Gli invertebrati acquatici

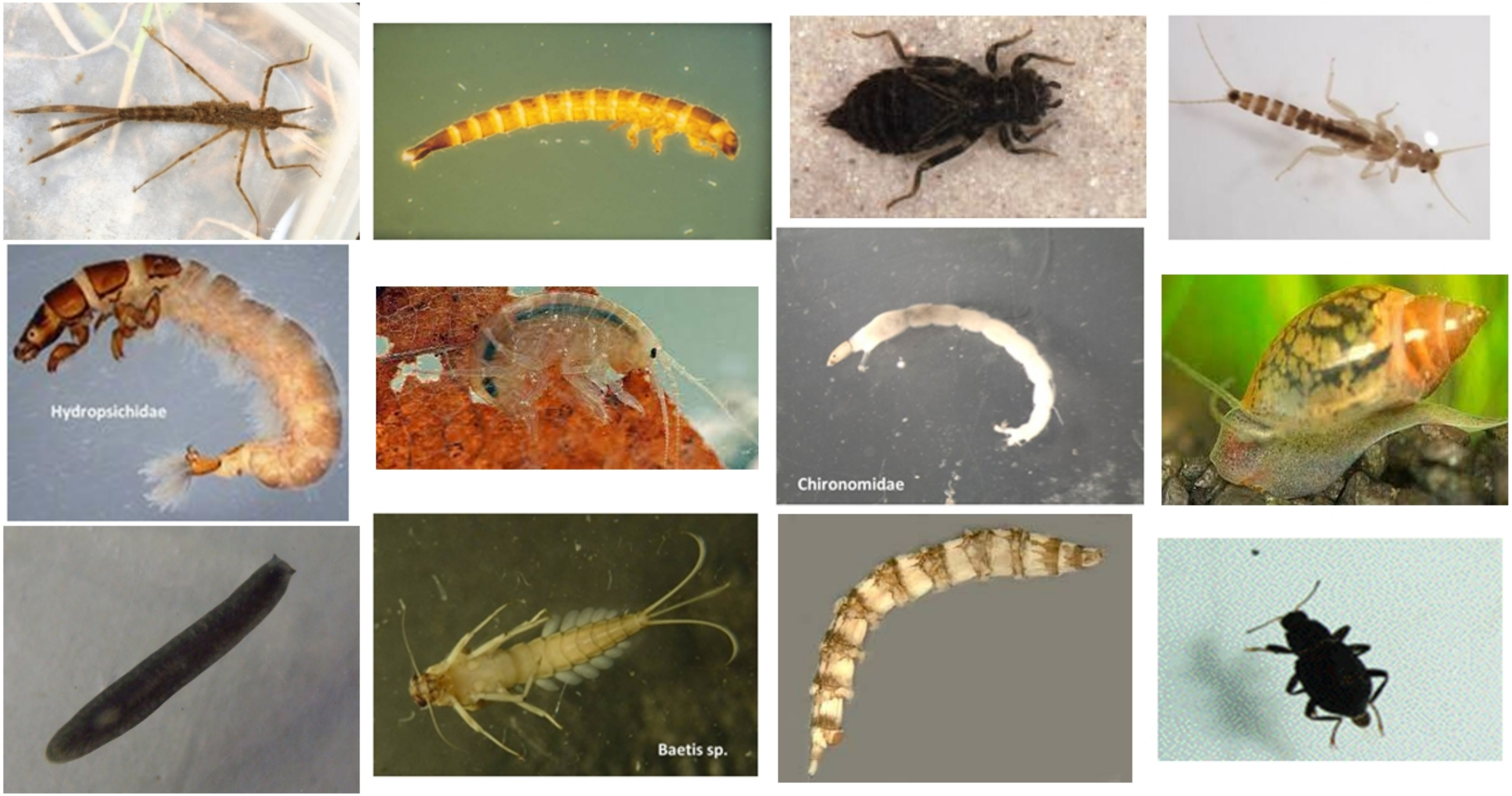
Alberto Doretto – Università del Piemonte Orientale
alberto.doretto@uniupo.it

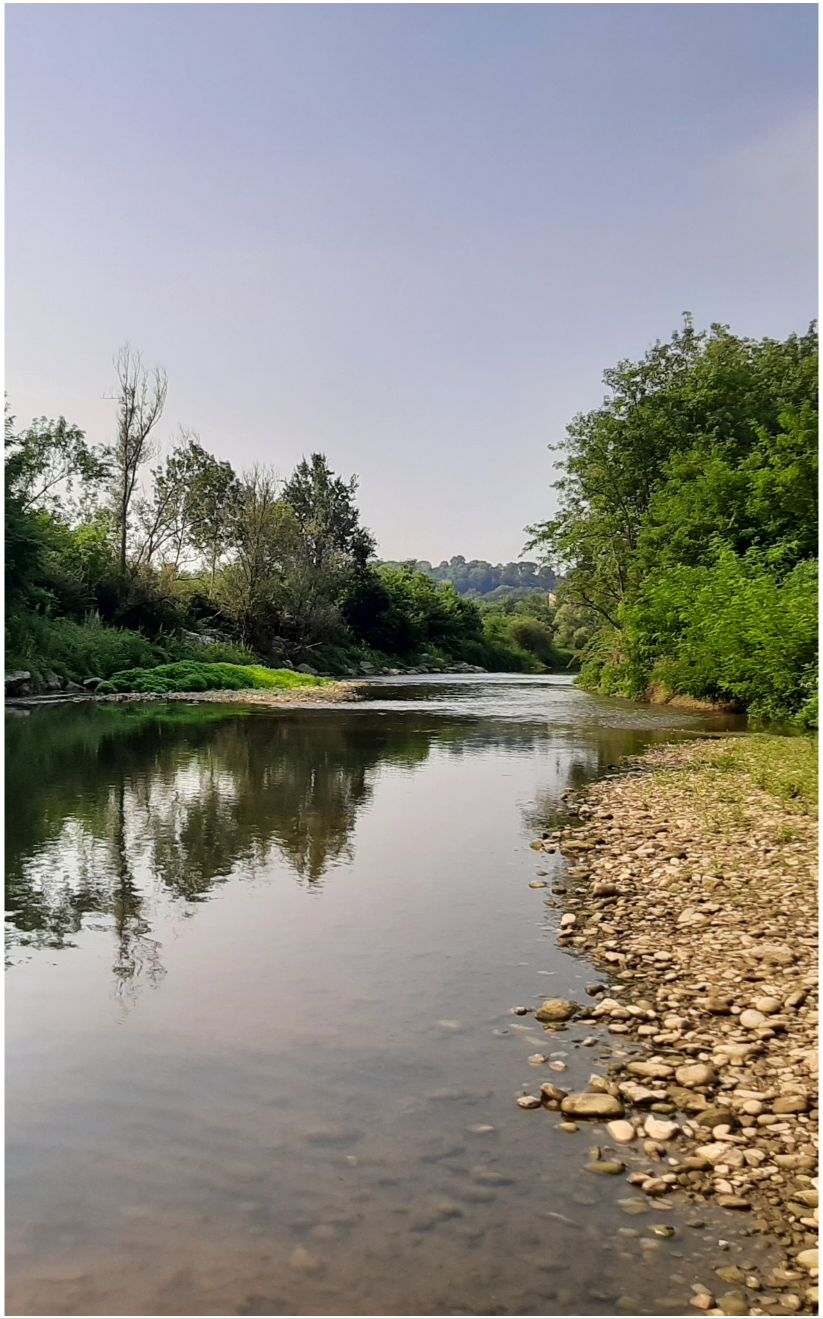
Torino

30 Settembre 2024

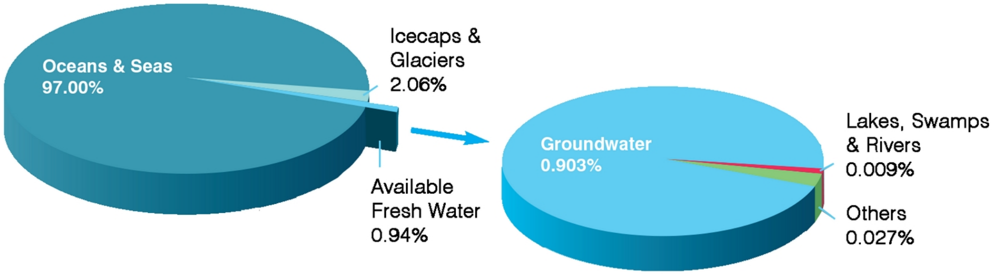
Macroinvertebrati bentonici: ottimi bioindicatori!

