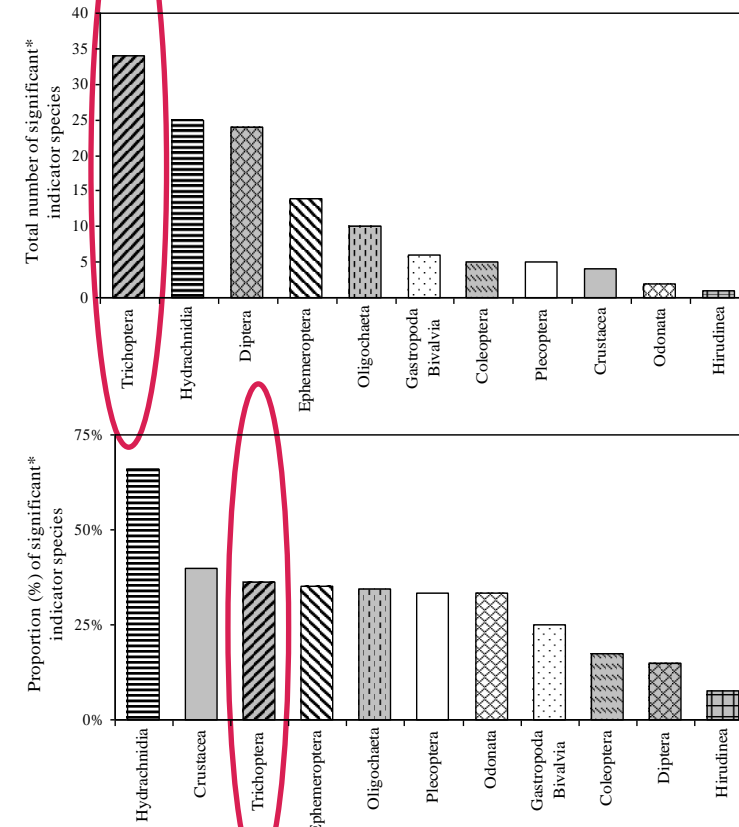
110 species of butterflies (Meyer 2000)

140 birding birds (centrale ornithologique)



Identification of benthic invertebrate and diatom indicator taxa that distinguish different stream types as well as degraded from reference conditions in Luxembourg

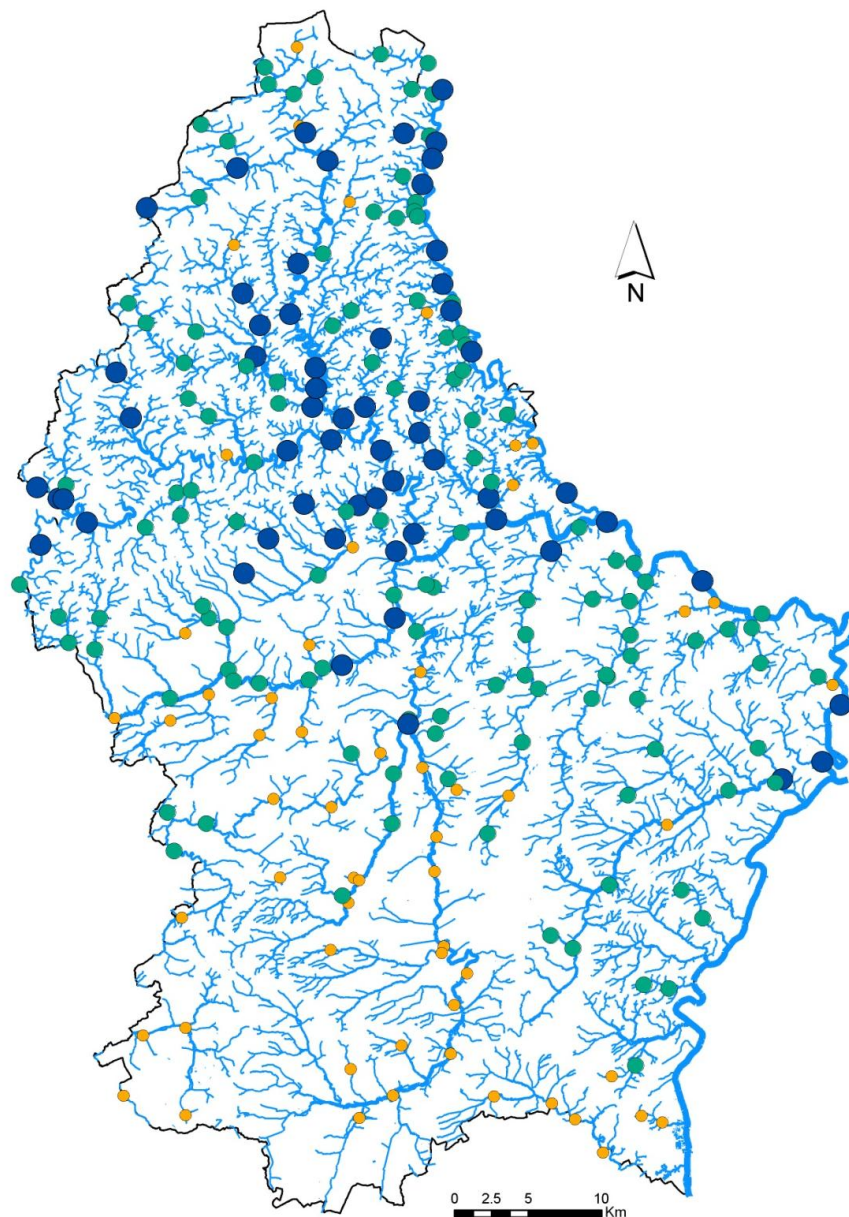
Alain Dohet*, Luc Ector, Henry-Michel Cauchie, and Lucien Hoffmann
Public Research Center-Gabriel Lippmann, Department Environment and
Agro-biotechnologies, 41 rue du Brill, L-4422 Belvaux, Luxembourg



