



Universitat de Girona

# DISTRIBUTIONAL PATTERNS OF DIATOM COMMUNITIES IN MEDITERRANEAN RIVERS

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**PhD Thesis**

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COMMUNITIES IN MEDITERRANEAN RIVERS**

**Elisabet Tornés Bes**

**2009**



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Dissertation submitted by Elisabet Tornés Bes  
to obtain the PhD degree by the University of Girona

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**“Few objects are more beautiful than the minute siliceous cases of the diatomaceae: were these created that they might be examined and admired under the higher powers of the microscope?”**

**Charles Darwin  
The Origin of Species, 1872**

Cover paintings by Elisabet Tornés Bes

## AGRAÏMENTS

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## **SUMMARY**



## GENERAL INTRODUCTION

Algae and cyanobacteria are the most important groups of primary producers in streams. Algae are a highly diverse group of organisms that have important functions in aquatic habitats. Benthic algae are those primary producers that live on or in association with substrata (Stevenson 1996a). Water chemistry, light availability, variations in temperature, current velocity, or substrata type are the environmental variables that most affect benthic algal communities. Benthic algae, along with bacteria, fungi and protozoa make consortia of phototrophic and heterotrophic microorganisms that are embedded in a mucilage matrix, and therefore function as a community highly efficient in capturing and processing nutrients, the biofilm.

Bioassessment is an appropriate alternative of physicochemical discrete analysis for fluvial water quality assessment. Biological communities integrate the environmental effects of water chemistry, along with the physical and geomorphological characteristics of rivers and lakes (Stevenson & Pan 1999). Diatoms have been proved to be effective biological indicators of aquatic systems in several studies in Europe (e.g. Kelly et al. 1998, Prygiel et al. 2002).

Seasonality and variability in rainfall is the principal attribute of the Mediterranean-type climate (Gasith & Resh 1999), where stream communities undergo an annual cycle of a sequence of biotic and abiotic regulation, which is a unique characteristic of Mediterranean-type streams (Gasith & Resh 1999).

Diversity in local communities can be regulated by local factors (such as competition, disturbance and abiotic conditions) as well as by regional factors (such as history of climate, evolution and migration) (Hillebrand & Blenckner 2002). Human activities act to change both local and regional variables, leading to impacted biological communities.

In this context, the present study wants to elucidate the distributional patterns of diatom communities in Mediterranean rivers over different spatial and temporal scales. Thus, different approaches are studied in the different chapters.

## GENERAL MATERIAL AND METHODS

The study has been developed in Catalonia (NE Iberian Peninsula) which has an important spatial heterogeneity determined by its geomorphological and climatic diversity. The sites studied ranged from siliceous high-mountain fluvial systems to coastal streams, passing through calcareous and siliceous Mediterranean fluvial systems. These sites were selected to cover a wide range of fluvial typologies with different levels of human disturbance.

Sampling was conducted during summer (July-August) 2002 and spring (May-June) 2003 (but see Chapter 5). Sampling and counting followed CEN standards (2000, 2001). The available environmental data for the sampling sites included both water chemistry and physical characteristics.

## **CHAPTER 1. INDICATOR TAXA OF BENTHIC DIATOM COMMUNITIES: A CASE STUDY IN MEDITERRANEAN STREAMS**

A survey of 152 streams and rivers sites in NE Iberian Peninsula encompassing different watersheds was investigated with the objective to determine indicator taxa for different ecological statuses of streams and rivers and identify type-specific taxa for high-ecological status.

Four groups of stream types were defined by means of ordination analysis and classification techniques. Group 1 included unpolluted siliceous high-mountain headwaters sites mostly in streams of the Wet Mountain region; a second group consisted of sites in moderately enriched and mineralized waters, which included most of the river types previously defined in Catalonia, with overlapping of nearly natural and slightly impacted sites; group 3 accounted for sites in highly polluted lowland streams mostly in the Dry Mediterranean region; and finally, group 4 consisted of mineralized and mid-altitude mountain headwaters mostly located in the Mediterranean Mountain region. The type-specific diatom taxa for the stream types studied were determined by using indicator species analysis (IndVal). The type-specific taxa from near-natural streams were coincident with the indicator taxa for high ecological status.

Overall, the diatom communities in NE Iberian Peninsula exhibited a regional distribution pattern that closely corresponded with that observed in river systems elsewhere. Differences in diatom community composition were more evident among relatively undisturbed sites, disturbances leading to the homogenization of the communities over wide areas.

## **CHAPTER 2. CLASSIFICATION STRENGTH OF REFERENCE CONDITIONS. ARE BIOLOGICAL CLASSIFICATIONS OF STREAM BENTHIC DIATOM COMMUNITIES CONCORDANT WITH ECOREGIONS?**

Sites with no perturbation were analysed separately to assess the performance of the *a priori* classification systems of stream sites. Thus, different *a priori* classification systems for reference condition sites were checked for their relative effectiveness, and they were later compared to the biological classification, based only on diatom

communities' data. These were the ecoregional and subcoregional classification based on geomorphology and water flow; the watershed as a unit, irrespectively of its size; and a classification based on the geographical distance between sites, based on the assumption that biological characteristics are increasingly similar in geographically closer sites. This analysis was performed in the 31 reference sites from the data set in summer 2003.

The global classification strength showed that the ecoregional and the subcoregional classification were the most robust classifications after the classification based only on diatom community, which, as it was expected, had the highest classification strength. Although differences between ecoregions and subcoregions were very subtle in the classification, the ecoregional classification has the strongest classification system for reference conditions in the studied area. Watershed (hydrological units) classification was significant though weaker than the typological classifications, possibly as a consequence of the larger environmental variation within the watershed when compared to ecoregions. However, spatial factors and patterns in diatom structure at the reference sites did not indicate a significant strength, implying that the geographically close sites were not necessarily biologically more similar.

Since local in-stream factors seem to be at least as important as geographical factors in explaining diatom distributions at reference sites, a combination of regional classification based on more local environmental features might provide the most robust framework for diatom-based classification of streams.

### **CHAPTER 3. DISTRIBUTION OF DIATOM COMMUNITIES ALONG ENVIRONMENTAL GRADIENTS IN MEDITERRANEAN STREAMS. APPLICATION AND USEFULNESS OF DIATOM INDICES**

The responses of the diatom communities to the gradients of environmental variables were evaluated with regard to the usefulness of three diatom indices. For this, 73 sites from the whole data set were selected, those with the most completed environmental data set.

Gradient analyses were used to analyse the community structure and the major ecological gradients underlying the variation in species composition. Two major gradients were evident. Distribution of diatom communities was defined by a first gradient from headwaters to lowlands, which arranged sites from oligotrophic highland sites (where the genera *Achnanthes*, *Cymbella* and *Denticula* dominated the community), to low elevation sites located in densely populated, highly industrialized or agricultural areas (where communities were dominated by the genus *Navicula*). The



second gradient expressed geochemical and water temperature differences, and separated sites with high calcium content and higher temperatures (dominated by the genus *Cymbella*) from those of low mineralization and low temperatures (dominated by the genus *Diatoma*).

The three applied diatom indices, IPD, IBD and CEE, reliably assessed the water quality of the sites, although they did not properly reflect the special situations of Mediterranean streams, like the calcareous headwaters. However better correlations with environmental variables were observed with IPS and IBD, though IBD underestimate or overestimate particular situations in the studied Mediterranean streams. Because of this the IPS was suggested as the best index to assess water quality at the studied sites in the region. A recent intercalibration work has proved to be a suitable exercise for the Mediterranean region in Europe, but further investigation is still needed to develop a powerful tool to biomonitor river systems across Mediterranean region.

#### **CHAPTER 4. DIVERSITY PATTERNS OF BENTHIC DIATOMS IN MEDITERRANEAN RIVERS**

It was necessary to define the factors that determined the longitudinal distribution of diversity in the benthic diatom communities at a watershed level. For this purpose 3 watersheds from the regional approach were selected in this chapter. The aim was to determine if there existed any regularity in the diatom diversity between the 3 rivers or, on the contrary, there was a different model for each river. Diversity patterns were studied approaching diversity at three levels,  $\gamma$ -,  $\alpha$ - and  $\beta$ -diversity. The diversity of the whole watershed was considered as the  $\gamma$ -diversity, the diversity of the different sampling points studied along the longitudinal section as the  $\alpha$ -diversity, and finally, the species turnover between points as the  $\beta$ -diversity.

The results of this chapter indicated that the  $\alpha$ -diversity pattern for the Ter watershed was comparable with that of the Segre in summer and in spring. The  $\alpha$ -diversity showed a consistent increase from the headwaters to the middle stretches, and a decrease towards the lower parts of the rivers, though these differences were not so evident in spring. The Llobregat River followed a completely different pattern from that of the Ter and Segre Rivers. The degree of pollution governed the diversity patterns in this watershed and masked the physiographic effects. In the three watersheds, the  $\beta$ -diversity followed an inverse pattern than that of the  $\alpha$ -diversity. However, in the Llobregat watershed in summer the  $\alpha$ -diversity remained constant from the middle stretches but the turnover of species between habitats incremented or decreased.

Under natural conditions, the stream habitat is highly heterogeneous, but contamination causes habitat degradation and homogenization, which is detected by a loss of species turnover between habitats and a community saturation of species.

## **CHAPTER 5. THE EFFECT OF HABITAT ON THE DISTRIBUTION OF BENTHIC ALGAE AND CYANOBACTERIA IN A FORESTED STREAM**

The study at the habitat level was approached in Fuirosos, a Mediterranean forested stream. Thus, it was examined the influence of environmental variables with respect to purely spatial factors on the distribution of algal and cyanobacterial communities in winter (December) 2005 and spring (May) 2006, and two reaches differing in canopy cover were selected.

Analyses revealed that the major determinants of the distribution of species were the variations in environmental variables. Light availability as well as local hydraulic conditions and substrata type were the main factors accounting for the algal and cyanobacterial distribution. The factors affecting distribution varied between periods. This suggested that some species are environmentally demanding only under certain conditions, while others show a wider tolerance to environmental conditions.

The results of this chapter demonstrated the importance of habitat heterogeneity to benthic community distribution in a small stream and the effect of the habitat diversity on the structure of these communities.



## **RESUM**



## INTRODUCCIÓ GENERAL

Les algues i cianobacteris són els grups més importants de productors primaris en rius. Les algues són un grup molt divers d'organismes que tenen importants funcions en els ambients aquàtics. En concret, les algues bentòniques són aquells productors primaris que viuen sobre o en associació amb el substrat (Stevenson 1996a). La composició química de l'aigua, la disponibilitat de llum, les variacions de la temperatura i de velocitat del corrent, o el tipus de substrat són variables ambientals que més afecten les comunitats d'algues bentòniques. Les algues bentòniques juntament amb els bacteris, fongs i protozous conformen un consorci de microorganismes fototròfics i heterotròfics dins una matriu mucilaginosa, i que per tant funcionen com una comunitat molt eficient en la captura i processat de nutrients, el que hom anomena biofilm.

L'avaluació biològica és una alternativa apropiada a les anàlisis fisicoquímiques pel que fa a l'avaluació de la qualitat de l'aigua dels rius, ja que les comunitats biològiques integren els efectes ambientals de la química de l'aigua, a més de les característiques físiques i geomorfològiques de rius i llacs (Stevenson & Pan 1999). Les diatomees han estat proposades com a indicadors biològics efectius dels sistemes aquàtics en diferents estudis que s'han realitzat a nivell Europeu (e.g. Kelly et al. 1998, Prygiel et al. 2002).

L'estacionalitat i la variabilitat en el règim de pluges és la principal característica del clima mediterrani (Gasith & Resh 1999), on les comunitats fluvials estan sotmeses a un cicle anual d'una seqüència de regulació biòtica i abiòtica, una característica única d'aquests sistemes.

La diversitat de les comunitats biològiques pot ser regulada tant per factors locals (com la competició o les condicions abiòtiques) com regionals (com la història del clima) (Hillebrand & Blenckner 2002). Les activitats humanes actuen de manera que canvien tant aquestes variables locals com regionals, conduint a comunitats impactades.

En aquest context, doncs, el propòsit d'aquesta tesi és posar de manifest els patrons de distribució de les comunitats de diatomees en rius mediterranis en diferents escales espacials i temporals. D'aquesta manera, en els diferents capítols s'estudien diferents aproximacions.

## **MATERIAL I MÈTODES GENERALS**

L'àrea d'estudi, Catalunya, té una important heterogeneïtat espacial determinada per la seva diversitat geomorfològica i climàtica. Tot el conjunt de punts estudiats en aquesta tesi formen un rang des de rius silícics d'alta muntanya a torrents litorals, passant per rius mediterranis calcaris i silícics, i han estat seleccionats per a cobrir un rang ampli de tipologies fluvials i diferents nivells de pertorbació humana.

El mostreig es va dur a terme durant l'estiu (juliol-agost) de 2002 i la primavera (maig-juny) de 2003 (però veure capítol 4). El mostreig i el comptatge es van realitzar seguint els estàndards CEN (2000, 2001). Les dades recollides per als punts mostrejats inclouen tant característiques químiques com físiques.

## **CAPÍTOL 1. ESPÈCIES INDICADORES DE COMUNITATS DE DIATOMEES BENTÒNIQUES. UN CAS D'ESTUDI EN RIUS MEDITERRANIS**

En aquest primer capítol, per tal d'estudiar Catalunya a nivell regional, es van investigar 152 rius i rieres que englobaven diferents conques amb l'objectiu de determinar les espècies indicadores per als diferents estatus ecològics d'aquests rius i rieres i identificar els taxons específics per a un estatus ecològic elevat.

Es van definir quatre grups de tipologies fluvials mitjançant anàlisis d'ordenació i tècniques de classificació. El grup 1 incloïa capçaleres d'alta muntanya silícies i sense contaminació, la majoria de les quals es troben dins la regió Muntanya humida; el segon grup consistia en punts d'aigües moderadament enriquides i mineralitzades, que incloïa la majoria de tipologies fluvials definides a Catalunya, amb solapament d'estacions gairebé de condicions naturals i lleugerament impactades; el grup 3 representava punts de poca elevació altament contaminats que es troben principalment a la regió de Zona baixa mediterrània; finalment, el grup 4 consistia en capçaleres de muntanya mitjana mineralitzades, la majoria localitzades a la regió de Muntanya mediterrània. Els taxons específics per a les tipologies fluvials trobades es van determinar utilitzant l'anàlisi d'espècies indicadores (IndVal). Els taxons específics dels rius de condicions gairebé naturals eren coincidents amb els taxons indicadors d'estatus ecològic elevat. En general, les comunitats de diatomees de Catalunya van exhibir un patró de distribució regional que correspon amb els patrons observats en altres sistemes fluvials d'arreu. Les diferències en la composició de les comunitats de diatomees eren més evidents entre punts relativament no contaminats, així les pertorbacions porten a una homogeneïtzació de les comunitats en grans àrees.