Organismi acquatici, invertebrati, visibili ad occhio nudo e la cui taglia corporea è superiore a 1 mm

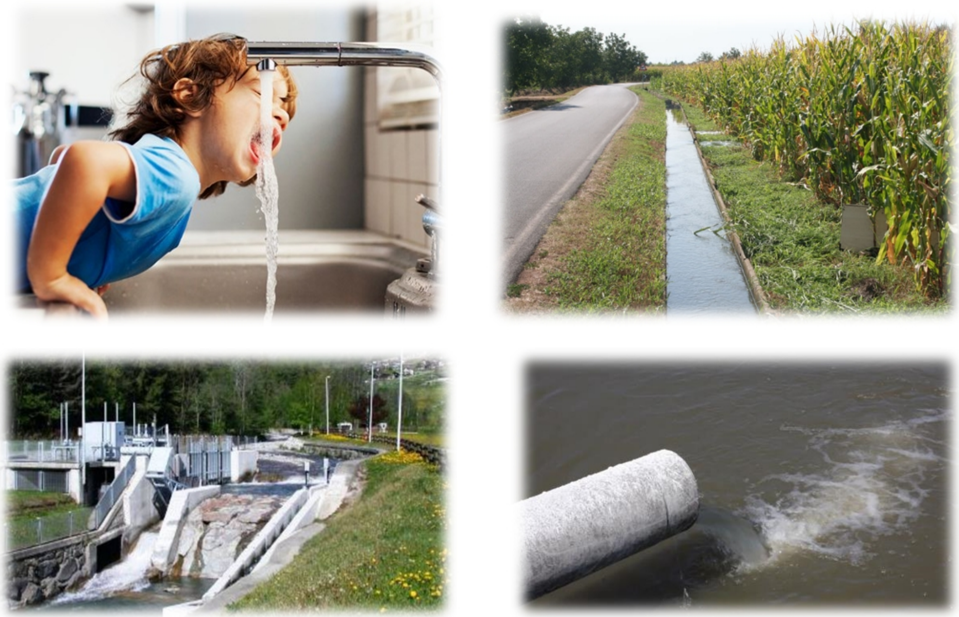

Hydropsichidae
Chironomidae
Baetis sp.

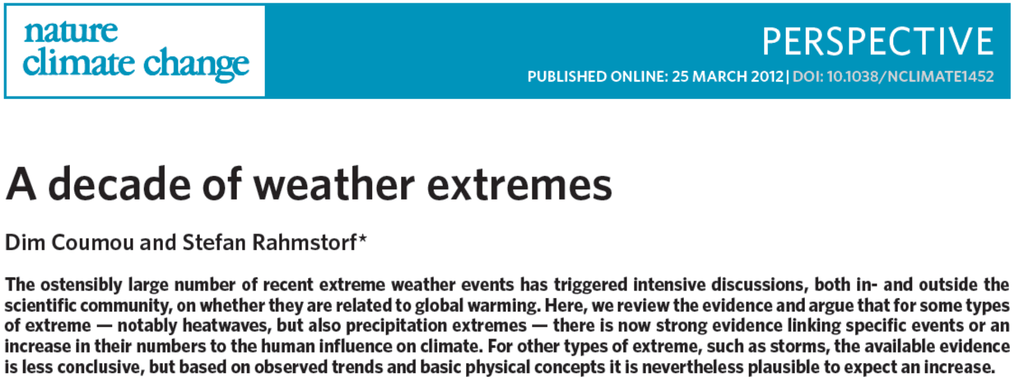


I fiumi rappresentano solamente lo **0,0002%** dell’acqua del



Ma dipendiamo proprio da questa piccola frazione per:





nature climate change

PERSPECTIVE

PUBLISHED ONLINE: 25 MARCH 2012 | DOI: 10.1038/NCLIMATE1452

A decade of weather extremes

Dim Coumou and Stefan Rahmstorf*

The ostensibly large number of recent extreme weather events has triggered intensive discussions, both in- and outside the scientific community, on whether they are related to global warming. Here, we review the evidence and argue that for some types of extreme — notably heatwaves, but also precipitation extremes — there is now strong evidence linking specific events or an increase in their numbers to the human influence on climate. For other types of extreme, such as storms, the available evidence is less conclusive, but based on observed trends and basic physical concepts it is nevertheless plausible to expect an increase.

Dead fish on the banks of the Guadiaro River in southern Spain during severe drought.

Prepare river ecosystems for an uncertain future

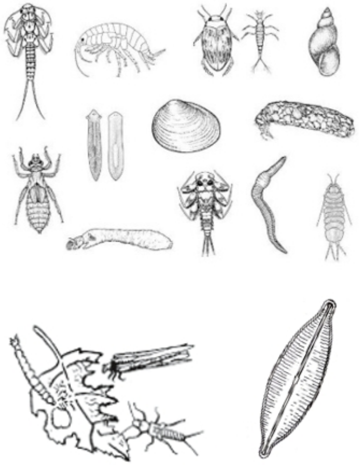
As the climate warms, we can't restore waterways to pristine condition, but models can predict potential changes, argue **Jonathan D. Tonkin**, **N. LeRoy Poff** and colleagues.

PRIN : PROGETTI DI RICERCA DI RILEVANTE INTERESSE NAZIONALE

Bando 2015 - Prot. 201572HW8F

NO ACQUA

Risposte di comuNità e processi ecOsistemici in corsi d'ACQUA soggetti a intermittenza idrologica



???

???

Biodiversity ?

Ecosystem processes ?

Resistance vs resilience ?