* Dohet et al. Animal Biology, 2008

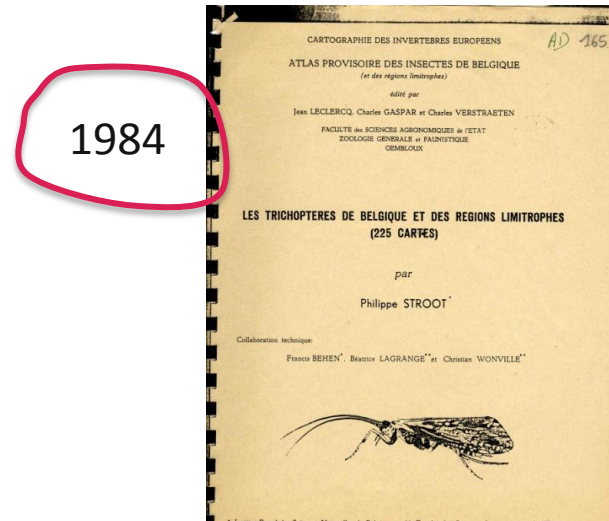
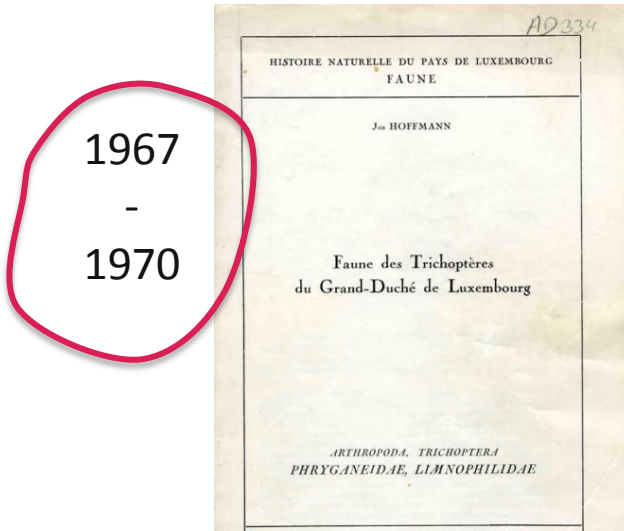
Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

Richness (Trichoptera taxa)

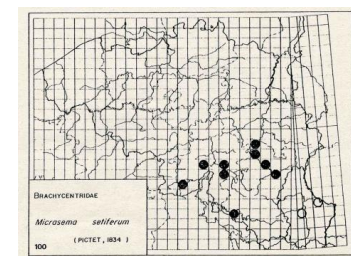
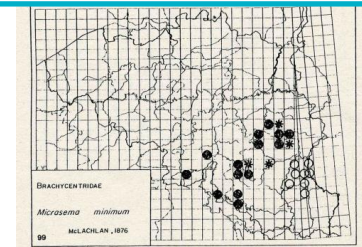
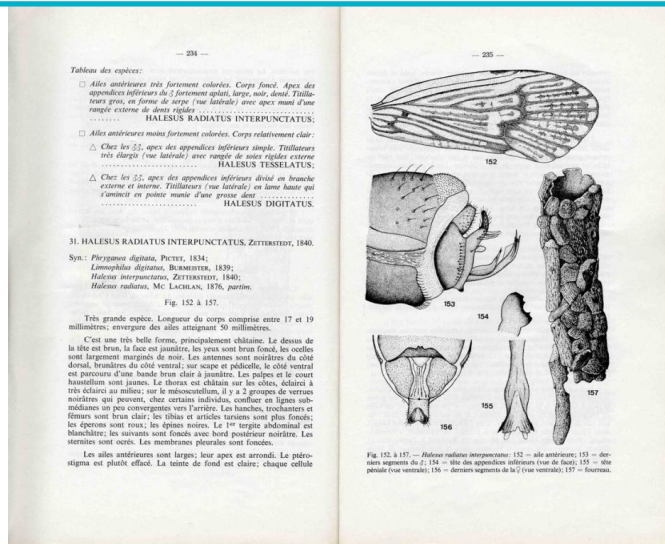


Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

Long series data



1994 → nowadays: different LIST (and former CRP-CU, CRP GL) ongoing projects where caddisflies are sampled and identified



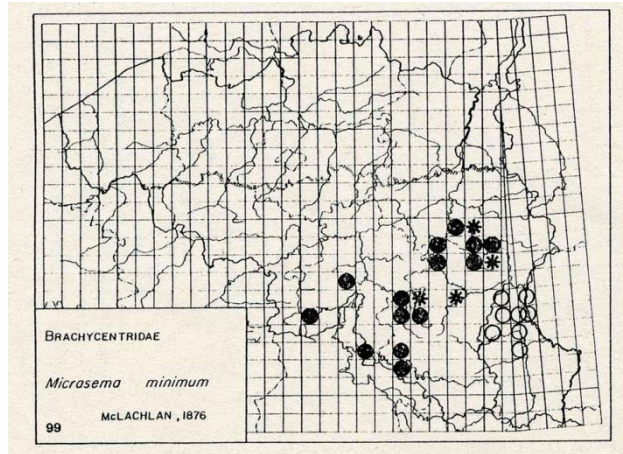
Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?