## **CAPÍTOL 2. SOLIDESA DE LA CLASSIFICACIÓ DE LES CONDICIONS DE REFERÈNCIA. LES CLASSIFICACIONS BIOLÒGIQUES DE DIATOMEES BENTÒNIQUES FLUVIALS CONCORDEN AMB LES ECOREGIONS?**

Es van estudiar per separat els punts que no presentaven cap tipus de contaminació per tal d'avaluar el comportament de diferents sistemes de classificació de les condicions de referència *a priori*, que van ser comparats després amb la classificació biològica, basada només en les comunitats de diatomees. Aquests van ser la classificació per ecoregions i subecoregions, basades en geomorfologia i cabal; les conques com a unitat, independentment de la seva mida; i la classificació basada en la distància geogràfica, basada en el supòsit que es dona un increment en la similitud biològica en llocs propers geogràficament. L'anàlisi es va realitzar en 31 punts de referència ja estudiats al capítol 1 (mostres recollides la primavera de 2003).

Els resultats van mostrar que la classificació més sòlida era la classificació ecoregional i la subecoregional, després de la classificació biològica, que com era d'esperar va ser la classificació més forta. Tot i que les diferències entre les ecoregions i les subecoregions en la classificació eren molt subtils, es pot dir que la classificació per ecoregions era la més sòlida en la classificació d'estacions de referència de l'àrea d'estudi. La classificació per conques era significativa però no tant robusta, degut potser a la gran variació ambiental entre conques comparat amb les ecoregions. Els resultats, a més, van semblar indicar que les comunitats de punts geogràficament propers no eren necessàriament més similars.

Ja que els factors local en rius són tant importants com els factors geogràfics en explicar la distribució de diatomees en punts de referència, la combinació d'una classificació regional basada en més característiques ambientals locals podria proporcionar el marc més robust per a la classificació de rius basada en diatomees.

## **CAPÍTOL 3. DISTRIBUCIÓ DE LES COMUNITATS DE DIATOMEES EN GRADIENTS AMBIENTALS. APLICACIÓ I UTILITAT D'ÍNDEXS DE DIATOMEES**

En aquest capítol es va dur a terme una altra aproximació a nivell regional per a avaluar la resposta de les comunitats de diatomees als gradients ambientals i provar la utilitat de tres índexs de diatomees. Es van escollir 73 punts dels ja estudiats, que eren els presentaven una base de dades ambientals més completa.

Els resultats van determinar dos gradients principals de distribució de les comunitats de diatomees. El primer gradient ordenava els punts de capçalera a desembocadura, on els gèneres *Achnanthes*, *Cymbella* i *Denticula* dominaven les comunitats de punts



d'alta muntanya i oligotròfics, i el gènere *Navicula* ho feia en els punts de poca altitud localitzats en zones densament poblades, industrialitzades o bé àrees agrícoles. El segon gradient estava relacionat amb les característiques fisiogràfiques, on en punts d'aigües amb elevada temperatura i alt contingut de calci dominaven espècies del gènere *Cymbella*, i en punts d'aigües de baixa mineralització i baixa temperatura dominava el gènere *Diatoma*.

Es van aplicar tres índexs de diatomees, l'IPS, l'IBD i el CEE, que van demostrar ser uns bons indicadors de la qualitat de l'aigua, tot i que fallen en situacions especials dels rius mediterranis com són les capçaleres calcàries. Les millors correlacions amb les variables ambientals es van obtenir amb els índex IPS i IBD, però finalment es proposa l'IPS com al millor indicador ja que l'IBD subestima o sobreestima situacions determinades. La intercalibració engegada a la regió mediterrània a nivell europeu, doncs, es presenta com a un exercici útil, però cal treballar més a fons per a desenvolupar una eina potent de biomonitoratge a nivell mediterrani europeu.

#### **CAPÍTOL 4. PATRONS DE DIVERSITAT DE DIATOMEES BENTÒNIQUES EN RIUS MEDITERRANIS**

A nivell de conca era necessari definir els patrons que determinaven la distribució longitudinal de les comunitats de diatomees en termes de diversitat. Per a això es van seleccionar 3 conques de les ja estudiades en altres capítols, la conca del Ter, del Llobregat i del Segre, amb l'objectiu de determinar si existia alguna regularitat pels tres rius o bé cada un tenia un model diferent. Els patrons de diversitat es van estudiar a tres nivells, considerant la diversitat gamma ( $\gamma$ ) com la diversitat de tota la conca, la diversitat alfa ( $\alpha$ ) com la diversitat dels diferents punts estudiats al llarg de la conca i la diversitat beta ( $\beta$ ) com el recanvi d'espècies entre aquests punts.

Els resultats d'aquest capítol van mostrar que el Ter i el Segre tenien uns patrons de diversitat comparables, tant a l'estiu com a la primavera. La diversitat  $\alpha$  va experimentar un augment progressiu des de la capçalera als trams mitjos, i després un descens cap a les parts baixes, tot i que a la primavera aquestes diferències eren menys evidents. El Llobregat, en canvi, presentava un patró completament diferent. L'elevat grau de contaminació present en aquesta conca sembla que governava la distribució de la diversitat i emascarava els efectes fisiogràfics. La diversitat  $\beta$  seguia en tots els casos un patró invers a la diversitat  $\alpha$ , excepte al Llobregat on la diversitat  $\alpha$  es va mantenir constant en els trams baixos mentre la diversitat  $\beta$  tendia a disminuir.

D'aquests resultats es conclou que sota condicions naturals l'hàbitat fluvial és molt heterogeni, però la contaminació provoca homogeneïtzació i degradació d'aquests

hàbitats que es detecta en una pèrdua de recanvi d'espècies entre hàbitats i una saturació d'espècies de la comunitat.

## **CAPÍTOL 5. L'EFECTE DE L'HÀBITAT EN LA DISTRIBUCIÓ D'ALGUES I CIANOBACTERIS BENTÒNICS EN UNA RIERA FORESTADA**

L'estudi a nivell d'hàbitat es va realitzar a Fuirosos, una riera mediterrània forestada. Es va examinar la influència de les variables ambientals respecte els factors purament espacials en la distribució d'algues i cianobacteris en dos moments diferents, l'hivern (desembre) de 2005 i la primavera (maig) de 2006, i per a això es van escollir dos trams de la riera que diferien en la disponibilitat de llum que entra al canal.

Les anàlisis van revelar que els principals determinants de la distribució d'espècies eren variacions ambientals. La disponibilitat de llum així com les condicions hidràuliques locals o el tipus de substrat van resultar ser els principals factors de distribució de les comunitats, tot i que afectaven les espècies de manera diferent en cada moment estudiat. Això va suggerir que algunes espècies són ambientalment exigents només sota determinades condicions, mentre que d'altres tenen una tolerància més àmplia a les condicions ambientals.

Els resultats d'aquest capítol demostren la importància de l'heterogeneïtat de l'hàbitat en la distribució de les comunitats bentòniques en una riera de dimensions petites i l'efecte de la diversitat de l'hàbitat en l'estructura d'aquestes comunitats.



## **GENERAL INTRODUCTION**



## BENTHIC PRIMARY PRODUCERS IN STREAMS

Algae and cyanobacteria are the most important groups of primary producers in streams. Algae are a highly diverse group of organisms that have important functions in aquatic habitats. Benthic algae are those primary producers that live on or in association with substrata (Stevenson 1996a). Most of benthic algae in freshwater habitats are green algae (Chlorophyta), diatoms (Bacillariophyta), and red algae (Rhodophyta). Benthic algae are widely considered to be the main source of energy for higher trophic levels in many, if not most, unshaded temperate region streams (e.g. Minshall 1978). Moreover, they sequester inorganic nutrients (Mulholland 1996) and labile organics (Tuchman 1996), helping to purify stream water (Vymazal 1988). In river ecosystems, water chemistry, light availability, variations in temperature, current velocity, or substrata type are potentially environmental variables affecting benthic algal communities. The variability of these environmental characteristics, plus the biological interactions, cause habitats for river algae to differ and this might be reflected in their community structure even at the habitat scale (Walker et al. 1999, Cardinale et al. 2000). Algae show a wide variety of mechanisms to attach to the substratum, being stalks, sticky capsules, filaments, pads, glue or simply clinging to the substratum. Also the shape varies from simple, non-motile cells to motile, multicellular, filamentous structures (Azim & Asaeda

2005). The main growth form or morphology in stream benthos, excluding benthic diatoms, is colonial or filamentous. Many of the green algal filaments are individually macroscopic, whereas most of other algae are only macroscopically evident in multicellular masses (Stevenson 1996a). Benthic algae along with bacteria, fungi and protozoa make consortia of phototrophic and heterotrophic microorganisms that are embedded in a mucilage matrix, and therefore functioning as a community highly efficient in capturing and processing nutrients, the biofilm (Fig. 1).

A



B

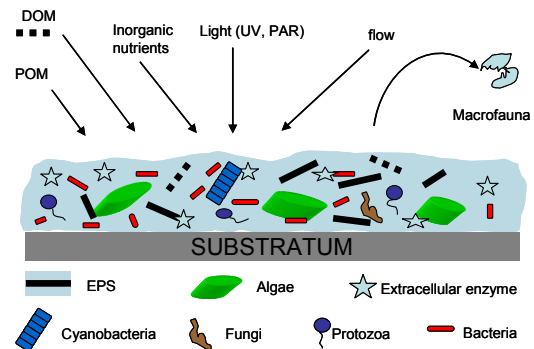


Fig. 1. A) Natural biofilm. B) Biofilm structure, biotic and abiotic interactions are represented (modified from Pusch et al. 1998).

## THE USE OF DIATOMS IN FLUVIAL BIOASSESSMENT

Physicochemical analyses have proved to be useful indicators of water quality, although fail to detect changes over a longer time scale, and do not necessarily reflect the ecological state of the system since they do not integrate ecological factors such as those altering the physical environment. Bioassessment is an appropriate alternative to the purely chemical analyses since biological communities integrate the environmental effects of water chemistry, along with the physical and geomorphological characteristics of rivers and lakes (Stevenson & Pan 1999). The short generation time of microorganisms make them appropriate early warning indicators of changes occurring in aquatic habitats (Sabater & Admiraal 2005). Diatoms usually account for the highest number of species among the primary producers in aquatic systems (Pan et al. 1999) and quickly react to environmental changes (Sabater et al. 1988, Rott 1991). Their structural elements in the siliceous cell wall allow reliable taxonomic determination at specific and sub-specific level (Fig. 2).

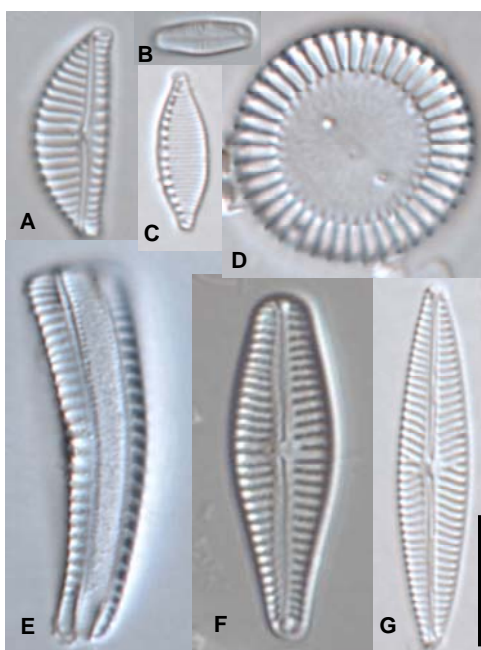


Fig 2. Diatoms. A) *Cymbella minuta*, B) *Achnanthes minutissima*, C) *Nitzschia fonticola*, D) *Cyclotella meneghiniana*, E) *Rhoicosphenia abbreviata*, F) *Gomphonema clavatum*, G) *Navicula cryptotenella*. Scale bar = 10  $\mu$ m.

They have been used as indicators of pH, salinity, nutrients as well as toxicity. Thus, diatoms have been proved to be effective biological indicators of aquatic systems in several studies in Europe (e.g. Kelly et al. 1998, Prygiel et al. 2002). Also they have

been considered in the European Framework Directive (European Commission 2000) as one of the biological quality elements in the definition of ecological status. The information provided by diatom communities may be understood by different approaches. On one hand, diatom indices constitute a way of summarizing the information provided by the autoecological preferences of the taxonomic composition of the diatom community (Sabater & Admiraal 2005). Several indices have been created and tested mainly in central and northern European rivers (Lange-Bertalot 1979, Coste in CEMAGREF 1982, Descy & Coste 1990, Lenoir & Coste 1996). Recently, different exercises of Intercalibration between different geographical European groups have been started within the Water Framework Directive (WFD). On the other hand, multivariate techniques are powerful methods to assess the important environmental gradients regulating community composition (Soininen 2002).

## **MEDITERRANEAN STREAMS**

Streams in Mediterranean-climate regions (areas surrounding the Mediterranean Sea, parts of western North America, parts of west and south Australia, south-western South Africa and parts of central Chile) are physically, chemically, and biologically shaped by sequential, predictable, seasonal events of flooding (late fall-winter) and drying (late summer-early fall) over an annual cycle. Seasonality and variability in rainfall is the principal attribute of the Mediterranean-type climate (Gasith & Resh 1999). On all continents, certain coastal regions in the middle latitudes, most extending between 30° and 40° north and south of the equator, are governed by a symmetrical atmospheric circulation that produces a climate characterized by mild, wet winters and hot, dry summers (Aschmann 1973). The marine influence keep winter temperatures mild, with mean monthly minima ranging from about 8° to 12 °C, and frost infrequent except at high elevations or well inland; summer mean monthly maxima usually vary between 18° and 30° C (Dell et al. 1989). Mediterranean regions are often rugged and have a marked change in elevation (except for Australia); therefore headwaters of some streams may be in high elevation areas where climate is wetter and colder than typical Mediterranean (e.g. Ter River in Spain, Sabater et al. 1995), the upper courses being partially subjected to a snow-fed regime. In these cases, streams may exhibit a bimodal flow pattern, one after rain in fall and the other after snow melt in spring. All the described characteristics influence the stream biota and their interaction with environment. That is, stream communities undergo an annual cycle where abiotic (environment) controls dominate during floods after which, where discharge declines, biotic (predation, competition) controls may become important. If there is extreme



drying or desiccation, abiotic regulation returns. The sequence of biotic and abiotic regulation is a unique characteristic of Mediterranean-type streams (Gasith & Resh 1999).



Fig. 3. Mediterranean streams in Catalonia (NE Iberian Peninsula). Tordera (A), Segre (B), Freser (C) and Ges (D) Rivers.

### THE IMPORTANCE OF INTEGRATIVE ECOLOGICAL SCALES

The physical characteristics of river systems can be investigated at spatial scales ranging from the individual particle to the entire drainage watershed and over equally broad temporal scale (Frissell et al. 1986, Fig. 4). This spatial-temporal framework likely has meaning for the biota (Fig. 5).