UNIVERSITÀ DEL PIEMONTE ORIENTALE

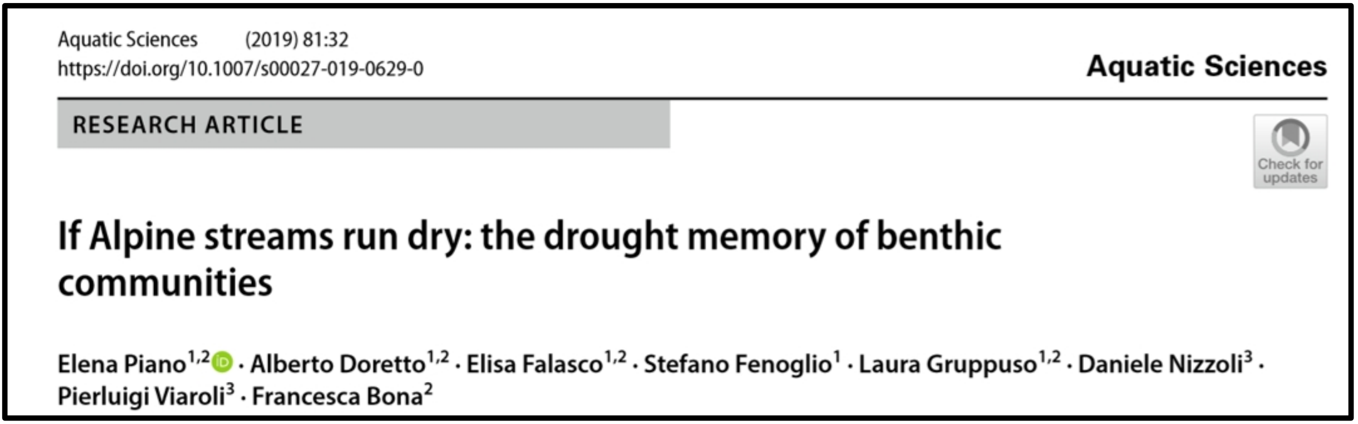
UNIVERSITÀ DI TORINO

UNIVERSITÀ DI PARMA

UNIVERSITÀ DEGLI STUDI DI FERRARA

FONDAZIONE EDMUND MACH

LIFE NatConnect 2030



Aquatic Sciences (2019) 81:32
https://doi.org/10.1007/s00027-019-0629-0

Aquatic Sciences

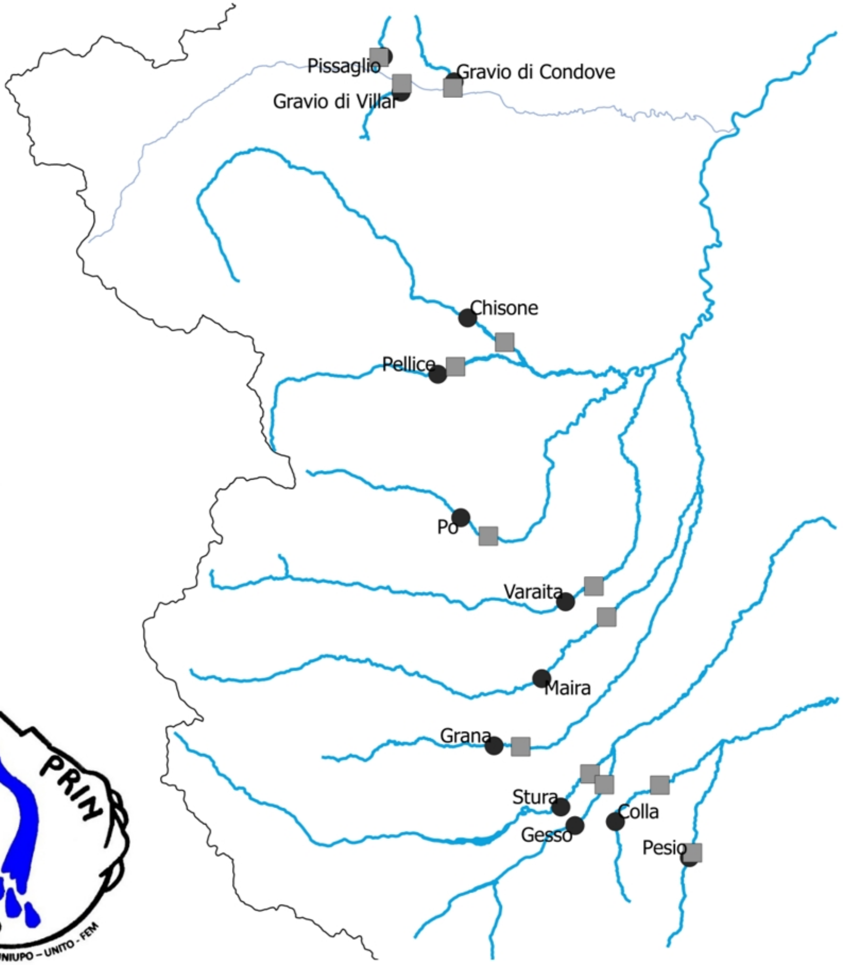
RESEARCH ARTICLE

Check for updates

If Alpine streams run dry: the drought memory of benthic communities

Elena Piano[1,2] · Alberto Doretto[1,2] · Elisa Falasco[1,2] · Stefano Fenoglio[1] · Laura Gruppuso[1,2] · Daniele Nizzoli[3] · Pierluigi Viaroli[3] · Francesca Bona[2]

- ✓ **13 fiumi alpini**
- ✓ 2 stazioni di campionamento in ogni fiume: **perenne (CON) vs intermittente (DIS)**
- ✓ **Macroinvertebrati**



Pissaglio
Gravio di Condove
Gravio di Villar
Chisone
Pellice
Po
Varaita
Maira
Grana
Stura
Colla
Gesso
Pesio

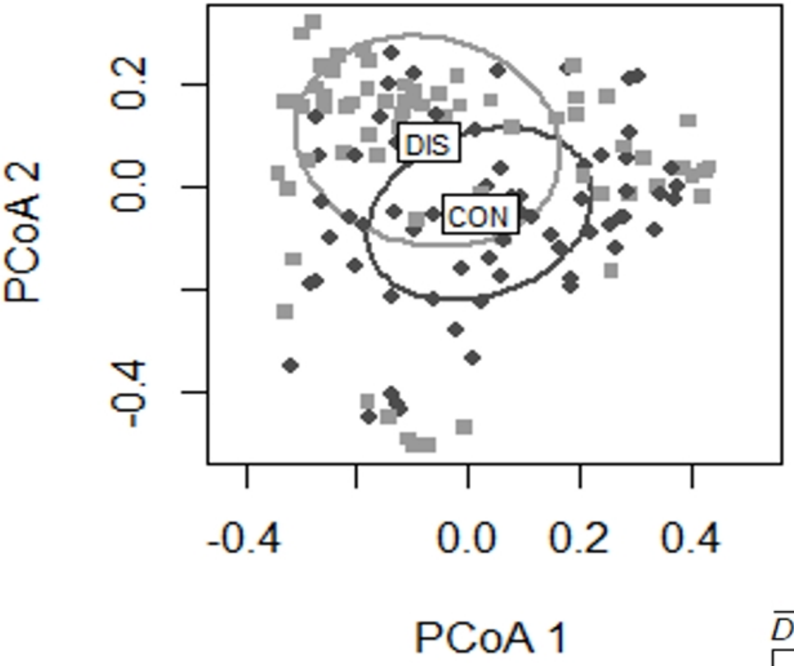
PRIN NO ACQUA

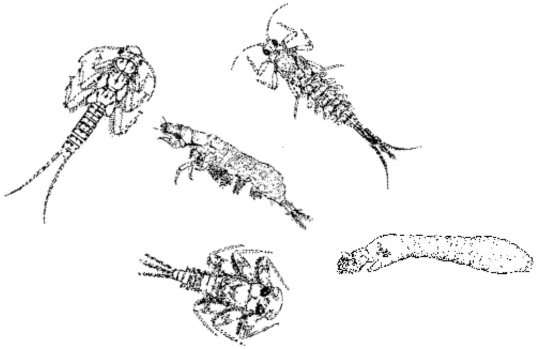
UNIPR - UNIFE - UNIUPO - UNITO - FEM

LIFE NatConnect 2030

NATURA 2000

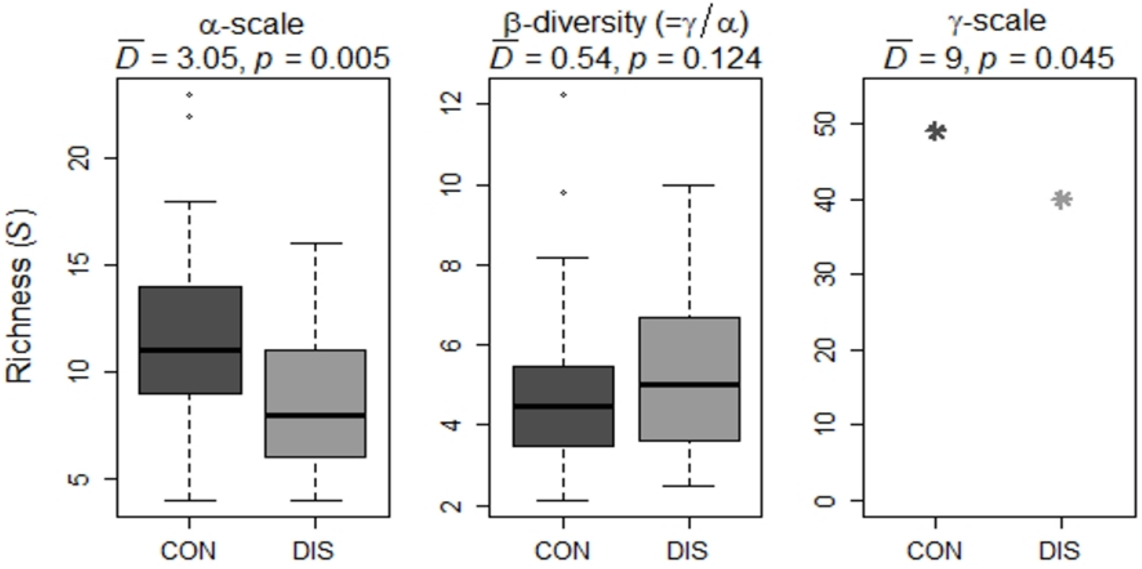
Macroinvertebrati





Diversa composizione in specie tra i siti perenni (CON) e quelli intermittenti (DIS)