Stroot P. 1984



Hoffmann J. 1970



Sericostomatidae:

Goerinae:

- 41 *Goera pilosa*
- 42 *Silo pallipes*
- 43 *Silo piceus*
- 44 *Silo nigricornis*
- 45 *Lithax niger*

Lepidostomatinae:

- 46 *Crunoecia irrorata*
- 47 *Lasiocephala basalis*
- 48 *Lepidostoma hirtum*

Sericostomatinae:

- 49 *Notidobia ciliaris*
- 50 *Sericostoma flavicorne*
- 51 *Sericostoma personatum*

Brachycentrinae:

- 52 *Brachycentrus subnubilus*
- 53 *Oligoplectrum maculatum*
- 54 *Micrasema longulum*
- 55 *Micrasema minimum*
- 56 *Micrasema nigrum*

AEQUIPALPIA:

Molannidae:

Molanninae:

- 57 *Molanna angusta*

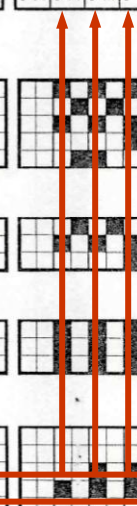
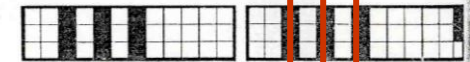
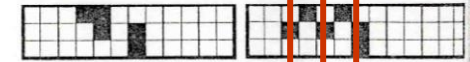
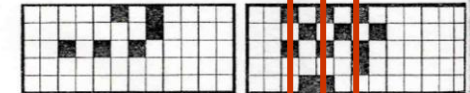
Beraeinae:

- 58 *Beraea pullata*
- 59 *Beraeodes minutus*
- 60 *Ernodes articularis*

Odontoceridae:

- 61 *Odontocerum albicorne*

| GUTLAND | | | | | | OESLING | | | | | |
|--------------|-----------------|--------------|--------------|--------------|--------------|--------------|-----------------|--------------|--------------|--------------|--------------|
| Sources | Filets initiaux | Ruisselets | Ruisseaux | Mares | Etangs | Sources | Filets initiaux | Ruisselets | Ruisseaux | Mares | Etangs |
| Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti | Très réparti |
| Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé | Localisé |



Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

30 years ago

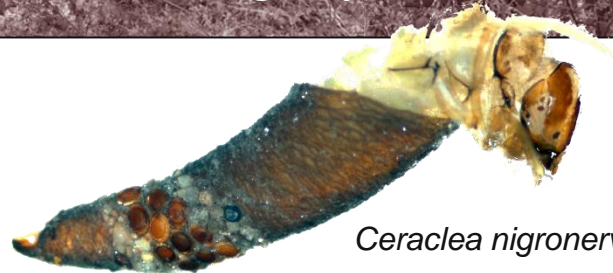
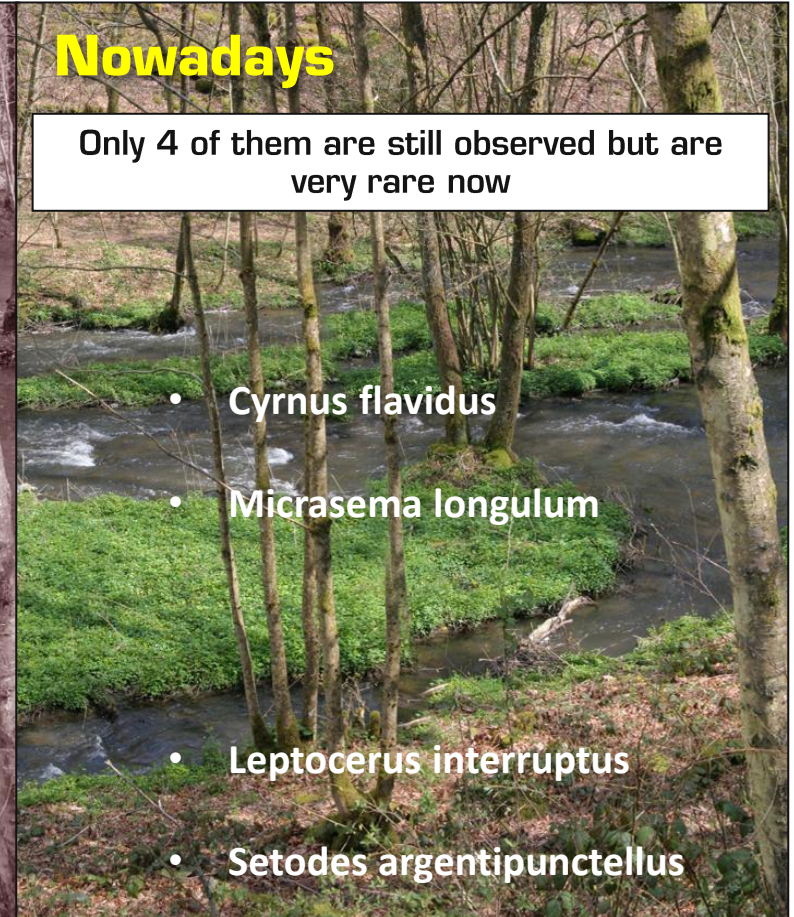
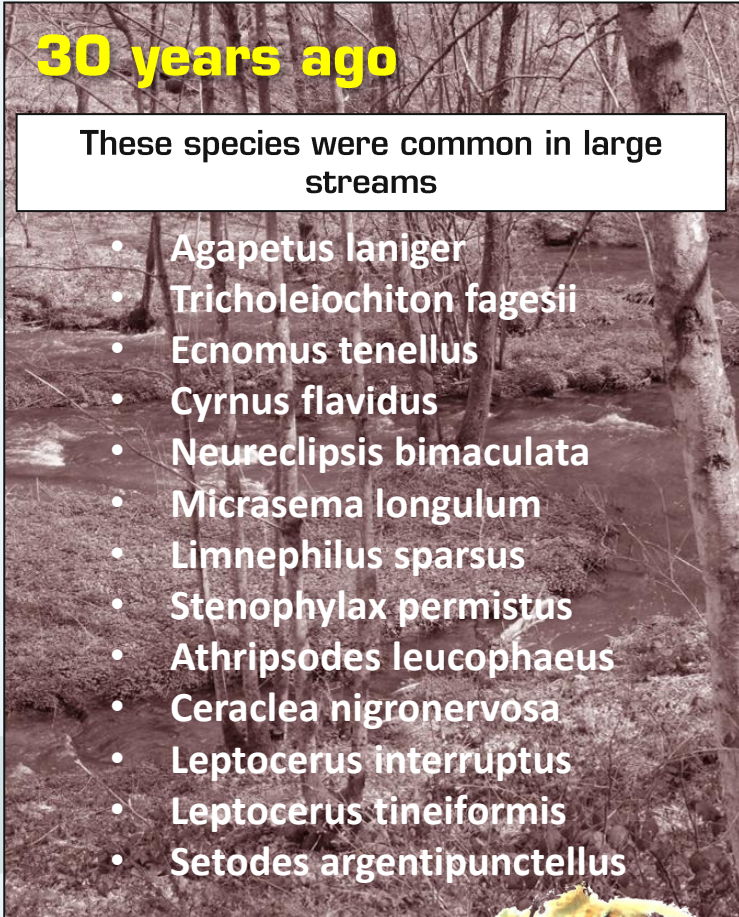
These species were common in large streams