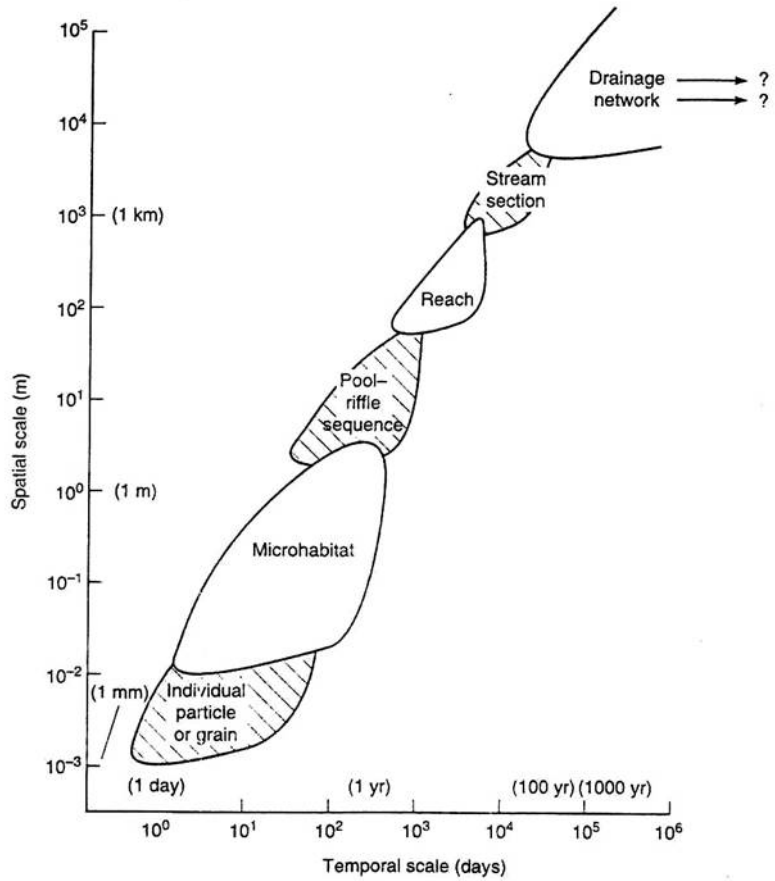


Fig. 4. An approximate spatial and temporal scale over which physical change takes place in rivers (From Frissell et al. 1986).

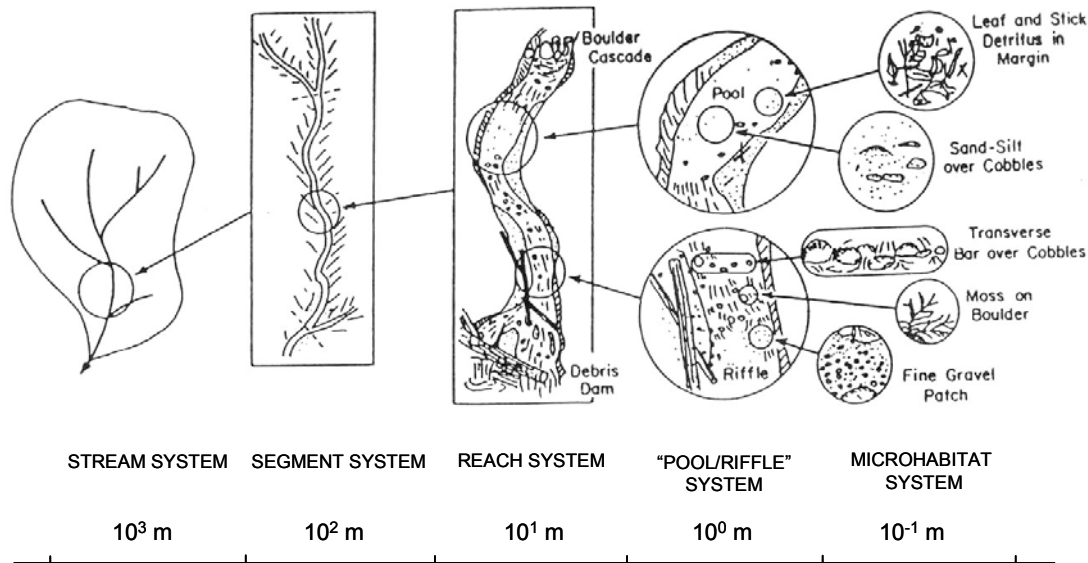


Fig. 5. Hierarchical organization of stream ecosystems, which determines the biological processes (From Frissell et al. 1986).

Running waters are naturally open, as well as hierarchical and heterogeneous ecosystems. This heterogeneity is expressed in physical, chemical and biological elements across multiple spatial and temporal scales, which are linked. The hierarchical system of running waters consist of streams systems, stream segments and reaches within streams, pool-riffle sequences within reaches and microhabitats within pools or riffles (Frissell et al. 1986, Fig. 5). Benthic algae present a considerable heterogeneity of biomass and species composition prevailing at these multiple spatial and temporal scales. The growth and success of benthic algae in streams is the outcome of complex interactions between hydrological, chemical and biotic factors (Biggs 1996). Proximate variables, variables directly controlling accrual and loss, like discharge regime and water quality, are controlled by higher-scale environmental features of catchments, ultimate variables, such as their topography, slope, land-uses and vegetation (Biggs et al. 1990). Human activities act to change both proximate and ultimate variables, leading to impacted biological communities. Diversity in local communities can be regulated by local factors (such as competition, disturbance, abiotic conditions) as well as by regional factors (such as history of climate, evolution and migration) (Hillebrand & Blenckner 2002). From several studies arise the question of how regional differences in diversity are generated and maintained during time (Rosenzweig 1995, Hillebrand & Azovsky 2001) and how these regional differences transfer into the diversity of local communities (Zobel 1997). The assembly of a local community is the result by species passing through a series of filters, which represent historical as well as ecological constraints on the arrival and survival of organisms at a certain locality (Hillebrand & Blenckner 2002).

The study of the patterns of benthic diatom communities in Mediterranean rivers was approached at different levels with the general aim of elucidating the factors affecting communities in each of these levels and in different temporal moments. At a regional level in Catalonia (NE Iberian Peninsula), a survey of 152 stream and rivers sites encompassing different watersheds provided an extensive survey of sampling sites, covering a wide range of fluvial typologies with different levels of human disturbance. The study region has an important spatial heterogeneity determined by its geomorphological and climatic diversity. The studied sites ranged from siliceous high-mountain fluvial systems to coastal streams, passing through calcareous and siliceous Mediterranean fluvial systems. At this level the idea was to study the responses of the diatom communities to the gradients of environmental variables, and also to determine indicator taxa for different ecological statuses of streams and rivers and identify type-specific taxa for high-ecological status. Multivariate techniques (ter Braak & Verdonschot 1995) allow the elucidation of ecological factors, which explain most of the

variation in diatom distribution. One method used to identify the indicator value of a range of taxa is the indicator value approach (IndVal, Dufrêne & Legendre 1997), which uses a species' degree of specificity and fidelity to an ecological state to define the indicator species as the most characteristic species within each state.

At a watershed level it was necessary to define the factors that determined the longitudinal distribution of diversity of benthic diatom communities. For this purpose 3 watersheds from the regional approach were selected. Two of them, the Ter and Llobregat, show similar physical dimensions though physical and chemical differences. The third system, the Segre, is larger and more diverse. The aim was to determine if there exists any regularity in the diatom diversity between the 3 rivers or, on the contrary, there is a different model for each river. The additive partition of Lande (1996), in which  $\gamma = \bar{\alpha} + \beta$ , express  $\alpha$ - and  $\beta$ -diversity in the same measurement units so that their relative importance could be easily quantified and interpreted (Crist & Veech 2006). This approach allows the diversity of the whole watershed to be considered as the  $\gamma$ -diversity, the diversity of the different sampling points studied along the longitudinal section to be the  $\alpha$ -diversity, and finally, the species turnover between points represent to be the  $\beta$ -diversity. With these 3 components of diversity, the diversity at different levels can be studied.

At a habitat level it was interesting to examine the effects of environmental factors that affected the microdistribution of biomass and composition of benthic algae and cyanobacteria in two reaches from Fuirosos, a Mediterranean forested stream previously studied at the regional level. Algal and cyanobacterial community was examined by multivariate analyses that consider the overall response of the community and the separate effects of the environmental variables.

## OBJECTIVES OF THE THESIS

The present study wants to elucidate the distributional patterns of diatom communities in Mediterranean rivers over different spatial and temporal scales. The main objectives are:

1. To describe the main distribution patterns of diatom communities and their best indicator taxa in Mediterranean streams, understanding how human influences are reflected in the variation in benthic diatom communities and type-specific indicator taxa.
2. To assess the performance of different *a priori* classification systems for reference condition sites to provide a reasonable framework for a corresponding regional grouping of streams according to their benthic diatom communities.
3. To determine the main environmental factors regulating diatom distribution in Mediterranean rivers.
4. To test the usefulness of different diatom indices developed in central Europe evaluating water quality, and the suitability of a Mediterranean intercalibration process in Europe for the use of diatom indices.
5. To investigate how abiotic environment contribute to shape diversity patterns in each river system and to determine whether the diversity patterns differ or not over watersheds of different size and characteristics.
6. To study the factors affecting the microdistribution of biomass and composition of benthic algae and cyanobacteria, and to assess the relative contribution of environment and space as determinants of this distribution at a habitat level in a Mediterranean forested stream.

## **GENERAL MATERIAL AND METHODS**



## STUDY AREA

Different data sets were used in order to assess the main objectives of the study. In this section a general description with common features of the area studied is carried out. Necessary details are explained extensively in each chapter.

The whole study area was composed of 152 stream and river sites in the NE Iberian Peninsula. These sites were selected to cover a wide range of fluvial typologies with different levels of human disturbance. Most of the sampled sites coincided with those designed by the control network of the Catalan Water Agency (ACA). Some reference sites included in this study were completely new, without previous historical data. The study sites were mostly located in western areas, with some sites in the hydrographic net of the River Ebre (Fig. 1).

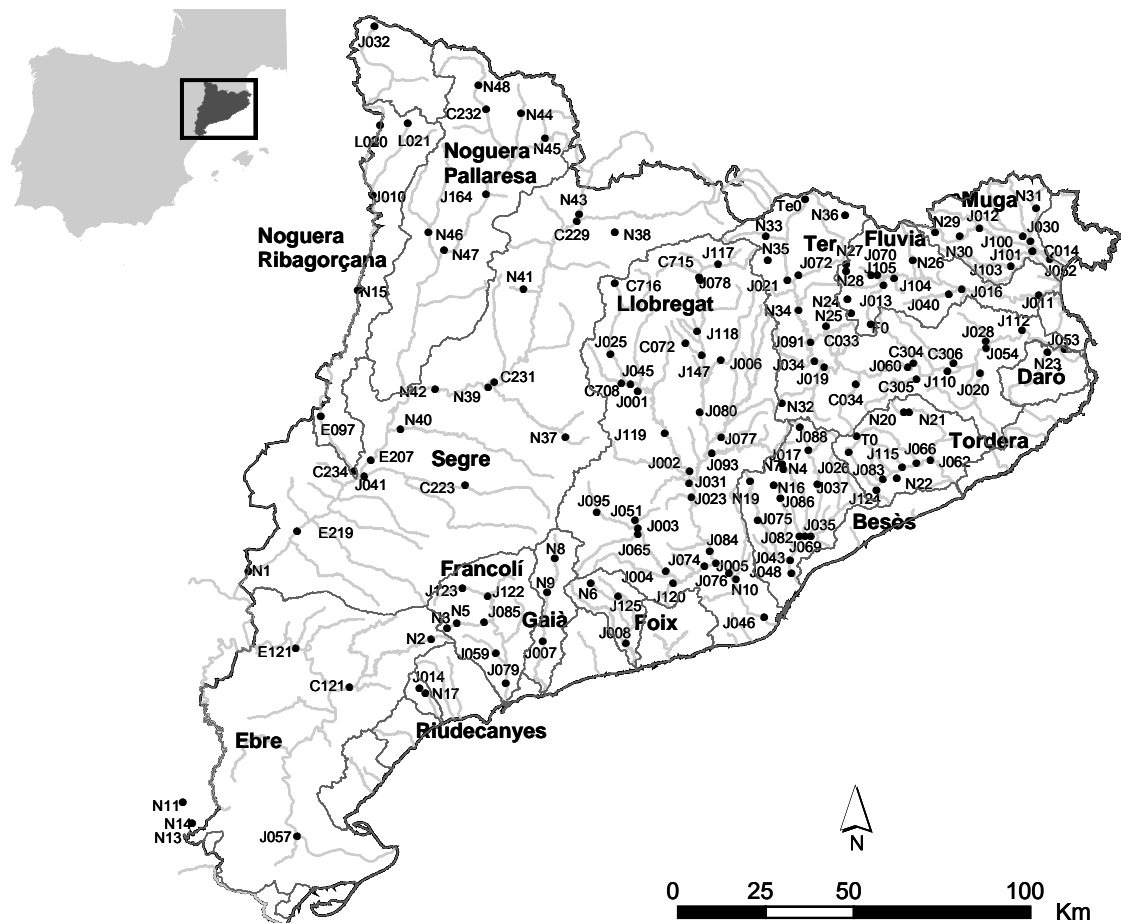


Fig. 1. Map of the study area and location of the sampling sites.



The study region has an important spatial heterogeneity determined by its geomorphological and climatic diversity. The sites included in the study ranged from siliceous high-mountain fluvial systems to coastal streams, passing through calcareous and siliceous Mediterranean fluvial systems. The internal watersheds are strongly influenced by a Mediterranean climate, with marked seasons and interannual variability in rainfall (Gasith & Resh 1999). These Mediterranean streams and rivers often flood in autumn and dry up in summer with consequent flow interruption. The shorter rivers (e.g. the Francolí, the Gaià) have their headwaters in middle mountain elevations and flow for a few kilometres to the sea. The larger systems, the Ter and the Llobregat, have their headwaters in the Pyrenees and therefore the upper courses are partially subjected to a snow fed regime. The tributaries of the Ebre watershed also have their headwaters in the Pyrenees, and experience minimum temperatures below 0°C, annual rainfall of above 1000 mm and heavy snowfall in winter. The middle and lower parts of the Ebre, the Llobregat and the Ter are subjected to a Mediterranean climate, implying high hydrological variability in these sections. Most of these streams and rivers are regulated and the existence of dams implies striking longitudinal differences in the river (Puig et al. 1987).