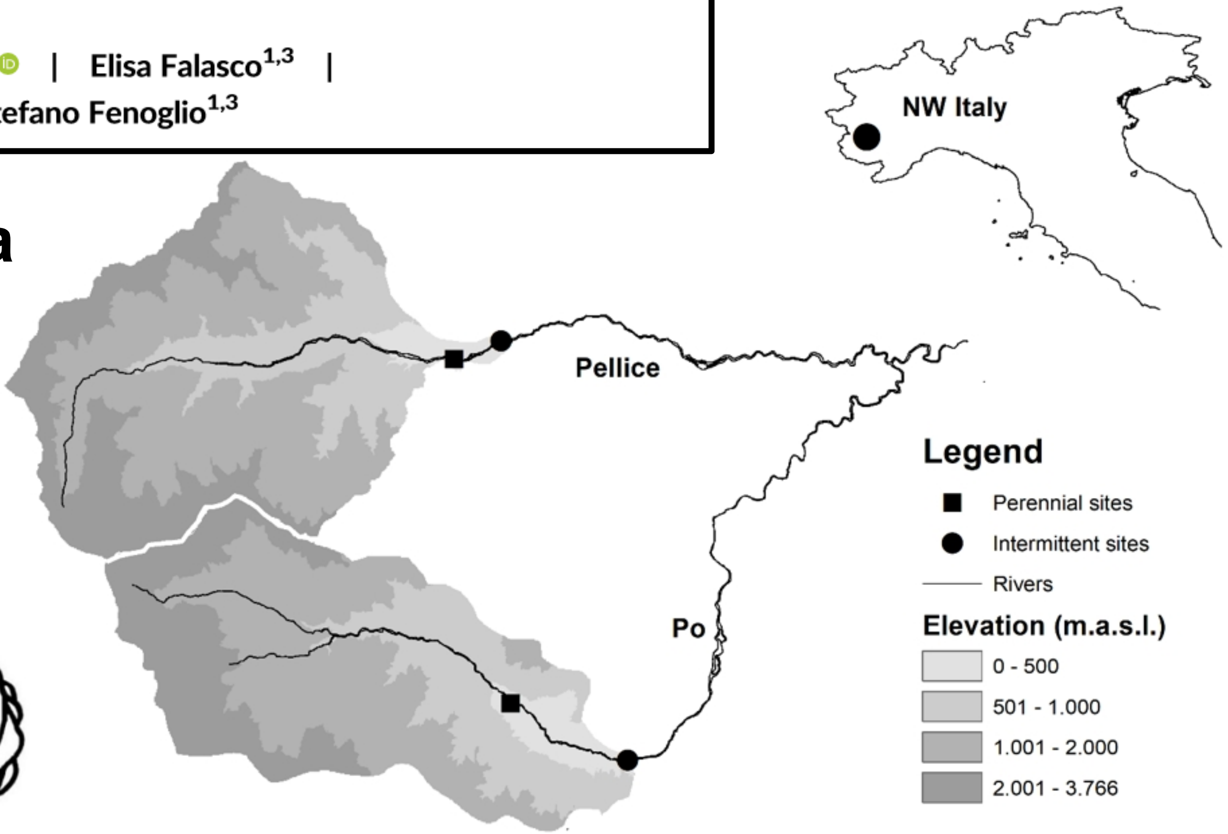
L’intermittenza idrologica riduce la biodiversità



Stay with the flow: How macroinvertebrate communities recover during the rewetting phase in Alpine streams affected by an exceptional drought

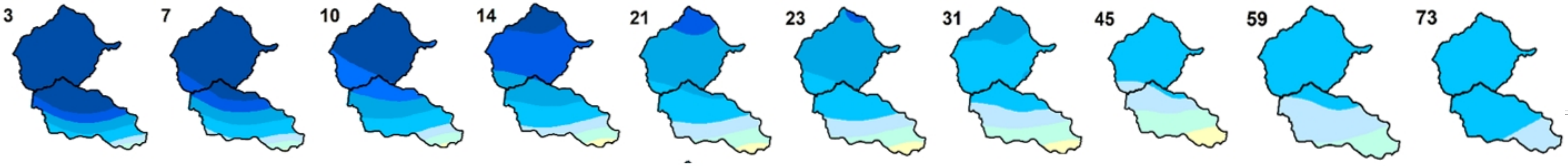
Alberto Doretto[1,2,3] | Francesca Bona[2,3] | Elisa Falasco[1,3] |
Daniele Morandini[2] | Elena Piano[1,3] | Stefano Fenoglio[1,3]

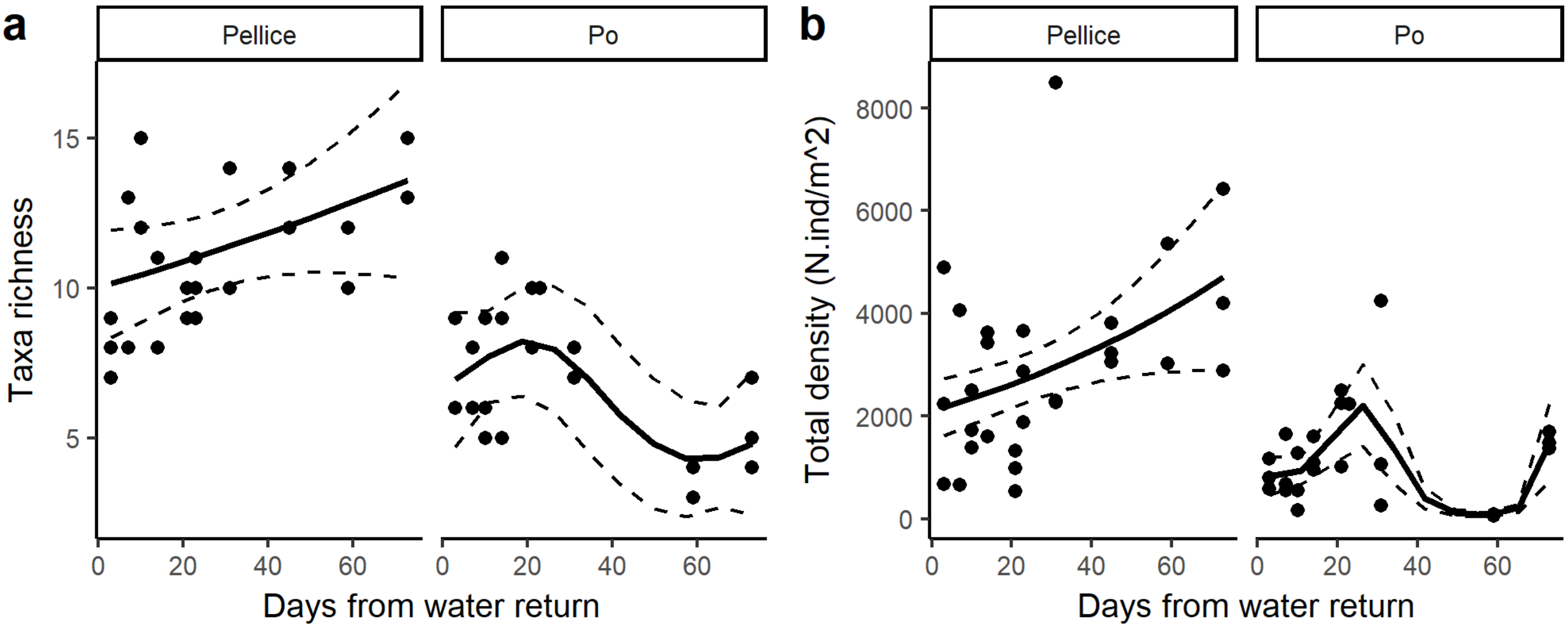
Capacità di resilienza


NW Italy
Pellice
Po
Legend
■ Perennial sites
● Intermittent sites
Rivers
Elevation (m.a.s.l.)
0 - 500
501 - 1.000
1.001 - 2.000
2.001 - 3.766

✓ **Rewetting**

✓ 10 date di campionamento (Gennaio-Marzo 2018)


3
7
10
14
21
23
31
45
59
73



Differenze tra i due fiumi durante il rewetting

→ la capacità di resilienza varia da fiume a fiume!

