

Supplementary material

Resilience of benthic diatom communities in Mediterranean streams: role of endangered species

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Table S1. Percentages of land uses calculated within a 1-km diameter buffer around each sampling site

Results are based on the analysis of the Corine Land Cover, provided by the cartographic services of the Regione Liguria (<http://www.cartografia.regione.liguria.it/>)

River	CLC nomenclature	CLC CODE	CLC description	Land use percentages
Arrestra	Agricultural areas	242	Complex cultivation patterns	2.68
		243	Land principally occupied by agriculture, with significant areas of natural vegetation	1.24
	Forest and semi natural areas	322	Moors and heathland	27.90
		323	Sclerophyllous vegetation	12.16
		324	Transitional woodland shrub	31.91
		3117	Hygrophilous forest	22.11
	Water bodies	5111	Streams and rivers with scarce riparian vegetation	1.99
Quiliano	Agricultural areas	223	Olive groves	21.03
		242	Complex cultivation patterns	4.83
		243	Land principally occupied by agriculture, with significant areas of natural vegetation	0.46
	Forest and semi natural areas	2211	Vineyards and olive groves	5.08
		312	Coniferous forest	40.07
		323	Sclerophyllous vegetation	0.00
		3112	Mixed thermophilous forests	20.30
		3113	Mixed mesophilous forests	1.25
	Artificial surfaces	3117	Hygrophilous forest	1.26
		1112	Continuous urban fabric with medium density	2.61
		Water bodies	5111	Streams and rivers with scarce riparian vegetation
5114		Streams and rivers with abundant riparian vegetation	2.77	
Sansobbia	Agricultural areas	223	Olive groves	5.24
		241	Annual crops associated with permanent crops	1.57
		242	Complex cultivation patterns	16.35
		243	Land principally occupied by agriculture, with significant areas of natural vegetation	0.77
	Forest and semi natural areas	2211	Vineyards and olive groves	18.23
		312	Coniferous forest	21.46
		323	Sclerophyllous vegetation	0.36
		3112	Mixed thermophilous forests	13.24
		3113	Mixed mesophilous forests	5.51
		3115	Chestnut forest	0.69
		3117	Hygrophilous forest	2.95

River	CLC nomenclature	CLC CODE	CLC description	Land use percentages
	Artificial surfaces	1111	Continuous and dense urban fabric	1.24
		1121	Discontinuous urban fabric with medium density	8.00
		1122	Discontinuous urban fabric with scarce density	0.87
	Water bodies	5114	Streams and rivers with abundant riparian vegetation	3.51

Table S2. Complete checklist of all the taxa detected in the samples

CODE, taxon code from OMNIDIA database (ver. 6.0.4, see <http://omnidia.fr>). Red List column refers to conservation status defined by Lange-Bertalot and Steindorf (1996): 1, threatened with extinction; 2, severely endangered; 3, endangered; D, data scarce; G, probably endangered; R, rare; V, decreasing; *, at present not considered threatened; **, surely not threatened. Life forms and ecological guilds follow the classification proposed in Rimet and Bouchez (2012); for species not included in this list, we inferred data to the closest taxon in terms of taxonomy and ecology. In the final columns, we display the presence or absence of each taxon in the three rivers, and for each treatment.