## **SAMPLING AND SPECIES IDENTIFICATION**

The aim of this section is to detail the most common methods for the different chapters, with the exception of Chapter 5, which follows a different methodology (see Chapter 5). Sampling was conducted during summer (July-August) 2002 and spring (May-June) 2003. Sampling and counting followed CEN standards (2000, 2001). At least five stones were randomly collected from the stream bottom in riffle sections. The substrata were scraped with a toothbrush or a knife to detach the algal communities to a final area of 2-10 cm<sup>2</sup>. The use of a toothbrush or a knife depended on the nature of the substrata sampled: if the substratum was softer, a toothbrush was used; in the case of harder substrata, the knife proved more efficient. Algal samples were preserved in formaldehyde 4% until analysis (Fig. 2).

The available environmental data for the sampling sites included both water chemistry and physical characteristics (see Appendix 1, page 155 and attached CD). The physical data collected in the field (Fig. 3) were dissolved oxygen, water temperature, conductivity and pH. Qualitative observations were also obtained for water transparency, light and the river habitat. Chemical data analyses were provided by the ACA. The altitude of the sites was derived from the Digital Elevation Model (DEM, 30 m x 30 m) of the Institute of Catalan Cartography (ICC, [www.icc.es](http://www.icc.es)) using ESRI ArcGIS®.



Fig. 2. Benthic algae collection.



Fig. 3. Physical data measurements by specific meters.

Diatom frustules were cleaned from the organic material using sulphuric acid, dichromate potassium and hydrogen peroxide, or, alternatively, boiling hydrogen peroxide. Frustules were mounted on permanent slides using Naphrax (r.i. 1.74; Brunel Microscopes Ltd., Chippenham, Wiltshire, UK). Up to 400 valves were counted on each slide by performing random transects under light microscopy using Nomarski differential interference contrast optics at a magnification of 1000x. Taxa were identified mainly according to Krammer & Lange-Bertalot (1991-1997) and Lange-Bertalot (2001) (see Appendix 2, page 155 and attached CD).



**CHAPTER 1. INDICATOR TAXA OF BENTHIC  
DIATOM COMMUNITIES: A CASE STUDY IN  
MEDITERRANEAN STREAMS**



## INTRODUCTION

According to the European Union Water Framework Directive (WFD) (European Commission 2000) the taxonomic composition of benthic diatoms is one of the biological quality elements in the definition of ecological status. Significantly, the determination of ecological status is based on characterizing type-specific reference or near-natural conditions and assessing the ecological quality of streams. This requires the development of a well-established typology and type-specific conditions. Diatoms are known to react sensitively to differences in physical and chemical characteristics of water (Rott et al. 1998, Passy et al. 1999, Winter & Duthie 2000) and they are abundant in rivers and streams (Round 1981). Since they integrate the environmental effects of water chemistry in addition to the physical and geomorphological characteristics of rivers and lakes, they have been considered among the best limnological indicators (Stoermer & Smol 1999), and indicator species for different nutritional levels have already been proposed for anthropogenically polluted waters (Sabater & Admiraal 2005).

Despite their importance as ecological indicators, large and regional scale knowledge of the structure and function of diatom communities is still scarce (Potapova & Charles 2002). Diatom communities may differ, both in their composition and relative abundance, because of their ecological affinities and preferences. Consequently, diverse diatom communities occur in natural waters spatially and temporally based on their geological setting, water chemistry and geomorphological conditions (Stevenson & Pan 1999). Many of these factors depend on climate, geology, topology and other physiographical features, but also on land-use characteristics. Land uses may be similar between ecological regions, and are likely to reduce the weight of physiography on diatom distribution, concealing the natural spatial heterogeneity (Leira & Sabater 2005). Therefore, it is relevant to understand the broad-scale patterns of diatom distribution in areas of high landscape diversity and a variety of human influences (Potapova & Charles 2002). Only through a good understanding of the variation in sensitivity and precision of diatom indicator species to environmental conditions among stream types and degrees of human disturbance can we develop and use biological indicators and indices with enough precision and accuracy.

NE Iberian Peninsula includes diverse physical and ecological regions, in a variety of landscapes ranging from high mountains to Mediterranean-dominated areas, which have been historically modified through irregular human influence. Studies on diatom distribution and autoecological preferences have so far included sparse watersheds

(Sabater et al. 1987, Sabater & Sabater 1988, Sabater & Roca 1992, Gomà et al. 2004), and none of them has attempted an overall analysis.

Under this framework, there is a need to identify type-specific diatom species, since the autoecological requirements are decisive in their use as indicator taxa. Several approaches have been used in ecology to investigate the species communities or indicator species that characterize a habitat. Diatom communities can be designated by the dominant taxa, but it is important to distinguish the tolerant taxa (occurring in all streams affected by a given disturbance) from those taxa more specific to a given condition. One method used to identify the indicator value of a range of taxa is the indicator value approach (IndVal). This method (Dufrêne & Legendre 1997) uses a species' degree of specificity and fidelity to an ecological state to define the indicator species as the most characteristic species within each state.

The present work provides an extensive survey of sampling sites, ranging from undisturbed locations to heavily disturbed sites, covering all river types in NE Iberian Peninsula. The objectives of this study were 1) to determine the indicator taxa for different ecological statuses of streams and 2) to identify type-specific taxa for high ecological status. It is also discussed how human influences are reflected in the variation in benthic diatom communities and type-specific indicator taxa.

## **MATERIAL AND METHODS**

### **Study area**

In this chapter the whole data set composed of 152 stream and river sites in NE Iberian Peninsula was used. More details can be obtained in the General Material and Methods.

The study sites covered the major types of geomorphologic and physiographic conditions (ACA 2003) and encompass the five river types of Catalonia. These five types have been defined in NE Spain in terms of climate, hydrology, geology and relief (Munné & Prat 2004). Wet mountain rivers (WM) are restricted to the high lands in the northwest (> 600 m a.s.l.) and encompass most of the Pyrenees ecoregion. This region is characterized by a high annual runoff (> 800 mm) and low mean annual temperatures (< 10°C). Siliceous geology is well represented in this river type (43%). The Mediterranean mountain rivers (DM) are located at an intermediate altitude (about 300–600 m a.s.l.), and are characterized by a moderate annual air temperature (9–14°C) and wet climate (> 850 mm year<sup>-1</sup>). The region of dry Mediterranean rivers (DL) is located in the central lowlands and is characterized by dry summers and an annual rainfall below 650 mm, and higher temperatures (14–16°C). The large watercourses

(LW) are also located in the lowlands and comprise those river stretches with high discharge values ( $> 20 \text{ m}^3 \text{ s}^{-1}$ ), although they have a moderate annual runoff ( $0.2\text{-}0.4 \text{ hm}^3 \text{ km}^{-2}$ ) because of the large catchment area drained. Annual precipitation is moderate and the mean annual temperature is about  $14^\circ\text{C}$ . Finally, coastal streams (CS) are located near the Mediterranean coast in the lowlands, and many of them are temporary or ephemeral streams, characterized by their small drainage area ( $< 250 \text{ km}^2$ ) and intermittent flow regime ( $> 120$  dry days per year).

### **Sampling and species identification**

See General Material and Methods.

### **Data analysis**

Multivariate data analyses were performed on the diatom data set to explore the main gradients of community variation and to detect and visualize similarities in the diatom samples. The major patterns of variation in the species composition data were described using a detrended correspondence analysis (DCA). DCA is an indirect gradient technique which assumes a unimodal response of species to their environment. Detrending by segments was undertaken using the CANOCO version 4.5 (ter Braak & Šmilauer 2002). Since the sampling data were distributed between two different seasons and years, time was considered as a categorical co-variable in order to avoid the effect of seasonal differences between the two study periods.

Given that DCA is a gradient analysis technique, the groups it outlined were not strictly followed. Therefore, a cluster analysis was performed to determine whether the interpretation of the DCA could result in the formation of different groups of sites. Sorensen's similarity coefficient (Czekanowski index) was measured on square-root transformed abundance data, and flexible beta was selected as the linkage method. Flexible beta was set to  $-0.25$  (Dufrêne & Legendre 1997). The cluster analysis was run with PC-Ord 4.2 (McCune & Mefford 1999). The statistical significance of between-group differences was tested using the multi-response permutation procedure (MRPP). MRPP is a non-parametric procedure that tests the hypothesis of no differences in assemblage structure among groups (Zimmerman et al. 1985). Sorensen's coefficient was also used as the distance measure. MRPP has the advantage of not requiring assumptions (such as multivariate normality and homogeneity of variances) that are seldom met with ecological community data. MRPP was also implemented using the program PC-Ord 4.2.

The Water Framework Directive assumes the denomination of type-specific taxa. Therefore, it is of the utmost importance to detect and describe the value of different



species as indicators of type-specific environmental conditions. The indicator value method (IndVal; Dufrêne & Legendre 1997) was then used to identify the indicator species of these groups of sites. IndVal is a simple and useful method to identify indicator species and species assemblages characterizing groups of samples (Dufrêne & Legendre 1997). The originality of this method lies in the way it combines information on the specificity and the fidelity of occurrence of a species in a particular group. It produces indicator values for each species in each group expressed as the product of the specificity and fidelity. Therefore, indicator species are defined as the most characteristic species of each group. The method derives indicators from any site classification. Taxa which were mostly observed in only one type of stream were nominated as type-specific. The statistical significance of the species indicator values is evaluated using a randomization procedure. The indicator value of a species  $i$  is the largest value of  $\text{IndVal}_{ij}$  observed among all groups  $j$ . The indicator value is at its maximum when all individuals of a species are found in a single group of sites (high specificity) and when the species occurs in all sites of that group (high fidelity) (Dufrêne & Legendre 1997).

Only those taxa occurring in at least three sites with an abundance of more than 1% during each of the sampling seasons were included in the analyses to minimize the influence of rare taxa. All analyses were carried out with square root transformed abundance data, except for the IndVal calculations which uses untransformed abundances.

## RESULTS

### Ordination

The DCA accounted for a relatively low percentage of explained variance. This is usual in noisy data sets which contain a large number of samples and taxa with zero values. Nevertheless, DCA effectively identified coherent ecological signals on the first two axes of the data set. The first DCA axis (15.5% of the variance) summarized the distribution of the diatom communities throughout the conductivity and nutrient gradient, which arranged the sites from the headwaters to the lowlands. The most polluted sites were clustered on the left side of the axis (Fig. 1) and corresponded to low elevation sites located in densely populated, highly industrialized or agricultural areas. Diatom taxa showing maximum abundance in these samples were *Nitzschia desertorum*, *Navicula saprophila*, *Nitzschia capitellata*, *Nitzschia frustulum*, *Navicula subminuscula*, *Nitzschia palea*, *Navicula veneta* and *Cyclotella meneghiniana*. Sites on the right side of the axis corresponded to communities in oligotrophic headwaters.

Diatom taxa abundant in these samples were *Cymbella delicatula*, *Achnanthes biasolettiana*, *Fragilaria arcus*, *Cymbella microcephala*, *Cymbella affinis* and *Gomphonema pumilum*.

The second DCA axis accounted for 6.7% of the variance. The main part of the near-natural or reference study sites were distributed along this axis. Sites with lower water temperatures and poorly mineralized waters were grouped together and apart from samples with higher temperatures and mineral content. Sites in the upper part of the diagram were in cold, siliceous, high-mountain headwaters of low mineralization. These were associated with *Fragilaria capucina* var. *rumpens*, *Fragilaria arcus* and *Cymbella sinuata*. Sites in the lower part of the diagram were in mineralized waters of calcareous mid-mountain headwaters, where *C. microcephala*, *C. delicatula* and *C. affinis* were characteristic.

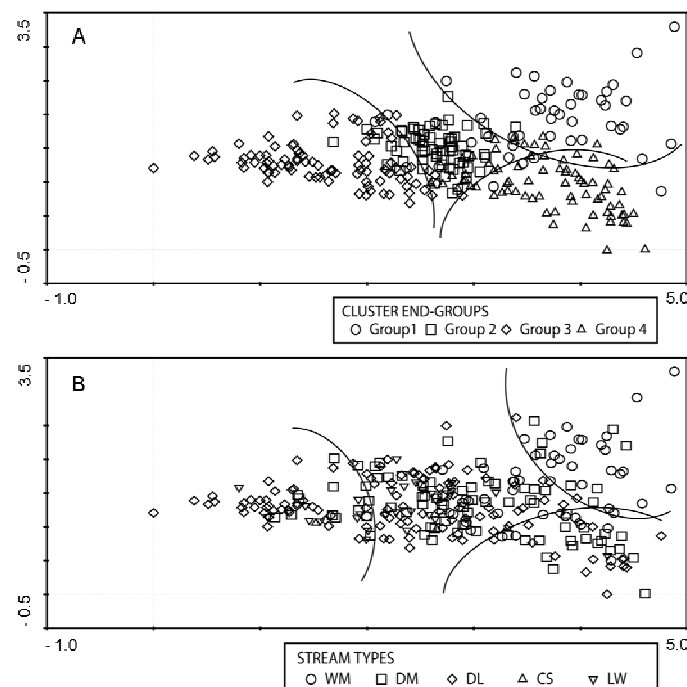


Fig. 1. Detrended correspondence analysis (DCA) of diatom communities in rivers of NE Iberian Peninsula in the ordination space of the first and second axis; A) DCA ordination of diatom assemblage samples classified by cluster groups, B) DCA ordination of diatom samples classified by river typology. Taxa codes correspond to those of Table 1.

### Diatom groups and type-specific taxa

After ordering the diatom communities by DCA as outlined above, a cluster analysis was performed. This classification analysis produced 4 groups of sites and confirmed the indications of the DCA (Table 1 and Fig. 2). A MRPP indicated significant

differences between the identified groups ( $A = 0.166$ ,  $p < 0.0001$ ). The main physical and water quality characteristics of the four groups of sites are indicated in Table 2.

Cluster group 1 (47 cases) included unpolluted and siliceous high-mountain headwater sites mostly in streams of the WM region. A second cluster group (67 cases) consisted of sites in moderately enriched and mineralized waters. This group included most of the river types, with overlapping of nearly natural and slightly impacted sites. Cluster 3 accounted for sites in highly polluted lowland streams (92 cases), mostly in the dry Mediterranean region. Finally, the fourth cluster group (76 cases) consisted of mineralized and mid-altitude mountain headwaters. Most of the streams in this group were located in the DM region.