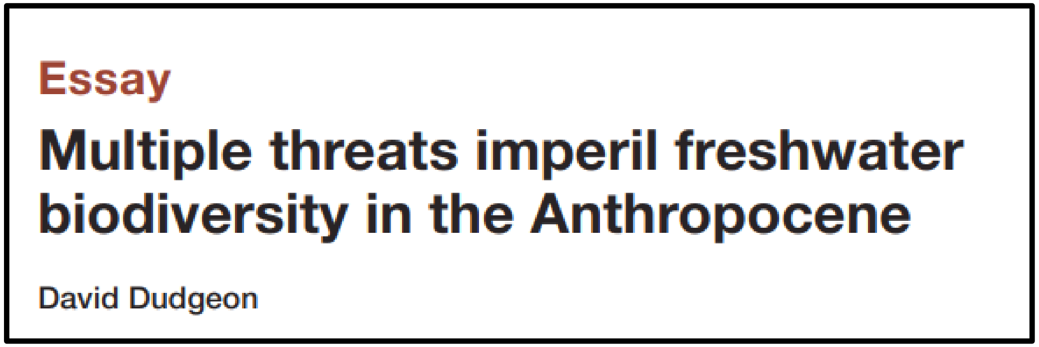
Sintesi dei principali impatti del cambiamento climatico sui fiumi e sul loro biota:

- ✓ **Perdita di biodiversità e banalizzazione delle comunità**
- ✓ **Ridotta capacità di resistenza e di resilienza**
- ✓ **Perdita di servizi ecosistemici** (ad esempio: capacità auto-depurativa dei corsi d’acqua)
- ✓ **Maggiore vulnerabilità agli effetti di altre forme di alterazione**

REPORT DI SINTESI
PER I DECISORI POLITICI

Il Piemonte è la **Regione con la massima biodiversità** a livello italiano: le **scelte prese oggi** sono determinanti per salvaguardarla e per tutelare il nostro benessere

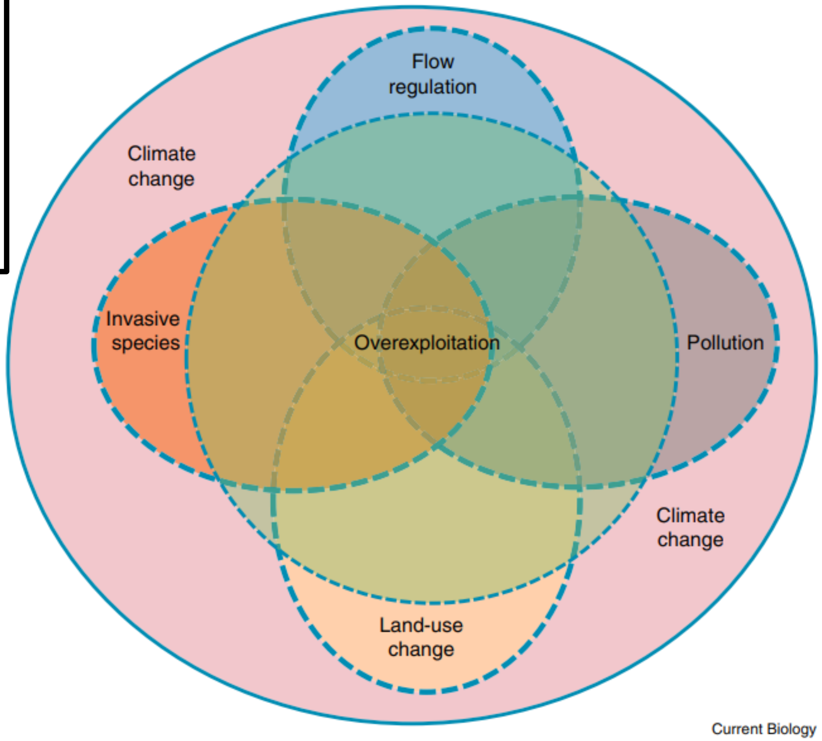
https://www.regione.piemonte.it/web/sites/default/files/media/documenti/2021-07/report_di_sintesi_per_decisori_politici_0.pdf



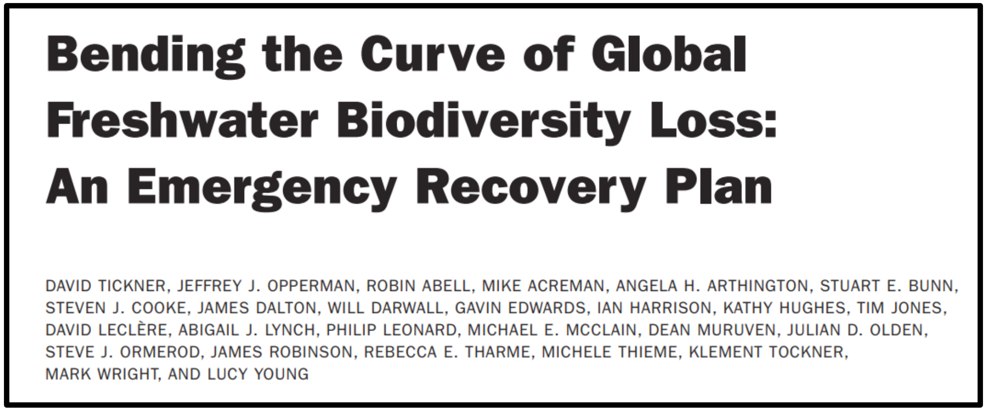
Essay

Multiple threats imperil freshwater biodiversity in the Anthropocene

David Dudgeon

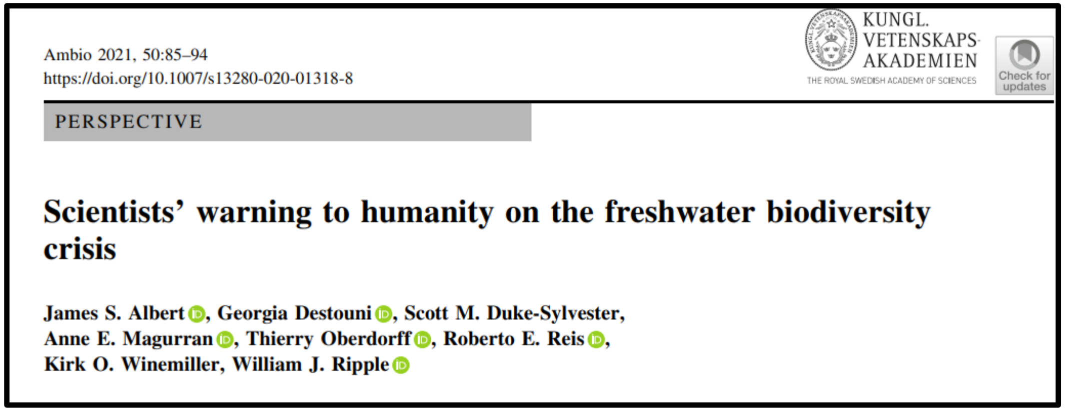


Current Biology



Bending the Curve of Global Freshwater Biodiversity Loss: An Emergency Recovery Plan

DAVID TICKNER, JEFFREY J. OPPERMAN, ROBIN ABELL, MIKE ACREMAN, ANGELA H. ARTHINGTON, STUART E. BUNN, STEVEN J. COOKE, JAMES DALTON, WILL DARWALL, GAVIN EDWARDS, IAN HARRISON, KATHY HUGHES, TIM JONES, DAVID LECLÈRE, ABIGAIL J. LYNCH, PHILIP LEONARD, MICHAEL E. MCCLAIN, DEAN MURUVEN, JULIAN D. OLDEN, STEVE J. ORMEROD, JAMES ROBINSON, REBECCA E. THARME, MICHELE THIEME, KLEMENT TOCKNER, MARK WRIGHT, AND LUCY YOUNG



Ambio 2021, 50:85–94
https://doi.org/10.1007/s13280-020-01318-8

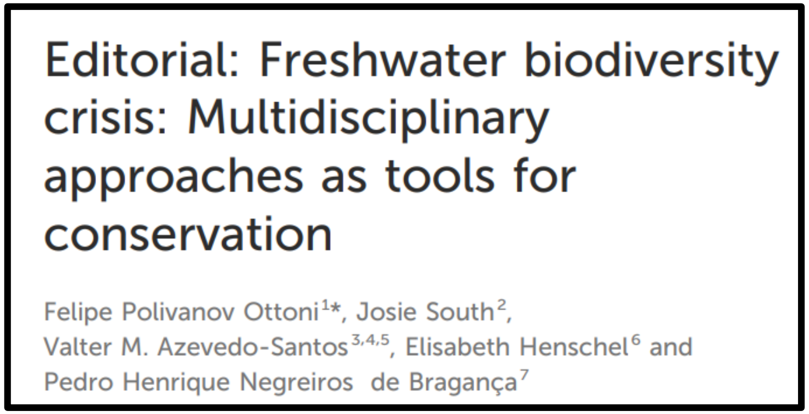
KUNGL. VETENSKAPS-AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES

Check for updates

PERSPECTIVE

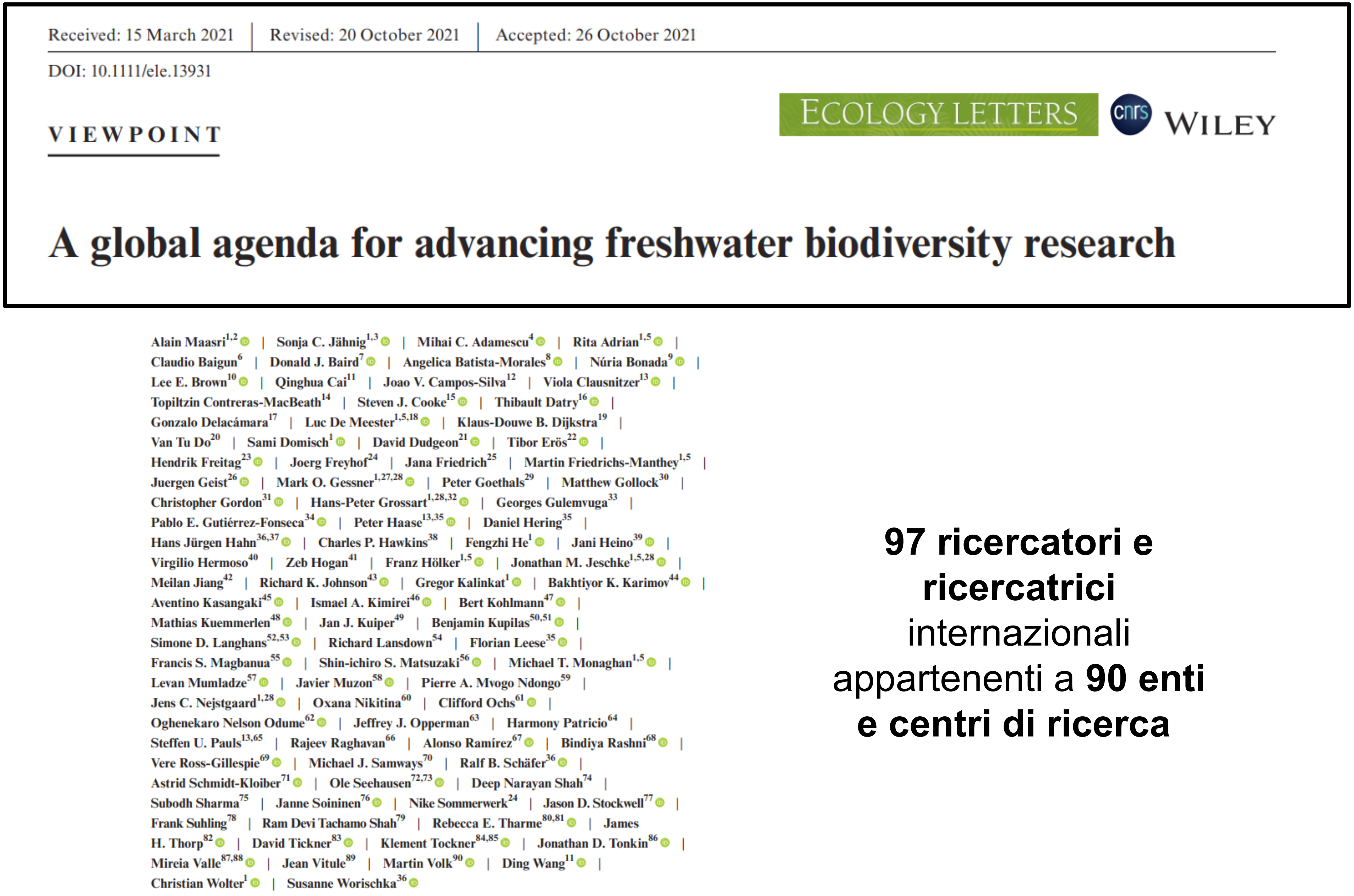
Scientists' warning to humanity on the freshwater biodiversity crisis

James S. Albert, Georgia Destouni, Scott M. Duke-Sylvester, Anne E. Magurran, Thierry Oberdorff, Roberto E. Reis, Kirk O. Winemiller, William J. Ripple



Editorial: Freshwater biodiversity crisis: Multidisciplinary approaches as tools for conservation

Felipe Polivanov Ottoni[1]*, Josie South[2], Valter M. Azevedo-Santos[3,4,5], Elisabeth Henschel[6] and Pedro Henrique Negreiros de Bragança[7]