- *Agapetus laniger*
- *Tricholeiochiton fagesii*
- *Ecnomus tenellus*
- *Cyrnus flavidus*
- *Neureclipsis bimaculata*
- *Micrasema longulum*
- *Limnephilus sparsus*
- *Stenophylax permistus*
- *Athripsodes leucophaeus*
- *Ceraclea nigronervosa*
- *Leptocerus interruptus*
- *Leptocerus tineiformis*
- *Setodes argentipunctellus*

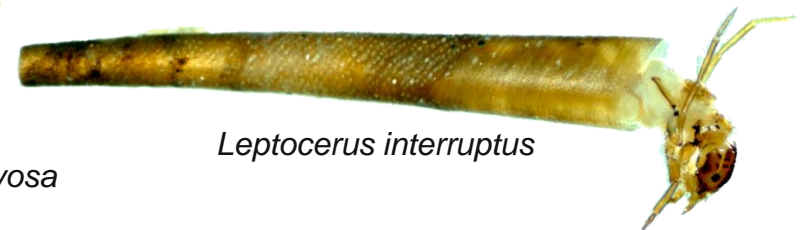
Nowadays

Only 4 of them are still observed but are very rare now

- *Cyrnus flavidus*
- *Micrasema longulum*
- *Leptocerus interruptus*
- *Setodes argentipunctellus*

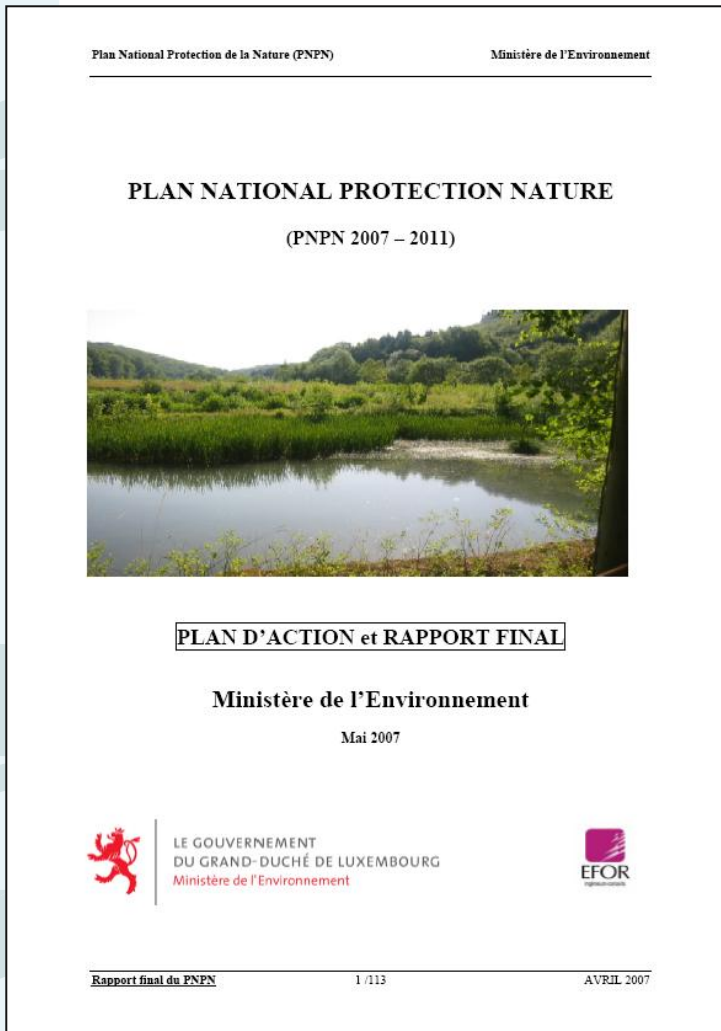


Ceraclea nigronervosa



Leptocerus interruptus

Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?