C, control; BS, bare substrates; TS, transplanted substrates

	CODE	Red List	Life form					Ecological guilds			ARRESTRA			QUILIANO			SANSOBBIA				
			Pioneer	Colonial	Non-colonial	Adnate	Pedunculate	High profile	Low profile	Motile	Planktonic	C	BS	TS	C	BS	TS	C	BS	TS	
<i>Achnanthydium affine</i> (Grunow) Czarn.	ACAF	*	+		+		+			+			+	+	+				+	+	+
<i>Achnanthydium atomoides</i> Monnier <i>et al.</i>	ADAM	z			+			+						+			+		+	+	+
<i>Achnanthydium delmontii</i> Peres <i>et al.</i>	ADMO	z			+			+											+		+
<i>Achnanthydium eutrophilum</i> (Lange-Bert.) Lange-Bert.	ADEU	z			+			+									+	+		+	+
<i>Achnanthydium sp.</i>	ACHD	z	+		+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium gracillimum</i> (Meister) Lange-Bert.	ADGL	3			+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium jackii</i> Rabenhorst	ADJK	D	+		+			+					+								
<i>Achnanthydium latecephalum</i> Kobayasi	ADLA	z			+			+					+	+	+	+					+
<i>Achnanthydium latecephalum</i> Kobayasi <i>terat. form</i>	ADLT	z			+			+									+	+		+	
<i>Achnanthydium lineare</i> W.Smith	ACLI	3			+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium minutissimum</i> (Kütz.) Czarn. <i>terat. form</i>	ADMT	z	+		+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium minutissimum</i> (Kütz.) Czarn.	ADMI	?	+		+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium pyrenaicum</i> (Hustedt) Kobayasi	ADPY	?			+			+					+	+	+	+	+	+	+	+	+
<i>Achnanthydium pyrenaicum</i> (Hustedt) Kobayasi <i>terat. form</i>	ADPT	z			+			+									+		+		+
<i>Achnanthydium rivulare</i> Potapova & Ponader	ADRI	3	+		+			+											+		
<i>Achnanthydium straubianum</i> (Lange-Bert.) Lange-Bert.	ADSB	z	+		+			+									+	+		+	
<i>Adlafia muralis</i> (Grunow) Monnier & Ector	AMUR	?			+						+								+	+	
<i>Amphipleura pellucida</i> Kütz	APEL	*		+					+										+		

	CODE	Red List	Pioneer	Colonial	Life form			Ecological guilds			ARRESTRA			QUILIANO			SANSOBBIA			
					Non-colonial	Adnate	Pedunculate	High profile	Low profile	Motile	Planktonic	C	BS	TS	C	BS	TS	C	BS	TS
<i>Amphora pediculus</i> (Kütz) Grunow	APED	?	+		+	+			+				+	+	+	+	+	+	+	+
<i>Amphora pediculus</i> (Kütz) Grunow terat. form	APAB	z	+		+	+			+										+	
<i>Brachysira neoexilis</i> Lange-Bert.	BNEO	z			+				+				+	+						
<i>Caloneis lancettula</i> (Schulz) Lange-Bert. & Witkowski	CLCT	z			+					+					+	+	+	+	+	+
<i>Cocconeis euglypta</i> Ehrenberg emend Romero & Jahn	CEUG	?			+	+			+				+	+	+	+	+	+	+	+
<i>Cocconeis lineata</i> Ehrenberg	CLNT	?			+	+			+				+		+	+	+	+	+	+
<i>Cocconeis pediculus</i> Ehrenberg	CPED	?			+	+			+				+	+	+	+	+	+	+	+
<i>Cocconeis placentula</i> Ehrenberg terat. form	CPTG	z			+	+			+					+		+	+	+	+	+
<i>Cocconeis placentula</i> Ehrenberg	CPLA	?			+	+			+					+	+				+	
<i>Cocconeis pseudolineata</i> (Geitler) Lange-Bert.	COPL	D			+	+			+				+	+	+	+	+	+		+
<i>Craticula subminuscula</i> (Manguin) Wetzel & Ector	CSNU	?			+					+									+	+
<i>Cyclotella meneghiniana</i> Kütz	CMEN	?			+						+								+	+
<i>Cymbella compacta</i> Østrup	CCMP	*			+		+			+										+
<i>Cymbella excisa</i> Kütz	CAEX	z			+		+			+			+	+	+		+	+	+	+
<i>Cymbella excisiformis</i> Krammer	CEXF	z			+		+			+			+	+	+		+	+	+	+
<i>Cymbella parva</i> (W.Sm.) Kirchner	CPAR	z			+		+			+			+	+						
<i>Cymbella perparva</i> Krammer	CPPV	z			+		+			+										+
<i>Cymbella subtruncata</i> Krammer	CSUT	z			+		+			+			+	+						
<i>Cymbella tropica</i> Krammer	CTRO	z			+		+			+					+	+				
<i>Cymbella tumida</i> (Brebisson) Van Heurck	CTUM	*			+		+	+							+		+			
<i>Cymbella vulgata</i> Krammer	CVUL	z			+		+			+			+							
<i>Cymbopleura amphicephala</i> Krammer	CBAM	V		+						+					+					
<i>Denticula kuetzingii</i> Grunow	DKUE	*			+						+				+					
<i>Denticula tenuis</i> Kütz	DTEN	*			+						+			+	+	+	+	+		
<i>Diadesmis contenta</i> (Grunow) Mann	DCOT	?		+					+											+
<i>Diadesmis perpusilla</i> (Grunow) Mann	DPER	?		+					+						+					
<i>Diatoma ehrenbergii</i> Kütz	DEHR	?		+			+		+				+	+	+				+	+
<i>Diatoma ehrenbergii</i> Kütz terat. form	DEHT	z		+			+		+						+					
<i>Diatoma hyemalis</i> (hiemale) (Roth) Heiberg	DHIE	*		+			+	+					+							