Received: 15 March 2021 | Revised: 20 October 2021 | Accepted: 26 October 2021

DOI: 10.1111/ele.13931

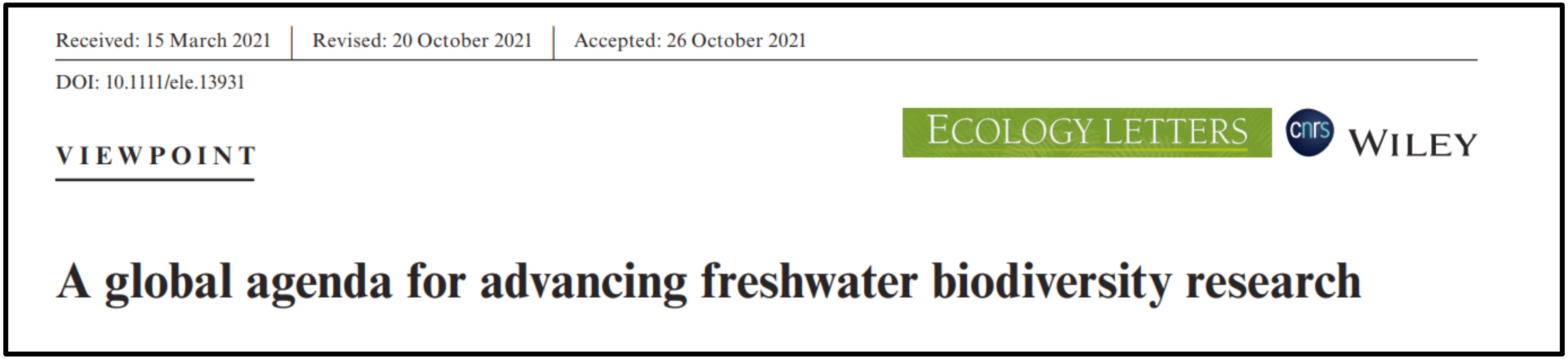
ECOLOGY LETTERS cnrs WILEY

VIEWPOINT

A global agenda for advancing freshwater biodiversity research

Alain Maasri[1,2] | Sonja C. Jähnig[1,3] | Mihai C. Adamescu[4] | Rita Adrian[1,5] |
Claudio Baigun[6] | Donald J. Baird[7] | Angelica Batista-Morales[8] | Núria Bonada[9] |
Lee E. Brown[10] | Qinghua Cai[11] | Joao V. Campos-Silva[12] | Viola Clausnitzer[13] |
Topiltzin Contreras-MacBeath[14] | Steven J. Cooke[15] | Thibault Datry[16] |
Gonzalo Delacámara[17] | Luc De Meester[1,5,18] | Klaus-Douwe B. Dijkstra[19] |
Van Tu Do[20] | Sami Domisch[1] | David Dudgeon[21] | Tibor Erös[22] |
Hendrik Freitag[23] | Joerg Freyhof[24] | Jana Friedrich[25] | Martin Friedrichs-Manthey[1,5] |
Juergen Geist[26] | Mark O. Gessner[1,27,28] | Peter Goethals[29] | Matthew Gollock[30] |
Christopher Gordon[31] | Hans-Peter Grossart[1,28,32] | Georges Gulemvuga[33] |
Pablo E. Gutiérrez-Fonseca[34] | Peter Haase[13,35] | Daniel Hering[35] |
Hans Jürgen Hahn[36,37] | Charles P. Hawkins[38] | Fengzhi He[1] | Jani Heino[39] |
Virgilio Hermoso[40] | Zeb Hogan[41] | Franz Hölker[1,5] | Jonathan M. Jeschke[1,5,28] |
Meilan Jiang[42] | Richard K. Johnson[43] | Gregor Kalinkat[1] | Bakhtiyor K. Karimov[44] |
Aventino Kasangaki[45] | Ismael A. Kimirei[46] | Bert Kohlmann[47] |
Mathias Kuemmerlen[48] | Jan J. Kuiper[49] | Benjamin Kupilas[50,51] |
Simone D. Langhans[52,53] | Richard Lansdown[54] | Florian Leese[35] |
Francis S. Magbanua[55] | Shin-ichiro S. Matsuzaki[56] | Michael T. Monaghan[1,5] |
Levan Mumladze[57] | Javier Muzon[58] | Pierre A. Mvogo Ndongo[59] |
Jens C. Nejstgaard[1,28] | Oxana Nikitina[60] | Clifford Ochs[61] |
Oghenekaro Nelson Odume[62] | Jeffrey J. Opperman[63] | Harmony Patricio[64] |
Steffen U. Pauls[13,65] | Rajeev Raghavan[66] | Alonso Ramírez[67] | Bindiya Rashni[68] |
Vere Ross-Gillespie[69] | Michael J. Samways[70] | Ralf B. Schäfer[36] |
Astrid Schmidt-Kloiber[71] | Ole Seehausen[72,73] | Deep Narayan Shah[74] |
Subodh Sharma[75] | Janne Soininen[76] | Nike Sommerwerk[24] | Jason D. Stockwell[77] |
Frank Suhling[78] | Ram Devi Tachamo Shah[79] | Rebecca E. Tharme[80,81] | James
H. Thorp[82] | David Tickner[83] | Klement Tockner[84,85] | Jonathan D. Tonkin[86] |
Mireia Valle[87,88] | Jean Vitule[89] | Martin Volk[90] | Ding Wang[11] |
Christian Wolter[1] | Susanne Worischka[36]

97 ricercatori e ricercatrici internazionali appartenenti a **90 enti e centri di ricerca**

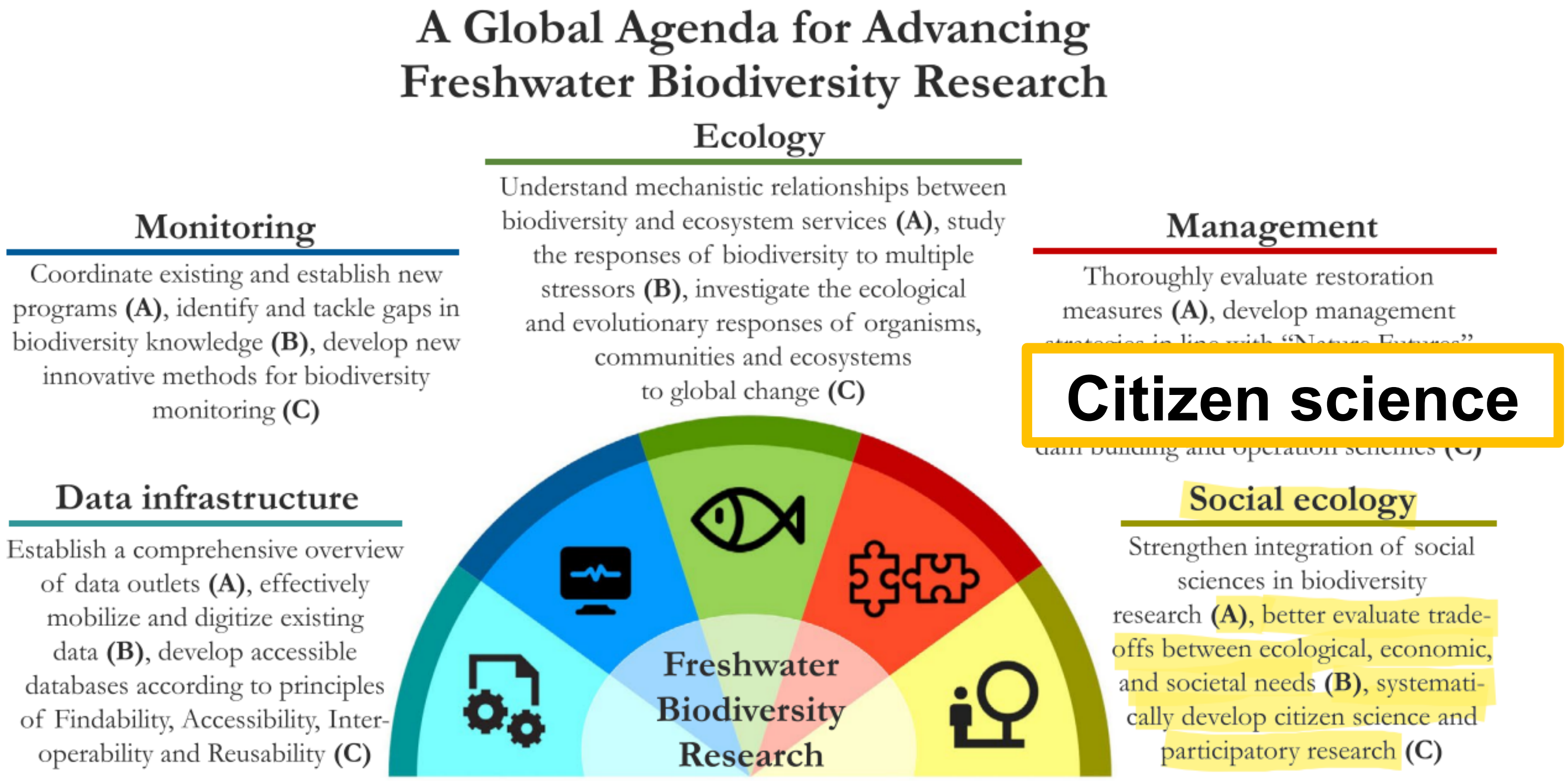

Received: 15 March 2021 | Revised: 20 October 2021 | Accepted: 26 October 2021

DOI: 10.1111/ele.13931

VIEWPOINT

ECOLOGY LETTERS cnrs WILEY

A global agenda for advancing freshwater biodiversity research



A Global Agenda for Advancing Freshwater Biodiversity Research

Ecology

Understand mechanistic relationships between biodiversity and ecosystem services **(A)**, study the responses of biodiversity to multiple stressors **(B)**, investigate the ecological and evolutionary responses of organisms, communities and ecosystems to global change **(C)**

Monitoring

Coordinate existing and establish new programs **(A)**, identify and tackle gaps in biodiversity knowledge **(B)**, develop new innovative methods for biodiversity monitoring **(C)**

Management

Thoroughly evaluate restoration measures **(A)**, develop management strategies in line with "Nature Futures"

dam building and operation schemes **(C)**

Citizen science

Data infrastructure

Establish a comprehensive overview of data outlets **(A)**, effectively mobilize and digitize existing data **(B)**, develop accessible databases according to principles of Findability, Accessibility, Interoperability and Reusability **(C)**

Social ecology

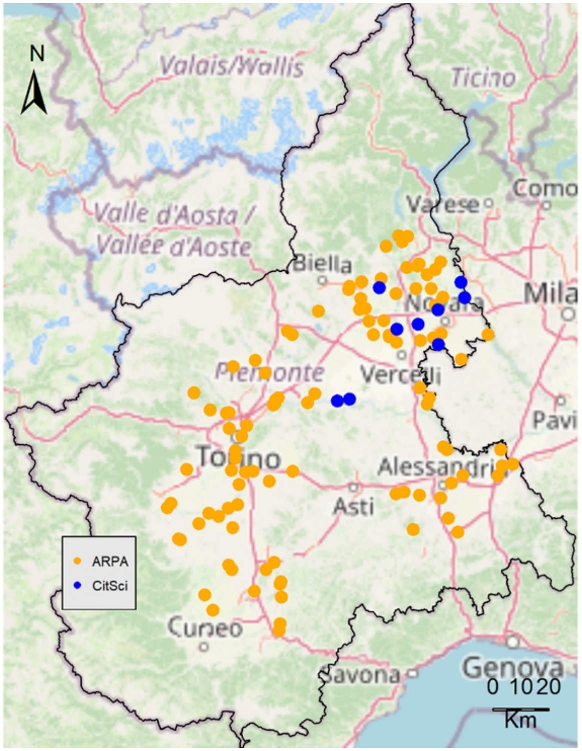
Strengthen integration of social sciences in biodiversity research **(A)**, better evaluate trade-offs between ecological, economic, and societal needs **(B)**, systematically develop citizen science and participatory research **(C)**