Plan National Protection de la Nature (PNPN)

6. ANNEXES



| Trichoptera (total 75 dont 11 prioritaires) | |
|---|---|
| Rhyacophila philopotamoïdes | 1 |
| Agapetus laniger | 1 |
| Chimarra marginata | 1 |
| Micrasema longulum | 1 |
| Ironocua dubia | 1 |
| Lithax niger | 1 |
| Athripsodes leucophaeus | 1 |
| Ceraclea albimacula | 1 |
| Ceraclea nigronervosa | 1 |
| Setodes argentipunctellus | 1 |
| Ernodes articularis | 1 |
| Rhyacophila laevis | 2 |
| Rhyacophila obliterata | 2 |
| Rhyacophila pubescens | 2 |
| Glossosoma boltoni | 2 |
| Synagapetus dubitans | 2 |
| Synagapetus iridipennis | 2 |
| Agapetus delicatulus | 2 |
| Philocolopus granulatus | 2 |
| Agraylea multipunctata | 2 |
| Agraylea sexmaculata | 2 |
| Hydroptila angulata | 2 |
| Hydroptila forcipata | 2 |
| Hydroptila simulans | 2 |
| Hydroptila sparsa | 2 |
| Oswestria flavicornis | 2 |
| Tricholeiochiton fagesii | 2 |
| Orthotrichia costalis | 2 |
| Philopotamus variegatus | 2 |
| Wormaldia mediana | 2 |
| Wormaldia subnigra | 2 |
| Timodes assimilis | 2 |
| Timodes dives | 2 |
| Timodes pallidulus | 2 |
| Lype phaeopa | 2 |
| Ecnomus tenellus | 2 |
| Cynus flavidus | 2 |
| Cynus insolitus | 2 |
| Cynus trimaculatus | 2 |
| Neureclipsis bimaculata | 2 |

Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

Science of the Total Environment 505 (2015) 1112–1126

LUXEMBOURG
INSTITUTE OF SCIENCE
BY



Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

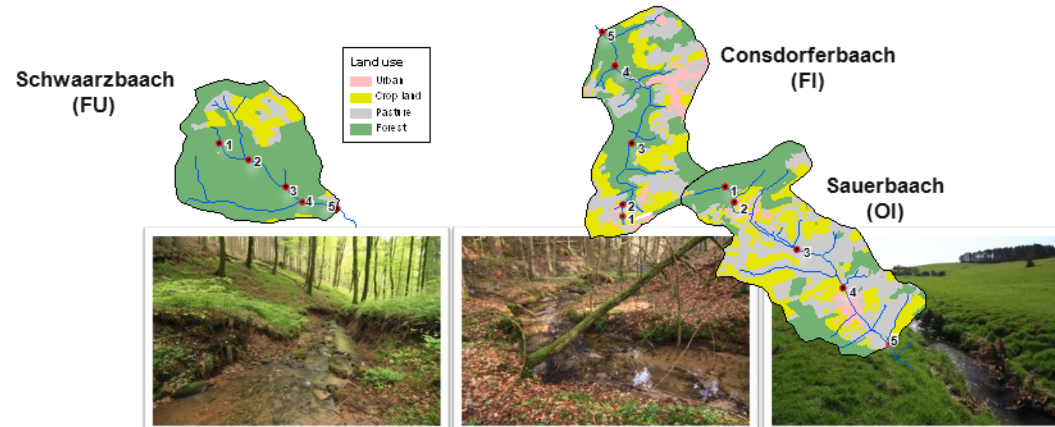


Influence of thermal regime and land use on benthic invertebrate communities inhabiting headwater streams exposed to contrasted shading



Alain Dohet*, Daša Hlúbíková, Carlos E. Wetzel, Lionel L'Hoste, Jean François Iffly, Lucien Hoffmann, Luc Ector

Department of Environment and Agro-biotechnologies, Centre de Recherche Public – Gabriel Lippmann, 41, rue du Brill, L-4422 Belvaux, Luxembourg



| | FU: forested unimpacted | FI: forested impacted | OI: open impacted |
|------------------------|-------------------------|-----------------------|-------------------|
| Headwater specialist | 5 | 0 | 0 |
| Cold-stenotherm | 4 | 0 | 0 |
| Short emergence period | 2 | 0 | 0 |
| Feeding specialist | 4 | 0 | 0 |