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<i>Diatoma mesodon</i> (Ehrenberg) Kütz	DMES	*		+				+				+	+						
<i>Diatoma moniliformis</i> Kütz	DMON	?		+				+				+		+				+	
<i>Diatoma vulgare</i> Bory	DVUL	D		+				+				+	+	+				+	+
<i>Encyonema cespitosum</i> Kütz	ECAE	?		+				+				+	+	+				+	+
<i>Encyonema minutum</i> (Hilse) Mann	ENMI	*		+				+				+	+	+	+	+		+	+
<i>Encyonema silesiacum</i> (Bleisch) Mann	ESLE	*		+				+				+	+	+	+	+	+	+	+
<i>Encyonema ventricosum</i> (Agardh) Grunow	ENVE	*		+				+				+	+	+	+	+	+	+	+
<i>Encyonopsis cesatii</i> (Rabenhorst) Krammer	ECES	*			+				+			+	+						
<i>Encyonopsis minuta</i> Krammer & Reichardt	ECPM	z			+				+			+	+	+	+	+	+	+	+
<i>Encyonopsis subminuta</i> Krammer & Reichardt	ESUM	z			+				+			+	+	+	+	+	+	+	+
<i>Eolimna minima</i> (Grunow) Lange-Bert. terat. form	EOMT	?			+						+							+	+
<i>Eucocconeis laevis</i> (Oestrup) Lange-Bert.	EULA	*			+				+			+	+	+	+	+			
<i>Eunotia</i> sp.	EUNO	z		+					+				+						
<i>Fistulifera saprophila</i> (Lange-Bert. & Bonik) Lange-Bert.	FSAP	?			+						+				+	+	+	+	+
<i>Fragilaria arcus</i> (Ehrenberg) Cleve	FARC	?		+			+		+			+						+	
<i>Fragilaria austriaca</i> (Grunow) Lange-Bert.	FAUT	G		+					+			+	+						
<i>Fragilaria capucina</i> Desm.var. <i>capitellata</i> (Grunow) Lange-Bert. terat. form	FCCT	?		+											+				
<i>Fragilaria capucina</i> Desmazieres terat. form	FCAT	z		+									+	+					
<i>Fragilaria capucina</i> var. <i>rumpens</i> (Kütz)Lange-Bert.ex Bukht. terat. form	FRUT	?		+											+		+		
<i>Fragilaria delicatissima</i> (W.Smith) Lange-Bert.	FDEL	V			+						+		+					+	
<i>Fragilaria gracilis</i> Østrup	FGRA	*		+							+		+	+					
<i>Fragilaria neointermedia</i> Tuji et Williams	FNIN	z		+							+							+	+
<i>Fragilaria pararumpens</i> Lange-Bert. et al.	FPRU	z		+									+	+	+	+	+	+	+
<i>Fragilaria pectinalis</i> (O.F.Müller) Lyngbye	FPEC	z					+		+			+	+						
<i>Fragilaria perminuta</i> (Grunow) Lange-Bert.	FPEM	*		+								+	+	+					