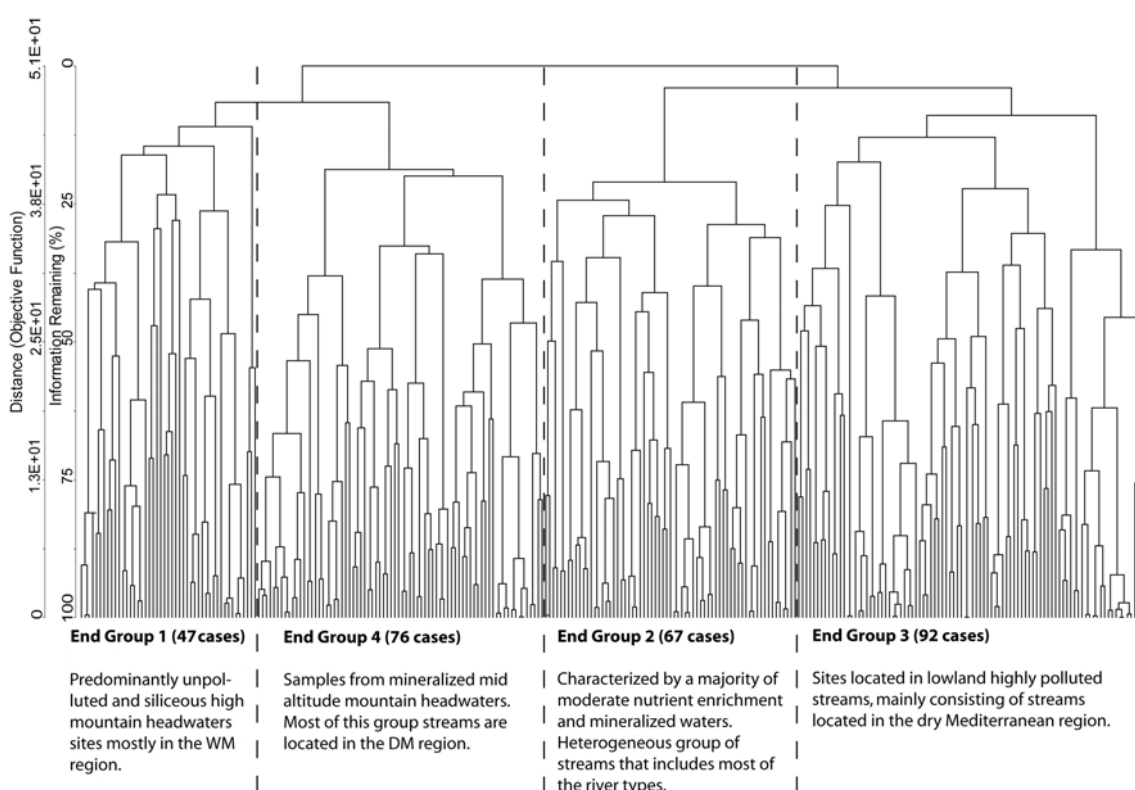


Fig. 2. Cluster dendrogram of the sampling sites. The four groups, with the number of sampling sites per group indicated in brackets, are identified and characterized.

Only eleven species were recorded as having high IndVals ( $> 50\%$ ) and could therefore be considered as good indicator species (Table 1). Nearly all site groups had species with high IndVals ( $> 50\%$ ). Species with higher IndVals were mostly characteristic in lowland, highly polluted rivers, as well as in mineralized mid-mountain headwaters. Although few species emerged as indicator species with high IndVals ( $> 50\%$ ) in unpolluted siliceous streams, those with low IndVals showed a high frequency of occurrence (high fidelity) in this group.

Table 1. Indicator values (IndVal) results for the most important taxa in each stream group. Significance of each species as a type-specific indicator was assessed by means of Monte Carlo tests based on 999 permutations ( $p < 0.001$ ). Fidelity (F) and specificity (S) values are also shown.

	Code	Group 1			Group 2			Group 3			Group 4		
		F	S	IndVal	F	S	IndVal	F	S	IndVal	F	S	IndVal
<i>Achnanthes biasolettiana</i> Grunow	ABIA	75	79	59	3	30	1	0	8	0	21	75	16
<i>Achnanthes minutissima</i> Kützing	AMIN	26	91	24	12	99	12	3	62	2	59	100	59
<i>Amphora inariensis</i> Krammer	AINA	4	15	1	65	58	38	2	5	0	29	21	6
<i>Cymbella affinis</i> Kützing	CAFF	15	49	8	4	30	1	3	12	0	78	88	68
<i>Cymbella microcephala</i> Grunow	CMIC	3	30	1	2	15	0	1	12	0	94	82	77
<i>Cymbella minuta</i> Hilse ex Rabenhorst	CMIN	41	79	32	33	75	25	0	7	0	26	62	16
<i>Cymbella sinuata</i> Gregory	CSIN	54	57	31	41	48	20	0	4	0	5	21	1
<i>Denticula tenuis</i> Kützing	DTEN	18	32	6	2	7	0	0	1	0	79	67	53
<i>Diatoma mesodon</i> (Ehrenberg) Kützing	DMES	96	36	35	3	6	0	1	1	0	1	3	0
<i>Diatoma moniliformis</i> Kützing	DMON	4	15	1	6	18	1	4	13	1	86	55	47
<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	GPUM	85	38	33	1	10	0	1	9	0	12	46	5
<i>Navicula capitatoradiata</i> Germain	NCPR	7	21	1	80	51	40	5	18	1	8	22	2
<i>Navicula gregaria</i> Donkin	NGRE	3	15	0	62	78	48	30	60	18	5	29	2
<i>Navicula saprophila</i> Lange-Bertalot & Bonik	NSAP	2	21	0	28	73	21	68	85	58	2	20	0
<i>Navicula subminuscula</i> Manguin	NSBM	0	4	0	3	33	1	94	66	62	3	13	0
<i>Navicula veneta</i> Kützing	NVEN	13	13	2	20	66	13	62	85	52	5	32	2
<i>Nitzschia fonticola</i> Grunow	NFON	26	55	14	56	85	48	4	35	2	14	54	7
<i>Nitzschia frustulum</i> (Kützing) Grunow	NIFR	1	11	0	5	33	2	92	67	62	3	25	1
<i>Nitzschia inconspicua</i> Grunow	NINC	4	23	1	48	85	41	44	50	22	4	22	1
<i>Nitzschia palea</i> (Kützing) W. Smith	NPAL	5	34	2	17	67	11	75	78	59	3	34	1

Only *A. biasolettiana* showed a high IndVal (59%) in the unpolluted (Table 2) siliceous upland streams (Group 1). *Diatoma mesodon*, *Gomphonema pumilum*, *Cymbella minuta* and *C. sinuata* showed a perfect indication between 25-35%. The species with the highest indicator value in Group 2 (*Nitzschia fonticola*, *Navicula gregaria*, *Nitzschia inconspicua* and *Navicula capitatoradiata*) showed a certain degree of preference for this particular environmental condition (i.e. high specificity), although they were also present across other stream types. In Group 3 only five taxa had a value index > 50%. These were *Nitzschia frustulum*, *N. palea*, *Navicula saprophila*, *N. subminuscula* and *N. veneta*, and they were therefore characteristic of lowland highly polluted sites with high mean phosphate and nitrate concentrations (Table 2). Indicator species (IndVal > 50%) of cluster Group 4 were *Cymbella microcephala*, *C. affinis*, *Achnanthes minutissima* and *Denticula tenuis*. These were indicator taxa from mineralized mid-mountain headwaters (Table 2).

Table 2. Statistical description for the environmental variables in each cluster group.

		N	Mean	Standard Deviation	Standard Error	Minimum	Maximum
Conductivity ( $\mu\text{S cm}^{-1}$ )	1	45	310.88	500.58	74.62	19.20	3320.00
	2	67	764.04	1317.22	160.92	105.40	10770.00
	3	86	1474.05	1550.72	167.22	284.00	14184.00
	4	67	577.76	553.10	67.57	45.90	3410.00
	Total	265	870.41	1234.07	75.81	19.20	14184.00
Nitrate ( $\text{mg NO}_3^- \text{-N L}^{-1}$ )	1	35	0.51	0.93	0.16	0.01	4.97
	2	53	2.44	2.92	0.40	0.01	20.11
	3	81	2.98	2.89	0.32	0.01	16.15
	4	47	1.44	2.84	0.41	0.01	15.73
	Total	216	2.11	2.80	0.19	0.01	20.11
Phosphate ( $\mu\text{g PO}_4^{3-} \text{-P L}^{-1}$ )	1	35	41.04	83.38	14.09	1.31	392.79
	2	53	140.06	405.04	55.64	2.18	2684.04
	3	81	325.71	554.88	61.65	2.18	3600.54
	4	47	51.03	103.62	15.11	2.18	626.28
	Total	216	174.26	415.66	28.28	1.31	3600.54
TOC ( $\text{mg C L}^{-1}$ )	1	32	1.99	2.95	0.52	0.05	17.07
	2	52	2.62	1.62	0.22	0.50	8.10
	3	80	5.51	5.90	0.66	0.05	44.70
	4	46	1.89	1.63	0.24	0.05	10.75
	Total	210	3.46	4.28	0.30	0.05	44.70
Water temperature ( $^{\circ}\text{C}$ )	1	42	14.85	3.68	0.57	8.00	22.00
	2	67	18.04	3.53	0.43	11.10	29.00
	3	85	19.67	3.31	0.36	11.00	26.80
	4	67	16.40	3.73	0.46	8.00	24.90
	Total	261	17.64	3.93	0.24	8.00	29.00
Altitude (m)	1	47	844	519	76	82	2241
	2	67	245	247	30	0	937
	3	92	189	216	23	1	1746
	4	75	509	287	33	9	1746
	Total	281	397	390	23	0	2241

## DISCUSSION

The diatom communities' composition and the characteristic species of each group of sites in NE Iberian Peninsula closely corresponded with those observed in other geographical areas (Potapova & Charles 2002, Martínez de Fabricius et al. 2003, Soininen et al. 2004). Benthic diatom assemblages are controlled by multiple factors reflecting land use and site-specific conditions at various temporal and spatial scales (DeNicola et al. 2004, Pan et al. 2004). Diatom distribution is sensitive not only to the biogeochemical characteristics of the waters (Aboal et al. 1996, Potapova 1996) and their nutrient content (Rott 1995, Licursi & Gómez 2002), but also to water velocity and substratum type (Passy et al. 1999, Martínez de Fabricius et al. 2003). The respective relevance of water quality variation and physiographic processes in rivers in a precise geographical area are expressed in a complex gradient, in which the interaction

between local and broader-scale factors determines the composition of diatom communities (Cushing et al. 1983, Molloy 1992, Steinman et al. 1992, Robinson et al. 1994, Leland 1995). This study shows the existence of distinctly different communities among river typologies. As a consequence, the indicator taxa for the near-natural streams proved to be type-specific.

*Achnanthes biasolettiana* was type-specific for high altitude, siliceous streams and was not observed in highly impacted streams. This taxon is characteristic of upstream sites with low human impact (Martínez de Fabricius et al. 2003, Soininen et al. 2004). *Gomphonema pumilum* and *Cymbella minuta* were also included in this group. The resulting species community is widely spread in headwaters characterized by low nutrient conditions (Lange-Bertalot 1980, Kelly 2002, Martínez de Fabricius et al. 2003).

In oligotrophic and mineralized headwaters the type-specific indicator taxa were *Achnanthes minutissima*, *Cymbella microcephala*, *C. affinis* and *Denticula tenuis*. Several *Cymbella* taxa and *A. minutissima* are dominant in the diatom communities of Pyrenean calcareous springs (Sabater & Roca 1992). *Cymbella* showed the highest affinity towards calcium in a data set collected from sites throughout the USA (Potapova & Charles 2003). However, the abundance of *A. minutissima* in headwaters is related to it being an early colonizer (Kelly 2002, Martínez de Fabricius et al. 2003) and favoured by the high water velocities in headwater streams.

Taxa such as *Navicula saprophila*, *N. subminuscula*, *N. veneta*, *Nitzschia frustulum* and *N. palea* were type-specific for river sections affected by intensive agricultural and industrial activities. These taxa have been described as highly tolerant and resistant to organic pollution (Vidal & Gentili 2000, Fawzi et al. 2002, Soininen 2002, John 2004, Rakowska 2004). Low elevation stretches support high irradiances, slow-moving waters and naturally high nutrient concentrations. The diatom taxa characteristic in these situations, such as *Navicula gregaria*, *Nitzschia fonticola* and *N. inconspicua*, are widespread in lowland rivers (Martínez de Fabricius et al. 2003).

Nutrient-enrichment and human disturbances have an overriding effect on local and large-scale factors, which are likely to reduce the regional differences (Gasse et al. 1983, Sabater & Roca 1992, Potapova & Charles 2003). An obvious consequence is that differences in diatom community composition are more evident among relatively undisturbed sites than among sites severely affected by nutrient enrichment. In this data set, sites in mid and low altitude areas with intensive agriculture and industry showed the largest overlap between nutrient-enrichment and physiographic factors (Leira & Sabater 2005). Accordingly, diatom species composition in the two groups of polluted sites showed the highest similarities to those sites subjected to human impact

elsewhere, regardless of their regional context. In streams with moderately polluted and mineralized waters, indicator values for the most characteristic species were all < 50% of perfect indication, implying that these taxa can be considered as sufficiently uncharacteristic. This might be, to a certain extent, a consequence of the overlapping conditions between near natural and impacted streams. Taxa characteristic of a particular habitat (i.e. high specificity and high fidelity) have a high indicator value. However, species showing another combination of specificity and fidelity might be useful indicators and are relatively resilient to changes. Some species with the highest indicator values (e.g. *Navicula gregaria*, *Nitzschia fonticola* and *N. inconspicua*) show a certain degree of preference for a particular environmental condition (i.e. high specificity), although they are also present across other stream types. Highly specific taxa are restricted to a single state and, consequently, these species might be regarded as sufficiently indicative of those sites with moderate nutrient enrichment. Under changing environmental conditions, species are more likely to decline or increase in abundance (i.e. fidelity), indicating mixed conditions or demonstrating a shift between different states.

River typology corresponded to diatom community classification among the least impacted sites when biota is regulated by regional factors, and where characteristic taxa indicated specific autoecological requirements. However, one of the strong inferences that may be drawn from the present results is that disturbances lead to the homogenization of the diatom community composition over wide areas, as the classification analysis grouped together streams with similar water chemistry, independently of their regional differences, in group 2. Interestingly, some taxa for highly impacted streams proved to be type-specific because they were mostly located in the dry Mediterranean climate region, thus showing a narrower geographical and ecological distribution. In spite of the downstream pollution gradient showed by the gradient analysis, this might suggest that anthropogenic impacts were not capable of completely overriding the regional, large-scale patterns in community structure.

The information value of indicators depends largely on how they are developed and calibrated, and more precisely on how well the autoecological requirements of those taxa are quantified. A key issue in developing indicator taxa is understanding the linkages between regional factors and diatom distribution. One conclusion derived from this study is that the use of diatom indices as an ecological tool (Descy 1979, CEMAGREF 1982) needs to take account of the different autoecological characteristics of the diatom taxa in different regions, and be adapted if it is to provide a reliable diagnosis of specific river systems. One of the main objectives of the WFD is to achieve a good ecological status for all European aquatic ecosystems by 2015. The

WFD provides a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. These findings support the characterization of river types through two classification systems (A and B) (Annex II of the WFD). The main purpose of typology is to enable type-specific conditions to be defined and to apportion study units. If the distribution of a diatom is limited primarily by regional characteristics, it should not be applied over wide areas so as to accurately discriminate between natural and human-induced changes.