Number of Trichoptera species sensitive to climate change

Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

Science of the Total Environment 505 (2015) 1112–1126

LUXEMBOURG
INSTITUTE OF SCIENCE
BY



Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

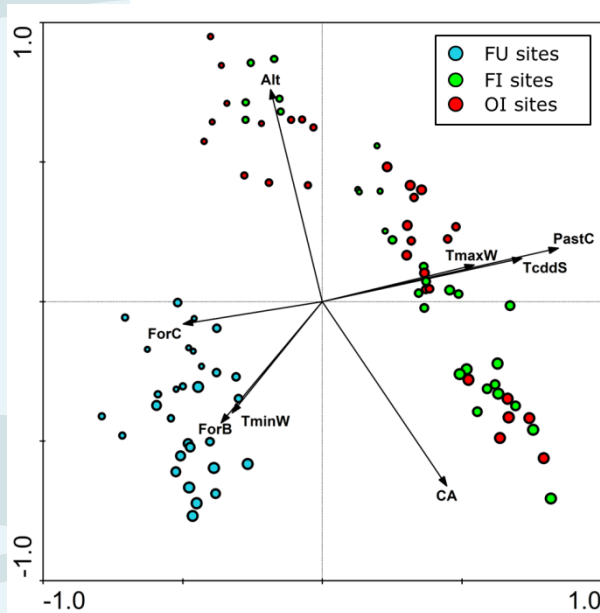


Influence of thermal regime and land use on benthic invertebrate communities inhabiting headwater streams exposed to contrasted shading

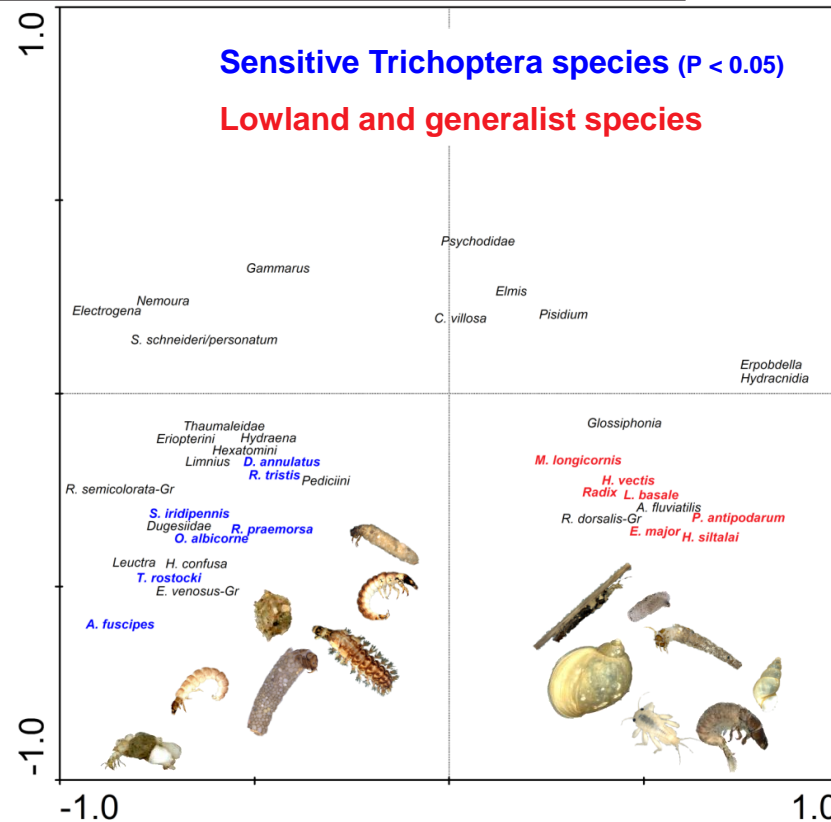


Alain Dohet*, Daša Hlúbiková, Carlos E. Wetzel, Lionel L'Hoste, Jean François Iffly, Lucien Hoffmann, Luc Ector

Department of Environment and Agro-biotechnologies, Centre de Recherche Public – Gabriel Lippmann, 41, rue du Brill, L-4422 Belvaux, Luxembourg



RDA ordination of sites (according to community composition) and best environmental variables