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					Non-colonial	Adnate	Pedunculate	High profile	Low profile	Motile	Planktonic	C	BS	TS	C	BS	TS	C	BS	TS	
<i>Fragilaria rumpens</i> (Kütz.) Carlson	FRUM	*		+			+	+				+	+	+	+	+	+	+	+		
<i>Fragilaria sp.</i>	FRAS	z		+			+	+				+	+								
<i>Fragilaria vaucheriae</i> (Kütz) Petersen	FVAU	?		+			+	+				+	+	+				+	+	+	
<i>Geissleria acceptata</i> (Hust.) Lange-Bert. & Metzeltin	GACC	G			+					+					+		+	+			
<i>Geissleria decussis</i> (Ostrup) Lange-Bert. & Metzeltin	GDEC	?			+					+					+	+	+	+	+	+	
<i>Gomphonema sp.</i>	GOMP	z			+		+	+												+	
<i>Gomphonema acuminatum</i> Ehrenberg	GACU	?		+			+	+							+	+	+				
<i>Gomphonema capitatum</i> Ehr.	GCAP	z		+			+	+					+		+	+	+		+		
<i>Gomphonema cymbelliclinum</i> Reichardt & Lange-Bert.	GCBC	z			+		+	+				+	+	+	+				+		
<i>Gomphonema elegantissimum</i> Reichardt & Lange-Bert.	GELG	z			+		+	+				+	+	+	+			+	+	+	
<i>Gomphonema gracile</i> Ehrenberg	GGRA	D			+		+	+					+		+						
<i>Gomphonema italicum</i> Kütz	GITA	z		+			+	+											+		
<i>Gomphonema lateripunctatum</i> Reichardt & Lange-Bert.	GLAT	V			+		+	+				+	+								
<i>Gomphonema micropus</i> Kütz var. micropus	GMIC	*			+		+	+				+	+								
<i>Gomphonema minutum</i> (Ag.) Agardh	GMIN	?			+		+	+											+	+	+
<i>Gomphonema olivaceum</i> (Hornemann) Brébisson	GOLI	?		+			+	+											+	+	+
<i>Gomphonema parvulum</i> (Kütz) Kütz	GPAR	?			+		+	+				+	+	+	+	+	+	+	+	+	+
<i>Gomphonema tergestinum</i> (Grunow) Schmidt	GTER	G			+		+	+				+	+		+						
<i>Hippodonta pseudacceptata</i> (Kobayasi) Lange-Bert. et al.	HPDA	z			+						+						+				
<i>Karayevia clevei</i> (Grunow) Bukhtiyarova	KCLE	*			+		+		+			+	+				+				
<i>Mayamaea cahabaensis</i> Morales et Manoylov	MCAH	z			+						+								+	+	+
<i>Mayamaea permitis</i> (Hustedt) Bruder & Medlin	MPMI	?			+						+				+		+	+	+	+	+
<i>Melosira varians</i> Agardh	MVAR	?		+				+							+	+		+	+	+	+
<i>Navicula amphiceropsis</i> Lange-Bert. & Rumrich	NAAM	?			+						+										+
<i>Navicula antonii</i> Lange-Bert.	NANT	?			+						+				+	+	+	+	+	+	+
<i>Navicula capitatoradiata</i> Germain	N CPR	?			+						+				+	+	+	+	+	+	+
<i>Navicula caterva</i> Hohn & Hellerman	NCTV	•			+						+								+	+	+

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									Low profile	Motile	Planktonic	C	BS	TS	C	BS	TS	C	BS	TS			
<i>Navicula cryptocephala</i> Kütz	NCRY	?			+					+						+	+	+			+		
<i>Navicula cryptotenella</i> Lange-Bert.	NCTE	?			+					+			+	+	+	+	+	+	+	+	+	+	
<i>Navicula cryptotenelloides</i> Lange-Bert.	NCTO	*			+					+					+						+	+	
<i>Navicula gregaria</i> Donkin	NGRE	?			+					+					+	+	+	+	+	+	+	+	
<i>Navicula gregaria</i> Donkin terat. form	NGTG	z			+					+					+						+	+	
<i>Navicula novaesiberica</i> Lange-Bert.	NNOV	R			+					+											+	+	+
<i>Navicula radiosa</i> Kütz	NRAD	?			+					+				+									
<i>Navicula reichardtiana</i> Lange-Bert.	NRCH	?			+					+			+	+	+	+	+	+	+	+	+	+	+
<i>Navicula rostellata</i> Kütz	NROS	?			+					+					+								
<i>Navicula splendicula</i> Van Ledingham	NSPD	V			+					+					+	+	+						
<i>Navicula tripunctata</i> (O.F.Müller) Bory	NTPT	?			+					+					+						+	+	+
<i>Navicula veneta</i> Kütz	NVEN	?			+					+					+						+	+	
<i>Nitzschia</i> sp.	NITZ	*			+					+			+		+								
<i>Nitzschia acicularis</i> (Kütz) W.M.Smith	NACI	*			+							+			+							+	+
<i>Nitzschia amphibia</i> Grunow	NAMP	*			+					+					+	+	+	+	+	+	+	+	+
<i>Nitzschia archibaldii</i> Lange-Bert.	NIAR	z			+					+						+	+				+	+	+
<i>Nitzschia costei</i> Tudesque, Rimet & Ector	NYCO	?			+					+											+	+	+
<i>Nitzschia dissipata</i> (Kütz) Grunow	NDIS	z			+					+			+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia fonticola</i> Grunow terat. form	NFOT	?			+					+					+	+	+	+	+	+	+	+	+
<i>Nitzschia fonticola</i> Grunow	NFON	?			+					+			+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia heufleriana</i> Grunow	NHEU	?			+					+											+		
<i>Nitzschia inconspicua</i> Grunow	NINC	?			+					+					+	+	+	+	+	+	+	+	+
<i>Nitzschia inconspicua</i> Grunow terat. form	NZIT	z			+					+											+	+	
<i>Nitzschia lacuum</i> Lange-Bert.	NILA	*			+					+			+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia linearis</i> (Agardh) W.M.Smith	NLIN	?			+					+					+	+	+	+	+	+	+	+	+
<i>Nitzschia microcephala</i> Grunow	NMIC	?			+					+											+	+	
<i>Nitzschia oligotraphenta</i> (Lange-Bert.) Lange-Bert.	NIOG	v			+					+			+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia palea</i> (Kütz) W.Smith var. <i>palea</i>	NPAL	?			+					+					+	+	+	+	+	+	+	+	+
<i>Nitzschia palea</i> (Kütz) W.Smith var. <i>debilis</i> (Kütz)Grunow	NPAD	*			+					+			+		+	+	+	+	+	+	+	+	+