Approccio sperimentale per attività di citizen science

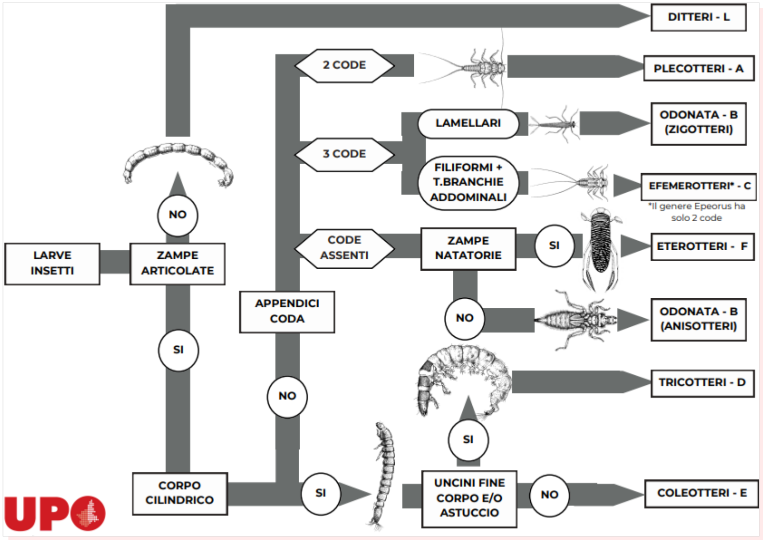
Dati ARPA 2008-2019
HER 6 - Macrotipo C
101 siti
905 eventi di campionamento

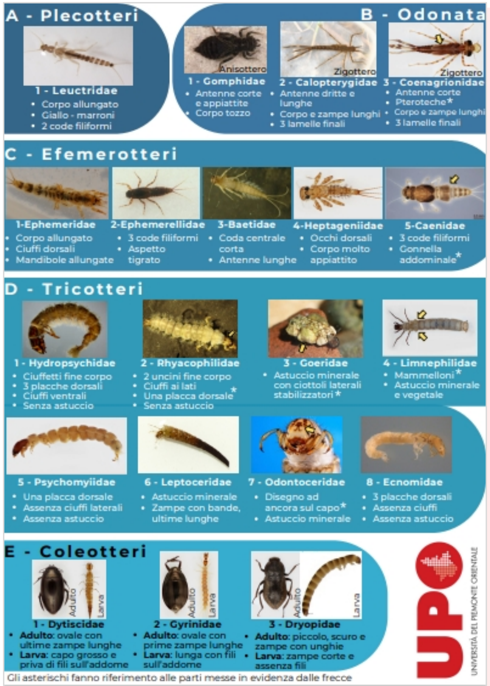
1. Definizione **comunità** semplificata
2. **Semplificazione** materiale riconoscimento
3. Definizione nuove **soglie**
4. Raccolta **dati** con gruppi di volontari

Comunità macrobentonica semplificata con solo **36 taxa**: quelli **più frequenti**, tipici del territorio e **facili da riconoscere**!


N
Valais/Wallis
Ticino
Valle d'Aosta / Vallée d'Aoste
Biella
Varese
Como
Mila
Novara
Piemonte
Vercelli
Pavi
Torino
Alessandria
Asti
Cuneo
Savona
Genova
0 10 20
Km
● ARPA
● CitSci

10 uscite con i volontari (VC e NO)


LARVE INSETTI
ZAMPE ARTICOLATE
NO
SI
DITTERI - L
CORPO CILINDRICO
APPENDICI CODA
NO
SI
2 CODE
PLECOTTERI - A
3 CODE
LAMELLARI
ODONATA - B (ZIGOTTERI)
FILIFORMI + T.BRANCHIE ADDOMINALI
EFEMEROTTERI* - C
*Il genere Epeorus ha solo 2 code
CODE ASSENTI
ZAMPE NATATORIE
SI
ETEROTTERI - F
NO
ODONATA - B (ANISOTTERI)
TRICOTTERI - D
SI
UNCINI FINE CORPO E/O ASTUCCIO
NO
COLEOTTERI - E
UPO



A - Plecotteri

1 - Leuctridae
- Corpo allungato
- Giallo - marroni
- 2 code filiformi

B - Odonata

Anisottero
1 - Gomphidae
- Antenne corte e appiattite
- Corpo tozzo

Zigottero
2 - Calopterygidae
- Antenne dritte e lunghe
- Corpo e zampe lunghi
- 3 lamelle finali

Zigottero
3 - Coenagrionidae
- Antenne corte
- Pteroteche*
- Corpo e zampe lunghi
- 3 lamelle finali

C - Efemerotteri

1-Ephemeridae
- Corpo allungato
- Ciuffi dorsali
- Mandibole allungate

2-Ephemerellidae
- 3 code filiformi
- Aspetto tigrato

3-Baetidae
- Coda centrale corta
- Antenne lunghe

4-Heptageniidae
- Occhi dorsali
- Corpo molto appiattito

5-Caenidae
- 3 code filiformi
- Gonnella addominale*

D - Tricotteri

1 - Hydropsychidae
- Ciuffetti fine corpo
- 3 placche dorsali
- Ciuffi ventrali
- Senza astuccio

2 - Rhyacophilidae
- 2 uncini fine corpo
- Ciuffi ai lati
- Una placca dorsale*
- Senza astuccio

3 - Goeridae
- Astuccio minerale con ciottoli laterali stabilizzatori*

4 - Limnephilidae
- Mammelloni*
- Astuccio minerale e vegetale

5 - Psychomyiidae
- Una placca dorsale
- Assenza ciuffi laterali
- Assenza astuccio

6 - Leptoceridae
- Astuccio minerale
- Zampe con bande, ultime lunghe

7 - Odontoceridae
- Disegno ad ancora sul capo*
- Astuccio minerale

8 - Ecnomidae
- 3 placche dorsali
- Assenza ciuffi
- Assenza astuccio

E - Coleotteri

Adulto Larva
1 - Dytiscidae
- **Adulto**: ovale con ultime zampe lunghe
- **Larva**: capo grosso e priva di fili sull'addome

Adulto Larva
2 - Gyrinidae
- **Adulto**: ovale con prime zampe lunghe
- **Larva**: lunga con fili sull'addome

Adulto Larva
3 - Dryopidae
- **Adulto**: piccolo, scuro e zampe con unghie
- **Larva**: zampe corte e assenza fili

Gli asterischi fanno riferimento alle parti messe in evidenza dalle frecce

UPO UNIVERSITÀ DEL PIEMONTE ORIENTALE

LIFE NatConnect 2030
NATURA 2000

12 uscite (Nov23-Set24): 242 volontari

Una Garlanda Custodi di Natura & Biodiversità

Aree protette Po piemontese

REGIONE PIEMONTE

AREE PROTETTE DEL TICINO E DEL LAGO MAGGIORE

unesco

NATURA 2000

BI + NO + VC + VCO 4 province con un parco nel cuore

UNIONE TUTELA CONSUMATORI ONLUS

FAI Fondo Ambiente Italiano

Delegazione di Novara

PROVINCIA DI NOVARA G.E.V.

VERCELLI - ISTITUTO TECNICO I.T. "PIERO CALAMANDREI" - CRESCENTINO

ECOMUSEO DELLE TERRE D'ACQUA

Progetto: “The biocultural dimensions of Eastern Piedmont's waterlands: a multifaceted heritage to originate future development – H20-lands. Heritage to Originate” Finanziamento: NextGeneration EU e Compagnia di San Paolo

Life

LIFE NatConnect 2030

NATURA 2000

UNIVERSITÀ DEL PIEMONTE ORIENTALE

Centro per lo Studio dei Fiumi Alpini

Alpine Stream Research Center - ALPSTREAM

GRAZIE PER L’ATTENZIONE!

alberto.doretto@uniupo.it