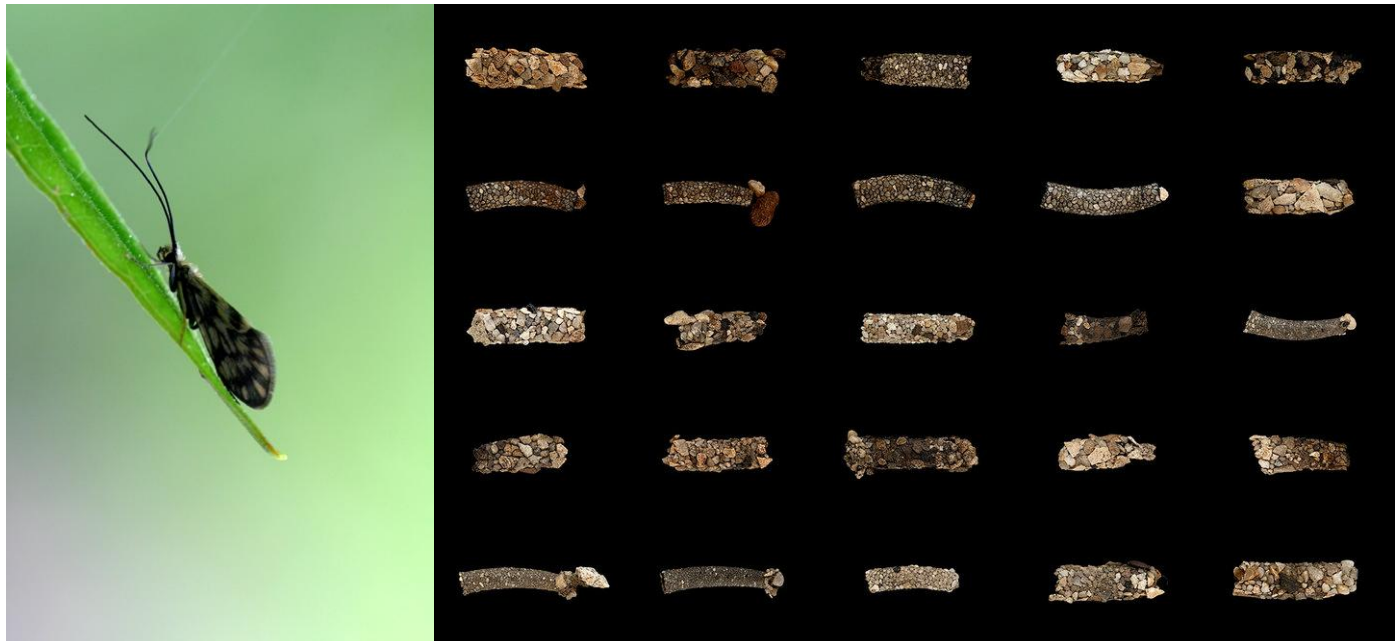


Projection into the ordination space of sensitive species and taxa with preference for downstream reaches

Are caddisflies ideal umbrella species and good indicators of biodiversity loss ?

YES

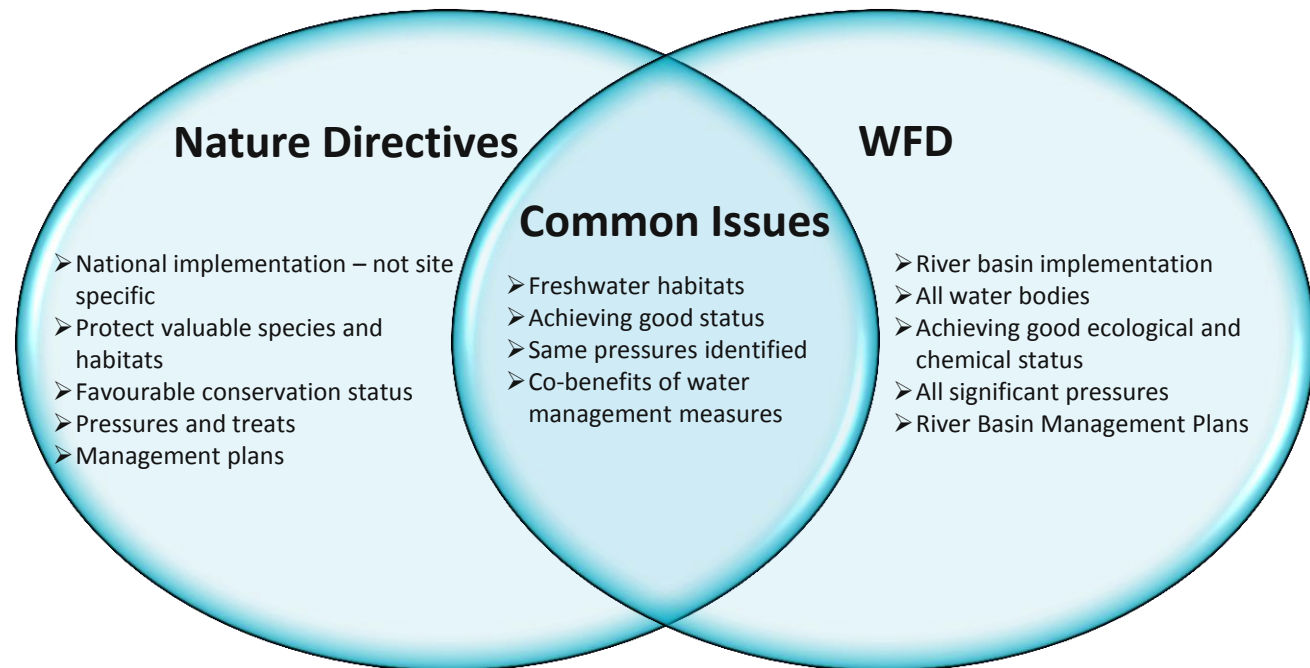
- ➔ Large number of species and numerous indicator species for different ecological conditions
- ➔ Present in all stream types and ecological areas in Luxembourg
- ➔ Long series data in Luxembourg (from 1967)
- ➔ Sensitive species to climate change in lowland rivers and headwater streams



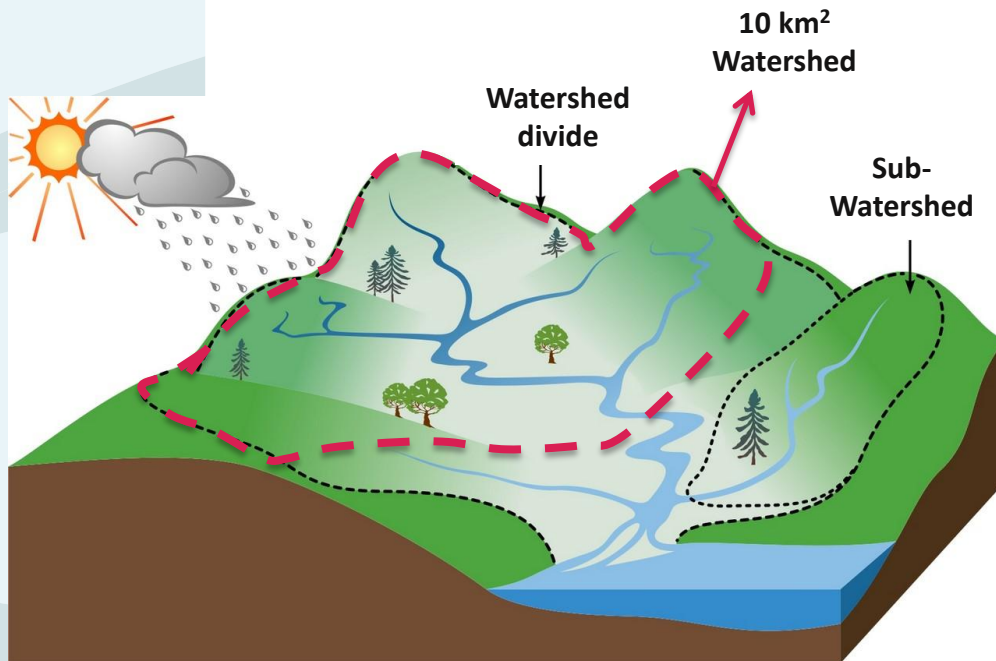
IMPLEMENTATION OF A SYNERGY BETWEEN WATER FRAMEWORK AND HABITAT EUROPEAN DIRECTIVES