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<i>Nitzschia perminuta</i> (Grunow) Peragallo	NIPM	*			+					+					+	+	+			
<i>Nitzschia puriformis</i> Hlubikova et Ector	NPUF	z			+					+			+	+						
<i>Nitzschia recta</i> Hantzsch	NREC	?			+					+					+	+	+		+	
<i>Nitzschia recta</i> Hantzsch terat. form	NZRT	z			+					+					+	+				
<i>Nitzschia soratensis</i> Morales & Vis	NSTS	z			+					+							+	+	+	+
<i>Nitzschia sp. f. anormale</i>	NIZT	z			+					+				+			+	+	+	+
<i>Nitzschia tabellaria</i> (Grunow) Grunow	NTAB	V			+					+									+	
<i>Planothidium frequentissimum</i> (Lange-Bert.) Lange-Bert.	PLFR	?			+		+			+				+		+	+	+	+	+
<i>Planothidium lanceolatum</i> (Breb. ex Kütz.) Lange-Bert. terat. form	PTLT	z			+		+			+						+				
<i>Planothidium lanceolatum</i> (Brebisson ex Kütz) Lange-Bert.	PTLA	?			+		+			+					+	+	+	+	+	+
<i>Pseudostaurosira brevistriata</i> (Grunow) Williams & Round	PSBR	?		+				+											+	+
<i>Reimeria sinuata</i> (Greg.) Kociolek & Stoermer terat. form	RSIT	z			+		+	+		+									+	+
<i>Reimeria sinuata</i> (Gregory) Kociolek & Stoermer	RSIN	?			+		+	+		+			+	+	+	+	+	+	+	+
<i>Reimeria uniseriata</i> Sala Guerrero & Ferrario	RUNI	z			+		+	+		+							+	+	+	+
<i>Rhoicosphenia abbreviata</i> (Agardh) Lange-Bert.	RABB	?		+				+		+						+	+	+	+	
<i>Sellaphora nigri</i> (De Not.) Wetzel et Ector	SNIG	z			+					+				+		+	+	+	+	+
<i>Sellaphora pupula</i> (Kütz) Mereschkowksy	SPUP	?			+					+									+	
<i>Sellaphora saugerresii</i> (Desm.) Wetzel & Mann	SSGE	?			+					+					+	+	+	+	+	+
<i>Sellaphora stroemii</i> (Hustedt) Kobayasi	SSTM	z			+					+				+					+	
<i>Staurosira binodis</i> Lange-Bert.	SBND	*		+				+											+	+
<i>Synedra acus</i> Kütz	SACU	*		+				+						+						+
<i>Ulnaria biceps</i> (Kütz) Compère	UBIC	G		+				+					+	+	+	+				
<i>Ulnaria ulna</i> (Nitzsch) Compère	UULN	*		+				+					+	+	+	+	+	+	+	+
<i>Ulnaria ulna</i> (Nitzsch) Compère terat. form	UULT	z		+				+							+			+		

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[doi:10.1051/kmae/2012018](https://doi.org/10.1051/kmae/2012018)