**CHAPTER 2. CLASSIFICATION STRENGTH OF  
REFERENCE CONDITIONS. ARE BIOLOGICAL  
CLASSIFICATIONS OF STREAM BENTHIC DIATOM  
COMMUNITIES CONCORDANT WITH ECOREGIONS?**



## INTRODUCTION

The determination of the ecological status of river ecosystems is based on characterizing type-specific reference or near-natural conditions and referring them to the ecological quality of streams. This requires the development of a well-established typology and type-specific conditions. The development of such a framework for biological assessment involves necessarily determining natural classes of undisturbed systems (i.e. ecological classification). A correct identification of reference conditions is fundamental, since deviations between expected (reference) and observed conditions are the base for the assessment of ecological quality. The strategy of the reference conditions implemented by the Water Framework Directive (WFD) (European Commission 2000) represents a new paradigm in biological evaluation. Therein, the reference conditions are represented by a number of sites that include variation in their expression of the good status. Thus, this strategy admits that variability exists among the biotic communities of the different sites that represent reference conditions. Subsequently, reference conditions have to be linked to water body types, and the communities thriving there should represent, as much as possible, the full range of conditions occurring naturally within the water body type (Nijboer et al. 2004). Therefore, classification of reference sites should include the biological variability. Thus, a correct identification and classification of reference conditions has important implications for management programmes and future comparisons between different countries.

Ecological classification can be identified as a method for describing ecosystem structure, hence making possible the development of environmental criteria, illustrating current environmental conditions, and guiding efforts to maintain and restore physical, chemical and biological integrity. Classification has been used so far as a method to compare disturbed or existing vegetation with reference conditions (Goebel & Hix 1996, 1997, Jenkins & Parker 1998, Palik et al. 2000). Classification can be done either with physical features (*a priori*), in which previous knowledge or assumptions are used to develop a classification, or by analysis of biological data without physical features or explicit prior assumptions (*a posteriori*) on the causes of differences among assemblages (Hawkins & Norris 2000). A central aspect of the WFD is to proceed to type-specific ecological assessment and classification. An integral part of this approach is the development of baseline data by which to compare various disturbances and land-uses. The WFD defines a European typological framework for assessing the ecological quality of streams, which is based on a fixed typology including catchment size, geology and altitude (system A) or alternatively variables such as latitude,

longitude, altitude, catchment size and geology (system B). This typological framework groups therefore areas of similar climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables. These ecoregions should define areas where similar communities are likely to occur and, therefore, where similar predictions can be established. For this reason, ecological regions have proven to be an important tool for ecological assessment. By delineating geographic areas with similar characteristics, ecological regions provide a framework for developing relevant indicators, setting expectations through the use of regional reference sites, establishing ecoregion-specific criteria and/or standards, presenting results, focusing models based on relationships between landscape and surface water metrics, and setting regional priorities for management and restoration.

The Water Agency in Catalonia (NE Iberian Peninsula) proposed a multivariate system to synthesize the environmental descriptors and to define river types using System B (Munné & Prat 2004). This method resulted in two levels of classification. Five 'river types', were mainly discriminated by annual runoff coefficient, air temperature, and discharge. A second level defining 10 'subtypes of river management' was established by the catchment geology and flow regime (see Material and methods in this chapter). Discussion has centered around the concordance between initial classification (*a priori*) by physical geographic features, and classification based on biological data, usually species composition (*a posteriori*) (Hawkins & Norris 2000). The result of the *a posteriori* approach, which is an empirical analysis of biological data to develop classes, might be a classification that group or not reference sites according to the *a priori* patterns. This would imply the necessity of testing and refining the *a priori* classification with subsequent analysis of the biological data.

According to the WFD the taxonomic composition of benthic diatoms is one of the biological quality elements in the definition of ecological status. Diatoms are known to respond (in terms of composition and abundance) sensitively to differences in physical and chemical characteristics of water (Rott et al. 1998, Passy et al. 1999, Winter & Duthie 2000). Because of their diverse autoecological requirements, their siliceous remains are used extensively as environmental indicators of climate change, acidic precipitation and water quality (Stoermer & Smol 1999), as well as indicator species for different nutritional levels in anthropogenically polluted waters (Sabater & Admiraal 2005).

In this study, stream diatom community data have been used to assess the performance of the *a priori* classification systems of stream sites. Within the context of the results of Chapter 1 the undisturbed sites were tested separately. Thus, different *a priori* classification systems for reference condition sites were checked for their relative

effectiveness, and they were later compared to the biological classification, based only on diatom communities' data. These were the ecoregional and subcoregional classification detailed above, based on geomorphology and water flow; the watershed as a unit, irrespectively of its size; and a classification based on the geographical distance between sites, based on the assumption that biological characteristics are increasingly similar in geographically closer sites.

## MATERIAL AND METHODS

Epilithic diatom community data collected from 31 reference sites (Fig. 1) in the NE Iberian Peninsula during the summer 2003 have been used (Table 1 and 2). More details are described in General Material and Methods.



Fig. 1. Map of the study area and location of the reference sites.

Table 1. Reference sites used in this study. See Table 2 for correspondence between numbers and types and subtypes names. Not all the river types and subtypes were considered due to the absence of reference sites. In this chapter Ebre, Segre, Noguera Pallaresa and Noguera Ribagorçana watersheds were all considered as Ebre watershed.

Watershed and stream	Site	Code	Type	Subtype
<b>Besòs</b>				
Avencó	Aiguafreda	J017	2	3
Caldes	Gallifa	N16	3	6
Rossinyol	Sant Miquel del Fai	N4	3	6
Tenes	Sant Miquel del Fai	N7	3	6
<b>Ebre</b>				
Cadí	Cava	N38	1	2
Fontanet	Organyà	N41	1	2
Noguera de Cardós	Lladorre	N44	1	1
Noguera de Vallferrera	Alins	N45	1	1
Flamicell	Lluçà	N46	1	2
Noguera Pallaresa	Alòs d'Isil	N48	1	1
Noguera de Tor	Balneari de Boí	L021	1	1
Noguera Ribagorçana	Senet	L020	1	1
Siurana	La Febró	N2	3	6
<b>Fluvià</b>				
Ser	Serinyà	J040	2	4
Gurn	Sant Privat d'en Bas	N24	2	4
Joanetes	Joanetes	N25	2	4
Llierca	Pont de Llierca	N26	2	4
Sant Ponç	Sant Salvador de Bianya	N27	2	4
Ferró	Sant Salvador de Bianya	N28	2	4
<b>Francolí</b>				
Brugent	Capafons	N3	3	8
<b>Llobregat</b>				
Merlès	Santa Maria de Merlès	J006	2	4
<b>Muga</b>				
Muga	Albanyà	N29	2	4
Muga	Sant Llorenç de la Muga	N30	2	4
<b>Ter</b>				
Freser	Planoles	N33	1	1
Solana	Sant Quirze de Besora	N34	2	4
Merdàs	Gombrèn	N35	1	2
Ritort	Molló	N36	1	1
Ter	Setcases	Te0	1	1
<b>Tordera</b>				
Tordera	Les Illes	T0	1	1
Santa Coloma	Les Fosses	N20	3	6
Fuirosos	Gualba	N22	2	3

Table 2. River types and subtypes of river management for the internal watersheds in Catalonia.

River types	Subtypes of river management
1 Humid mountain rivers	1 Siliceous humid mountain rivers
	2 Calcareous humid mountain rivers
2 Mediterranean mountain rivers	3 Siliceous Mediterranean mountain rivers
	4 Calcareous Mediterranean mountain rivers
	5 Mediterranean mountain rivers with high discharge
3 Dry Mediterranean rivers	6 Lowlands Mediterranean rivers
	7 Siliceous dry Mediterranean rivers
	8 Karst feed rivers
4 Large watercourses	9 Large watercourses
5 Coastal streams	10 Coastal streams

Classifying the diatom communities into groups with similar species composition was conducted by means of cluster analysis in R-package (R Development Core Team 2004). Clustering was conducted using Bray-Curtis dissimilarity and flexible-linkage ( $\beta = -0.25$ ) which conserves the object space (Legendre & Legendre 1998). The classification dendrogram was pruned to an optimum number of clusters with the aid of multiresponse permutation procedures (MRPP) in order to select the level of the classification with the highest divergence between groups and the highest convergence within groups. MRPP was performed on data separated into at least two clusters and up to 15 clusters. Results from the MRPPs that showed high separation between groups (T-statistic) and high homogeneity within groups (A-statistic) were used to select the optimum number of plot clusters.

After the optimum number of clusters was determined, an indicator species analysis was performed to identify which diatom species were important to each end-group cluster. Indicator species analysis provides a method of combining the relative abundance and relative frequency of each species into an indicator value (Dufrêne & Legendre 1997). Indicator values (IndVals) were tested for statistical significance using a randomization technique (Monte Carlo). The randomizations were used to test the statistical significance of each species' IndVal by finding the probability of achieving an equal or greater IndVal from randomized data. Species having IndVals significantly different from the randomized data were identified as significant indicators of their respective plot groups. Indicator values range from 0 to 100, with 100 representing perfect indication.

The strength of the respective different classifications was compared with the following procedure. The classification strength (CS) of ecoregions and subcoregions was tested using the randomization protocol of Van Sickle & Hughes (2000). Hence, the mean of all between-class similarities (B) and the within-class mean similarity (W) were



first calculated using Bray-Curtis similarity coefficient. CS is defined as the difference between these similarities ( $CS = W-B$ ). Values of this measure range from 0 to 1, with those near zero indicating that sites are randomly assigned to classes. A similar procedure was followed to test the classification strength of hydrological units. Finally, was also tested if the proximity of sites in the biological classification could be explained by mere spatial/geographical distance between the sampling sites. If this was positive, site similarity was more a product from spatial autocorrelation rather than from ecological similarity. The classification strength of spatial coordinates (longitude and latitude, see Appendix 1) of the study sites grouped according to the biotic classification was therefore tested.

The observed values of CS were later compared to permuted values, obtained through 1000 random reassignments of sites to groups. Since such permutation tests are able to assign statistical signification to very small differences between observed and expected values of CS when sample size is moderately large (Van Sickle & Hughes 2000) the emphasis was mostly placed on the relative magnitude of CS statistic than on the p-values from the randomization tests.

**RESULTS**

Cluster analysis provided 4 site groups (Fig. 2) validated by MRPP procedure showing the highest separation between groups (T-statistic) and highest homogeneity within groups (A-statistic).

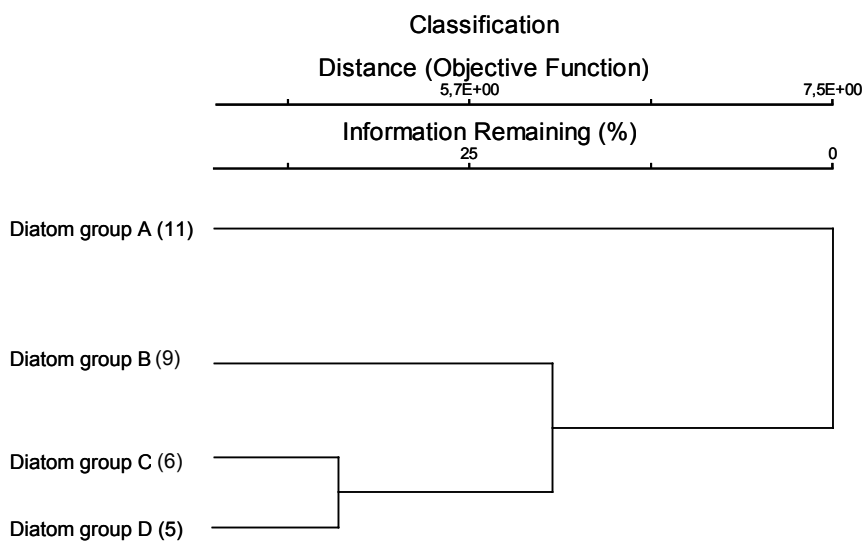


Fig. 2. Flexible Beta clustering dendrogram of reference sites based on their Bray-Curtis similarities. The number of sites in each group is shown in brackets.

The physiographic and chemical characteristics of the 4 end-groups obtained by the cluster analysis are detailed in Table 3.

Table 3. Mean values (n) of the environmental variables for each of the diatom groups. Standard errors of the mean are given in italics.

	Diatom group			
	A	B	C	D
pH	8.15 (11) <i>0.06</i>	8.19 (9) <i>0.10</i>	8.22 (6) <i>0.15</i>	7.69 (5) <i>0.11</i>
Conductivity ( $\mu\text{S cm}^{-1}$ )	388.82 (11) <i>58.80</i>	576.78 (9) <i>150.38</i>	263.10 (6) <i>46.70</i>	61.30 (5) <i>14.96</i>
Water temperature ( $^{\circ}\text{C}$ )	15.89 (11) <i>1.17</i>	15.13 (9) <i>0.50</i>	14.08 (6) <i>0.76</i>	10.12 (5) <i>0.92</i>
Oxygen saturation (%)	101.36 (7) <i>2.36</i>	98.34 (8) <i>4.17</i>	112.67 (6) <i>6.68</i>	111.18 (5) <i>4.45</i>
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	67.63 (8) <i>20.95</i>	18.75 (4) <i>4.33</i>	47.60 (5) <i>23.05</i>	21.00 (4) <i>15.02</i>
$\text{Cl}^{-}$ ( $\text{mg L}^{-1}$ )	8.86 (8) <i>1.32</i>	8.45 (4) <i>3.13</i>	10.94 (5) <i>4.85</i>	5.32 (4) <i>2.09</i>
$\text{HCO}_3^{-}$ ( $\text{mg L}^{-1}$ )	222.55 (8) <i>21.71</i>	224.95 (4) <i>36.26</i>	145.44 (5) <i>35.55</i>	46.26 (4) <i>15.49</i>
$\text{K}^{+}$ ( $\text{mg L}^{-1}$ )	1.72 (8) <i>0.46</i>	1.34 (4) <i>0.24</i>	0.43 (5) <i>0.12</i>	0.26 (4) <i>0.07</i>
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	62.64 (8) <i>8.58</i>	38.72 (5) <i>5.16</i>	44.8 (5) <i>11.75</i>	20.42 (4) <i>10.43</i>
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	21.33 (8) <i>3.93</i>	13.20 (5) <i>2.86</i>	9.66 (5) <i>4.29</i>	2.64 (4) <i>1.14</i>
$\text{Na}^{+}$ ( $\text{mg L}^{-1}$ )	6.10 (8) <i>1.07</i>	10.79 (5) <i>2.71</i>	2.10 (5) <i>0.97</i>	1.75 (4) <i>0.72</i>
$\text{NO}_3^{-}\text{-N}$ ( $\text{mg L}^{-1}$ )	0.38 (8) <i>0.14</i>	0.40 (4) <i>0.14</i>	0.14 (4) <i>0.05</i>	0.19 (3) <i>0.09</i>
$\text{NH}_4^{+}\text{-N}$ ( $\text{mg L}^{-1}$ )	0.05 (3) <i>0.03</i>	0.01 (1)		0.04 (1)
$\text{PO}_4^{3-}\text{-P}$ ( $\mu\text{g L}^{-1}$ )	21.00 (8) <i>16.09</i>	9.60 (4) <i>7.71</i>	12.00 (4) <i>5.94</i>	10.18 (3) <i>5.95</i>
TOC ( $\text{mg L}^{-1}\text{ C}$ )	1.15 (8) <i>0.36</i>	0.62 (3) <i>0.29</i>	0.73 (4) <i>0.39</i>	1.14 (3) <i>0.09</i>
Width (m)	8.50 (11) <i>2.96</i>	3.44 (9) <i>0.45</i>	7.17 (6) <i>2.94</i>	4.40 (5) <i>0.40</i>
Depth (cm)	19.50 (10) <i>2.52</i>	21.67 (9) <i>6.24</i>	23.33 (6) <i>4.41</i>	45.00 (5) <i>10.72</i>
Altitude (m)	667.09 (11) <i>148.42</i>	502.44 (9) <i>86.32</i>	1027.50 (6) <i>165.09</i>	1179.60 (5) <i>78.14</i>

Sixteen species were recorded as having high IndVals (> 50%) and could therefore be considered as good indicator species (Table 4). All site groups had species with high IndVals (> 50%).