setting up a common monitoring
survey and a common sampling
strategy to respond to the objectives
of both directives (HD & WFD)



IMPLEMENTATION OF A SYNERGY BETWEEN WATER FRAMEWORK AND HABITAT EUROPEAN DIRECTIVES



Main constraints of the WFD:

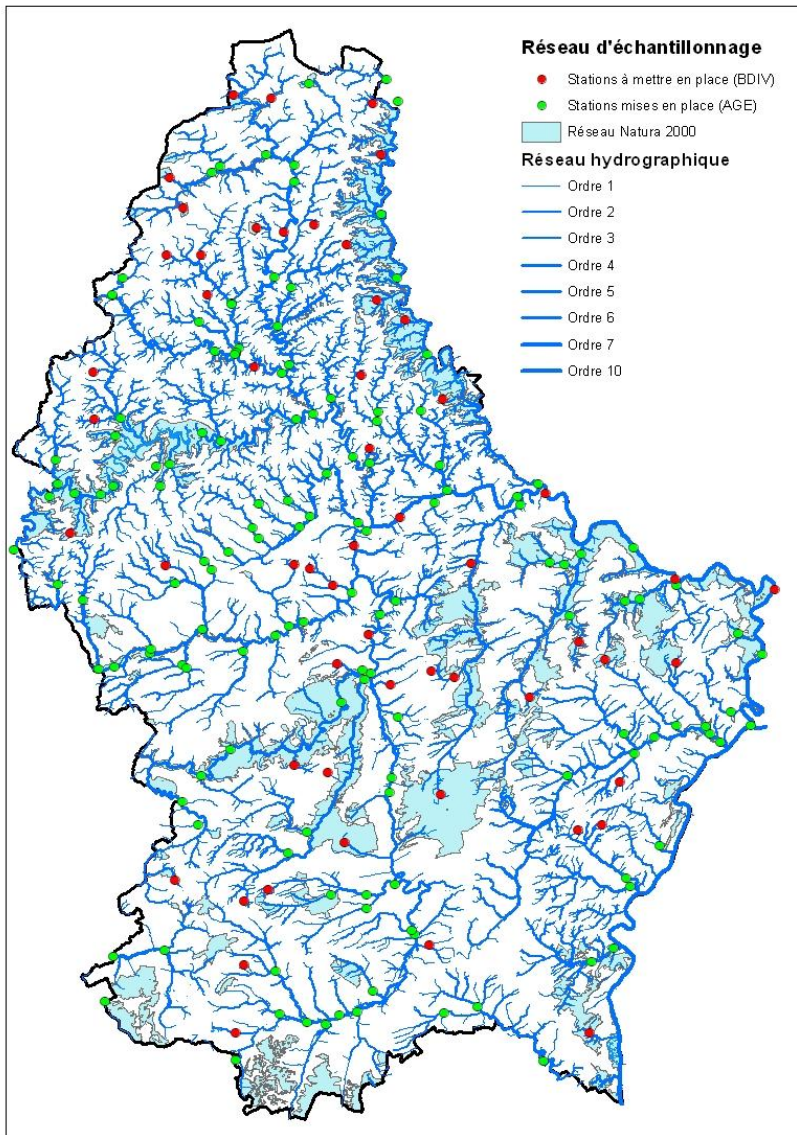
- Only watersheds $> 10 \text{ km}^2$ are taken into account

Headwater streams (watersheds $< 10 \text{ km}^2$)

contribute up to more than 3/4 of total stream channel length

- No stratified monitoring partition
- The Natura 2000 perimeter is not taken into account

IMPLEMENTATION OF A SYNERGY BETWEEN WATER FRAMEWORK AND HABITAT EUROPEAN DIRECTIVES



How?

- Complement the existing monitoring survey for WFD (green sites on the map) with supplementary sites (red sites on the map) in order to achieve a stratified monitoring partition: number of sites proportional in both ecoregions (Oesling, Gutland); along different stream orders (1 to 7) and inside (30%) or outside (70%) of the Natura 2000 perimeter
- Identify caddisflies at a species level

Benefits:

- Limit expenses and efforts
- Extended survey suitable for the monitoring of species of the Annexes II, IV and V of the DH: 6 fish and 2 dragonfly species
- Extended survey suitable for the monitoring of invasive species (e.g. alien crayfish, several fish, molluscs and crustaceans)

Preserving rivers means
nothing less than protecting
our future

Thank you