Table 4. Indicator value (IndVal) results for the most important taxa in each stream group. Significance of each species as type-specific indicator for each group was assessed by means of Monte Carlo permutation tests based on 999 permutations ( $p < 0.001$ ). The average (Avg) and maximum (Max) value recorded for a species in all groups are also shown.

Taxa	Code	Avg	Max	Group	Observed IndVal (%)				p-value
					A	B	C	D	
<i>Cymbella microcephala</i> (Grunow) Krammer	CMIC	24	90	A	<b>90</b>	2	3	0	0.001
<i>Denticula tenuis</i> Kützing	DTEN	18	61	A	<b>61</b>	2	10	1	0.016
<i>Cymbella affinis</i> Kützing	CAFF	22	53	A	<b>53</b>	16	17	0	0.040
<i>Navicula cryptotenella</i> Lange-Bertalot	NCTE	20	53	A	<b>53</b>	20	4	2	0.012
<i>Gomphonema lateripunctatum</i> Reichardt & Lange-Bertalot	GLAT	13	51	A	<b>51</b>	1	0	0	0.017
<i>Cocconeis pediculus</i> Ehrenberg	CPED	23	91	B	1	<b>91</b>	0	1	0.001
<i>Amphora pediculus</i> (Kützing) Grunow	APED	18	67	B	2	<b>67</b>	2	2	0.002
<i>Navicula gregaria</i> Donkin	NGRE	15	56	B	1	<b>56</b>	0	2	0.008
<i>Nitzschia inconspicua</i> Grunow	NINC	14	52	B	0	<b>52</b>	0	2	0.030
<i>Achnanthes biasolettiana</i> Grunow	ABIA	23	76	C	3	10	<b>76</b>	3	0.001
<i>Diatoma ehrenbergii</i> Kützing	DEHR	13	50	C	0	0	<b>50</b>	0	0.011
<i>Diatoma mesodon</i> (Ehrenberg) Kützing	DMES	25	98	D	0	0	1	<b>98</b>	0.001
<i>Fragilaria arcus</i> (Ehrenberg) Cleve	FARC	24	91	D	0	0	4	<b>91</b>	0.001
<i>Achnanthes biasolettiana</i> Grunow var. <i>subatomus</i> Lange-Bertalot	ABSA	20	80	D	0	0	0	<b>80</b>	0.001
<i>Achnanthes lanceolata</i> (Breb.) Grunow	ALAN	19	73	D	0	2	0	<b>73</b>	0.002
<i>Cymbella sinuata</i> Gregory	CSIN	21	73	D	1	1	8	<b>73</b>	0.001

The first group (group A) contained calcareous high- and mid-mountain streams characterized by *Cymbella microcephala*, *Denticula tenuis* and *Cymbella affinis*. The most important species in group B characterize alkaline waters with moderate organic pollution and relatively high nutrient concentrations (e.g. *Cocconeis pediculus*, *Amphora pediculus*, *Navicula gregaria*, *Nitzschia inconspicua*). These are calcareous mid-altitude mountain streams and lowland rivers. Group C was composed of Pyrenean siliceous and calcareous streams. This was a poorly-defined group with two weak indicator species (*Achnanthes biasolettiana* and *Diatoma ehrenbergii*). Sites of group D were small siliceous high-mountain streams. Many of the best indicators for group D were common taxa at low water temperatures and poorly mineralized waters (e.g. *Diatoma mesodon*, *Fragilaria arcus*, *Achnanthes biasolettiana* var. *subatomus*, *Achnanthes lanceolata* and *Cymbella sinuata*).

With only 2 exceptions all *a priori* classifications showed statistically significant differences ( $p < 0.001$ ) of greater CS than would be seen for randomly grouped sites (Table 5).

Table 5. Results of the classification strength for the different classification approaches. The classification strength is defined as the difference between the within-class mean similarity ( $\bar{W}$ ) and the mean of between-class similarities ( $\bar{B}$ ). Significance of the classification was assessed by means of Monte Carlo permutation tests based on 999 permutations ( $p < 0.001$ ).

Classification	Number of classes	Weighted within-groups mean similarity	Between-groups mean similarity	Observed ratio (M)	Observed difference	p-value
		$\bar{W}$	$\bar{B}$	$\bar{B}/\bar{W}$	$\bar{W}-\bar{B}$	
Diatom communities	4	0.716	0.557	0.778	1.59E-01	0.0001
Ecoregions	3	0.626	0.575	0.919	5.05E-02	0.0010
Subcoregions	5	0.642	0.578	0.901	6.38E-02	0.0003
Geography	4	0.988	0.987	1.000	3.29E-04	0.3059
Watersheds	6	0.625	0.583	0.932	4.27E-02	0.0178

The subcoregions CS was 0.064 and was only improved by the diatom community classification (CS = 0.159). At the level of ecoregions the classification strength was also nearly strong as at the subcoregion level (CS = 0.051), although p-value was higher in the former ( $p = 0.001$ ). On the other hand, hydrological units (watershed) classification was significant ( $p < 0.05$ ) but weaker (CS = 0.043) than the typological classifications. Finally, spatial factors (summarized by UTM coordinates of the study sites) and patterns in diatom structure at the reference sites did not show a significant strength.

## DISCUSSION

Although classifications can be applied both *a priori* and *a posteriori*, it seems evident that the largest variability in reference conditions occurs in the *a posteriori* classification, that is using biota of reference sites to form the groups (Hawkins & Carlisle 2001). *A posteriori* classifications have been widely used in Great Britain (Moss et al. 1987), Australia (Simpson & Norris 2000), Canada (Reynoldson et al. 1995, 1997) and USA (Hawkins et al. 2000) as a precursor to develop predictive models. In this study the diatom classification (*a posteriori* classification) were used to search for an appropriate *a priori* classification for reference conditions.

Hierarchical dendrograms are useful for comparing alternative multiway classifications because of their concise format. As an illustration, the *a priori* ecoregion classification in NE Iberian Peninsula rivers can be compared to *a posteriori* groupings derived from

a clustering algorithm on diatom communities. Such comparisons have been frequently, but only qualitatively, used to evaluate ecoregions and other land classifications from site-level data (e.g. McDonough & Barr 1977, Hughes & Gammon 1987, Hughes et al. 1987, Omernik & Griffith 1991). Mean similarity dendrograms convey classification strengths through conceptually simple comparisons of within and between-class similarities. As a result, they may prove to be an attractive, nontechnical tool for evaluating environmentally-oriented land classifications. The concise dendrogram format allows visual comparison of several different classifications, such as those produced by different similarity measures or clustering algorithms. Unlike most ordinations, the dendrograms depict class separation and compactness directly in the original units of the chosen similarity measure.

The global CS test applied to the NE Iberian Peninsula data set showed that there were significant differences ( $p < 0.001$ ) in diatom community composition among the ecoregion and subecoregion zones. However, these CS values were not numerically large. Ecoregions and subecoregions, with CS values ranging between 5% and 6.4% respectively, were weaker classifiers than diatom communities (15.9%) but stronger than watersheds and geographical position, which ranged from CS = 4.3% to 0.03%. Values of  $M$  (Table 5) that are only slightly less than 1.0 indicate a weak classification, and classification strength increases progressively as  $M$  decreases from 1.0 towards 0. Soininen et al. (2004) reported similar results on Finnish rivers, except that these rivers showed a distinct spatially-structured variation.

The results of this study showed that the ecoregional and the subecoregional classification were the most robust classifications after the classification based only on diatom community, which, as it was expected, had the highest classification strength. Moreover, classification of watersheds and that of geographical distance between sites proved to have non-significant classification strength. This suggested that watersheds are not indicated as a unit for biological classification and that the distribution of diatom communities of Mediterranean streams was not explained by mere proximity of sites. However, comparing the ecoregions and subecoregions with the diatom classification in the mean similarity dendrograms for diatom abundances (Fig. 3) it was observed that there were contrasting patterns between ecoregions and subecoregions in the test results.

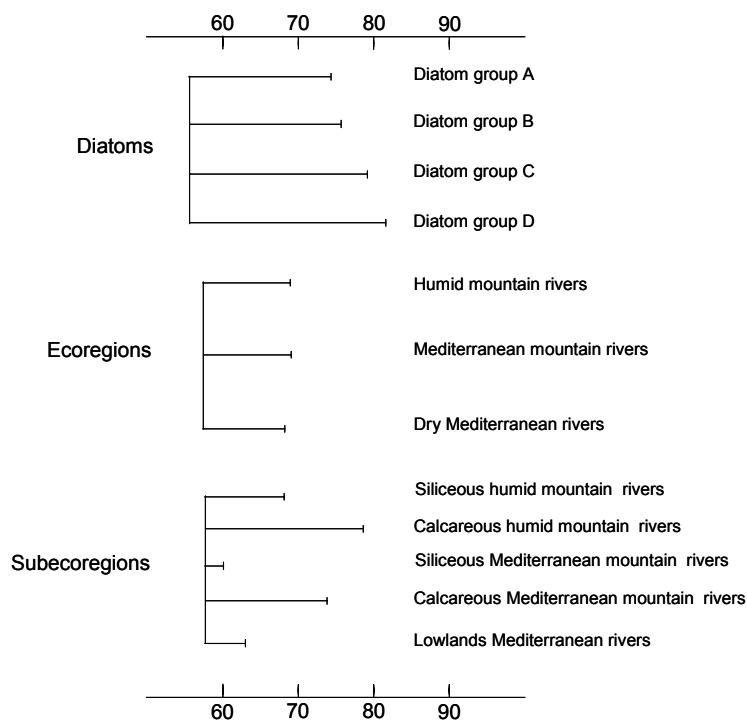


Fig. 3. Mean similarity dendrograms of the three significant alternative classifications. Scale is given above and below the dendrograms (%). The lengths of the branches indicate classification strength (CS); the join base of the branches is the mean between-class similarity (B) and the end of the branches is the mean within-class similarity (W) for the class.

Differences between ecoregions and subecoregions were very subtle in the classification. However, what is suggested from the classification dendrogram (Fig. 3) is that the ecotype classification might be stronger than the subecotype classification. All branches of the ecoregion dendrogram were quite large, and branch length was very equal between them, showing that the 3 ecoregions have non-negligible and comparable levels of within-class homogeneity in species abundance. Although the similarity within the calcareous humid and calcareous Mediterranean subecotypes was higher than the respective ecotype, most of the branches length for the subecotypes diminished respectively to ecotypes, probably because of the little number of sites in these subecotypes. Overall, the ecoregional classification is the most robust classification system for reference conditions in the studied area.

Classifications based simply on geographical distance showed a smaller power in partitioning biological variance as landscape elements defined by physical and ecological processes. Large watersheds had weaker CSs than ecoregions probably because of the larger environmental variation within the watershed when compared to ecoregions. Moreover, difference in biota among watersheds can occur because of either habitat differences among and within watersheds (e.g. channel type, slope,

substrate availability, temperature, current velocity, chemistry) or because of biogeographical reasons.

It is necessary to highlight that classification of reference conditions needs to respond to the biological as well as the environmental variability, since the two allow for the definition of the ecological quality of the system. Ecoregional classification represented the geomorphological and hydrological characteristics of streams, and from these results it can be assumed that also responded to the biological variability (diatom communities) in the area. Finally, watersheds were not the most appropriate for classification of reference conditions. These statements have implications in water management programmes and should be given full consideration. A strong covariation of physiographical location and water chemistry across the study area (see Leira & Sabater 2005) is remarkable. Since local in-stream factors seem to be at least as important as geographical factors in explaining diatom distributions at reference sites (see also Potapova & Charles 2002, Leira & Sabater 2005), a combination of regional classification based on more local environmental features might provide the most robust framework for diatom-based classification of streams.

**CHAPTER 3. DISTRIBUTION OF DIATOM  
COMMUNITIES ALONG ENVIRONMENTAL GRADIENTS  
IN MEDITERRANEAN STREAMS. APPLICATION AND  
USEFULNESS OF DIATOM INDICES**





## INTRODUCTION

Diatoms have widely been used for monitoring aquatic environments, since they integrate the environmental effects of water chemistry, in addition to the physical and geomorphological characteristics of rivers and lakes (Stevenson & Pan 1999). Diatoms are an important component in many rivers and streams as they are the most common and diverse group in these ecosystems (Round 1981). Because taxa show diverse ecological requirements, their siliceous remains are used extensively as environmental indicators in studies of climate change, acidic precipitation and water quality (Stoermer & Smol 1999).

There are several methodological tools for bioassessment that use diatom-derived information. Diatom indices and ecological classifications have been tested along pollution gradients in several countries (e.g. Kelly 1998, Kwadrans et al. 1998, Rott et al. 1998). These indices have been developed and used mainly in central and northern European rivers (Lange-Bertalot 1979, Coste in CEMAGREF 1982, Descy & Coste 1990, Lenoir & Coste 1996). Moreover, multivariate statistical methods are powerful tools for classifying diatom communities and especially to assess the important environmental gradients regulating community composition (Soininen 2002). An important goal for community ecology is to identify major patterns of community structure and to characterize and predict changes in those patterns in relation to environmental gradients (Soininen et al. 2004). Diatom communities change in relation to their affinities and ecological preferences, and therefore communities may differ with respect to geological settings, water chemistry and geomorphological conditions. Diatom communities may differ both in their composition and relative abundances in relation to the before mentioned environmental parameters. It is relevant to understand their distribution in areas of high diversity of landscapes, and a variety of human influences (Potapova & Charles 2002).

Studies on diatom distribution and autoecological preferences so far have included some watersheds in the NE Spain (Sabater et al. 1987, Sabater & Sabater 1988, Sabater & Roca 1992). Recently, a wider perspective including the majority of watersheds in NE Spain has been undertaken. While the factors affecting the distribution of the diatom taxa were analysed by Leira & Sabater (2005), the present work includes a high number of sampling sites covering the whole geography and a wider array of environmental parameters. This larger data set, which includes the different fluvial systems types of the area, was analysed to determine the regional distribution patterns of diatom communities.

The aims of the present work were, 1) to study the responses that diatom communities structure show to the gradients of environmental variables, 2) to test the usefulness of different diatom indices developed in central Europe evaluating water quality, and 3) to test the suitability of a Mediterranean intercalibration process in Europe for the use of diatom indices as summary parameters of the information provided by diatom communities.

## MATERIAL AND METHODS

### Study area

The study area included 73 stream and rivers from Muga, Fluvià, Tordera, Ter and Segre watersheds in NE Iberian Peninsula (Fig. 1). See also General Material and Methods.

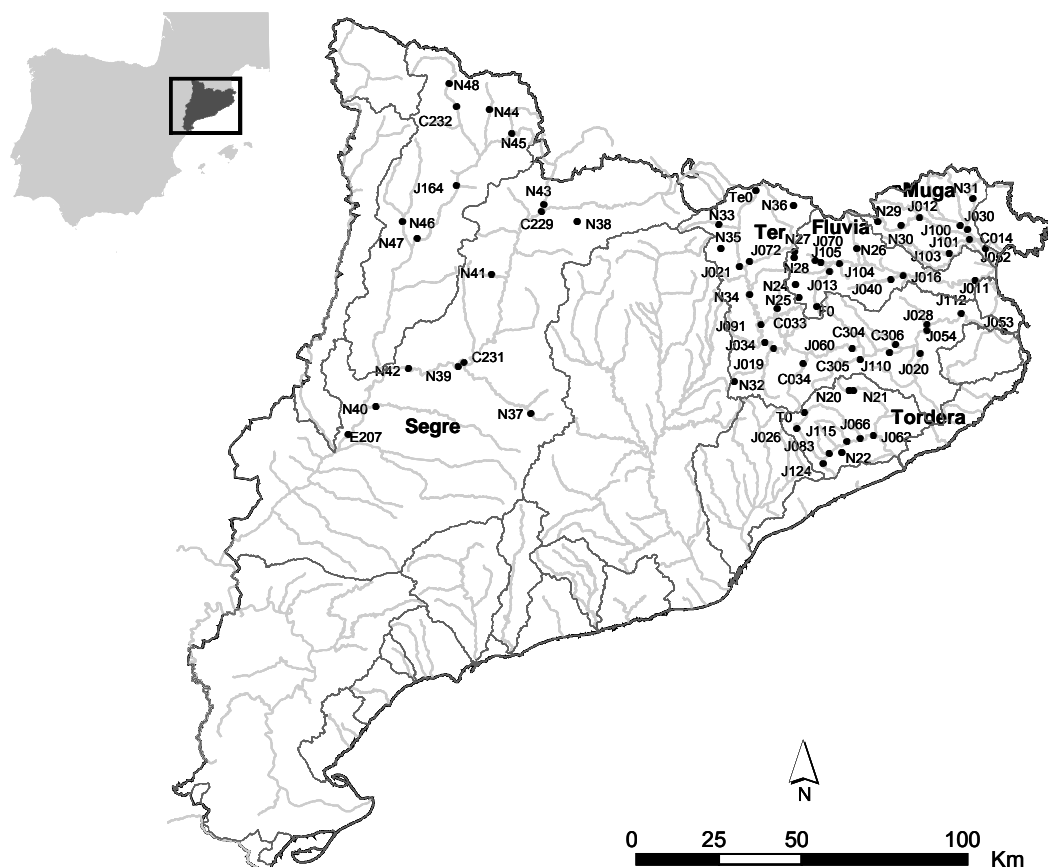


Fig. 1. Map of the study area and location of the sampling sites.

### Data sampling

See General Material and Methods

## Data analysis

Diatom data were first analysed with detrended correspondence analysis (DCA) (Hill & Gauch 1980) to determine the length of the gradient for the first axes. DCA indicated that the maximum gradient length was 3.8 standard deviation units. Therefore, this gradient length suggested that methods based on a unimodal response model were best suited for analysing these data (Lepš & Šmilauer 2003). DCA was used to search for the main patterns in diatom communities without incorporating data on environmental variables. Canonical correspondence analysis (CCA) was used to relate community structure to environmental variables. Diatom taxa occurring in at least three samples with a relative proportion of 1% or more during the two sampling periods were included in the statistical analyses. Abundances of the diatom taxa were square root transformed to reduce the effect of highly variable population densities on ordination scores. Environmental variables, except pH and qualitative descriptors, were logarithmically transformed before analysis to reduce skewed distributions. Analyses were undertaken using CANOCO for Windows (version 4.5, Microcomputer Power, Ithaca, New York).

The ecological status of the water from the studied sites was evaluated using the pollution diatom index (IPS, Coste in CEMAGREF 1982), the biological diatom index (IBD, Lenoir & Coste 1996) and the CEE index (Descy & Coste 1990). Diatom indices were calculated using OMNIDIA program version 4.1, and range from 1 to 20, being 1 the worst quality and 20 the best. Indices are divided in 5 water quality classes: values from 1 to 5 represent the bad quality class; poor water quality is designed with values from 5 to 9; values from 9 to 13 assign the moderate water quality; the good water quality range from 13 to 17; and finally, the high water quality goes from 17 to 20. The relationship between diatom indices and logarithmically transformed environmental variables was analysed with Pearson's correlations using SPSS for Windows (version 15.0.1, SPSS, Chicago, Illinois).

## RESULTS

### Species composition of diatom communities

A total of 354 diatom taxa were found in the analysed data set. *Achnanthes minutissima* was the most abundant taxon and occurred in up to 90% of all samples. The second most abundant taxon was *Achnanthes biasolettiana*, present in 50% of all samples. DCA ordination results showed that 16.1% of diatom community variance was explained on axis 1, and a further 6.5% on axis 2. This first DCA axis summarized



The most polluted sites were clustered on the left side of the axis (Fig. 2A, B) and corresponded to sites predominantly with low elevation and besides densely populated, highly industrialized or agricultural areas. Diatom taxa showing maximum abundance in these samples were *Navicula seminulum*, *Navicula subminuscula* and *Achnanthes lanceolata* spp. *frequentissima*. Sites on the right side of the diagram corresponded to oligotrophic and pristine headwaters. Diatom taxa abundant in these samples were *Cymbella delicatula*, *Cymbella microcephala*, *Cymbella helvetica*, *Denticula tenuis*, *Achnanthes biasoletiana* and *Cymbella affinis*.

The second DCA axis represented a separate gradient within the sites with higher axis 1 scores (Fig. 2A, B). Most of the near-natural or reference study sites were distributed along this axis. Sites with lower water temperature and poorly mineralized waters were grouped together and apart from samples with higher temperatures and mineral content. Sites in the right upper part of the diagram were therefore in cold waters, siliceous substrata and high-mountain headwaters of low mineralization. These locations were associated with *Diatoma ehrenbergii* and *Diatoma mesodon*. On the other hand, sites in the right lower part of the diagram were characteristically of mineralized waters in calcareous mid-mountain headwaters. Taxa in these locations included *C. microcephala*, *C. helvetica* and *C. delicatula*.

### **Important environmental variables**

The first two CCA axes were significant ( $p < 0.05$ ) and jointly explained 12.5% of the total variation in the diatom taxa data. CCA with forward selection indicated that nutrients (nitrate and phosphate), calcium, water temperature and river habitat (physical impact) were the environmental variables that accounted for significant ( $p < 0.05$ ) portions of the total variance in diatom species composition. Thus, CCA ordination plots primarily expressed two major gradients (Fig. 3A, B).



*N. seminulum* and *Nitzschia amphibia* were mainly observed at sites with high water mineralization and nutrient content. *Denticula tenuis*, *Cymbella helvetica*, *C. microcephala* and *C. delicatula* were the dominating species at headwaters and unpolluted sites. The second axis expressed geochemical and water temperature differences, and therefore separated sites with high calcium content and higher temperatures from those of low mineralization and low temperatures. *Diatoma mesodon*, *Cymbella sinuata*, *Nitzschia linearis* and *Nitzschia paleacea* showed maximum abundance at low mineralization and cold water sites. *C. microcephala*, *C. helvetica* and *C. affinis* characterized sites with high alkalinity and relatively high water temperatures.

### Diatom indices

*Evaluation of water quality using IPS, IBD and CEE diatom indices.* The applicability of diatom indices to monitor water quality was assessed with the present data set. The diatom indices tested were the IPS, IBD and CEE. The three are inspired on the saprobic index of Kolkwitz & Marsson (1908). However, the indices take into consideration the structure of the community, and therefore consider not simply the presence of the taxa but also their proportion in the community. Most of these indices are calculated according to the formula designed by Zelinka & Marvan (1961), which consider the sum of the different species abundance influenced by their *sensitivity* to the described disturbance, and by their *indicator* value (the latter being opposite to the unspecificity for any situation):

$$ID = \frac{\sum_{j=1}^n a_j s_j v_j}{\sum_{j=1}^n a_j s_j}$$

being *a*, the relative abundance; *s*, the sensitivity value; *v*, the indicator value; and *n*, the number of species observed in the diatom community.

The values of the three water quality indices ranged from the lowest class to the highest (Table 2), where most of the sites fell into the moderate and good water quality class in summer and into the good and high water quality class in spring for the three indices. As a general trend, the highest values of water quality for the three diatom indices were located in the headwaters of the different watersheds, most of them in the Pyrenees. The lowest values were found in lowland sites receiving high inputs of organic matter and industrial discharge. These values improved in spring, when there was an increasing of the water quality of the sites due to dilution effects of the higher



water discharge. The watershed with the worst water quality amongst those considered here was the Tordera, that was affected by an important chemical industry and agricultural land uses. The Segre watershed had the best water quality, some of the sites reaching the value of 20 for IBD. The three indices significantly correlated with the environmental variables, both those related with pollution and physical impact (e.g. ammonium, nitrate, phosphate, total organic carbon (TOC)) and those related with physiography (e.g. altitude, water velocity, water temperature) (Table 3). However, higher correlation was observed with the IPS and IBD than with the CEE.

Table 2. Sampled sites with the corresponding indices values for summer 2002 and spring 2003.

Watershed and river	Site	Code	Summer 2002			Spring 2003		
			IBD	IPS	CEE	IBD	IPS	CEE
<b>Muga</b>								
Muga	Albanyà	N29	13.6	14.5	13.0	16.4	17.7	17.9
Muga	Sant Llorenç de la Muga	N30	15.3	16.8	17.2	16.4	16.9	15.8
Muga	Boadella	J012	15.1	16.8	16.2	18.1	18.9	17.7
Llobregat de la Muga	Peralada	J100	13.5	14.3	13.5	11.1	12.2	11.5
Orlina	Rabós	N31	9.7	9.0	7.8	14.3	13.6	11.8
Orlina	Peralada	J030	12.0	10.2	10.3	15.7	14.0	11.6
Muga	Vilanova de la Muga	J101	12.1	11.8	11.1	15	11.5	10.3
Àlguema	Santa Llogaia d'Àlguema	J103	10.5	12.3	12	15.7	15.7	14.1
Manol/Figueres	Vilanova de la Muga	C014	6.7	5.3	4.6	6.6	5.5	4.8
Muga	Castelló d'Empúries	J052	5.9	10.2	6.3	12.0	10.0	9.2
<b>Fluvià</b>								
Fluvià	Hostalets d'en Bas	F0	16.5	17.8	17.2	17.8	19.0	17.9
Joanetes	Joanetes	N25	17.1	18.7	17.9	18.5	19.1	17.9
Gurn	Sant Privat d'en Bas	N24	16.0	18.5	17.5	18.3	19.0	17.3
Ferró	Sant Salvador de Bianya	N28	16.4	17.8	18.1	13.8	13.6	14.9
Sant Ponç	Sant Salvador de Bianya	N27	12.9	15.6	17.7	17.7	17.9	16.4
Fluvià	Olot	J013	12.4	14.4	13.9	15.1	16.9	16.2
Ridaura	Llocalou	J105	5.0	6.5	7.3	8.9	9.7	9.2
Bianya	Sant Joan les Fonts	J070	10.5	11.8	11.5	18.3	19.2	17.3
Turonell	Castellfollit de la Roca	J104	8.9	7.2	7.5	12.1	14	12.6
Llierca	Pont de Llierca	N26	13.3	15.6	17.5	15.1	17.9	17.9
Ser	Serinyà	J040	15.1	16.5	16.8	16.0	17.3	17.3
Fluvià	Esponellà	J016	12.5	12.2	13.9	7.3	7.1	13.2
Fluvià	Sant Pere Pescador	J011	10.5	10.7	11.8	13.4	13.4	15.1
<b>Tordera</b>								
Tordera	Les Illes	T0	11.3	12.5	12.4	18.7	18.8	17.5
Tordera	Piscines Montseny	J026	16.2	14.4	11.6	17.8	18.9	17.7
Vallgorguina	Sant Celoni	J124	8.0	8.6	7.7	7.7	5.4	5.4
Tordera	Sant Celoni	J083	4.9	5.9	4.6	12.4	11.2	9.6
Fuirosos	Gualba	N22	15.3	15.8	14.1	11.6	16.7	14.3
Breda	Breda	J115	10.1	11.2	8.2	11.0	8.7	8.0
Arbúcies	Hostalric	J066	10.4	12.1	10.7	10.9	9.0	7.3
Santa Coloma	Les Fosses	N20	14.0	15.1	14.5	17.5	17.4	15.6
Santa Coloma	Parc Sant Salvador	N21	13.5	13.0	12.4	15.4	15.2	14.1
Tordera	Fogars de Tordera	J062	8.5	7.6	5.8	9.1	8.4	6.5

Table 2. Continued.

Watershed and river	Site	Code	Summer 2002			Spring 2003		
			IBD	IPS	CEE	IBD	IPS	CEE
<b>Ter</b>								
Ter	Setcases	Te0	17.4	18.2	17.3	17.8	18.6	17.3
Ter	Ripoll	J072	13.8	13.9	13.2			
Ritort	Molló	N36	15.5	15.2	14.7	16.1	18.2	16.6
Freser	Planoles	N33	15.7	15.7	14.1	20.0	19.8	18.1
Freser	Ripoll	J021	16.5	16.5	16.0	20.0	19.7	17.3
Merdàs	Gombrèn	N35	13.0	14.5	14.1	16.7	18.2	16.8
Solana	Sant Quirze de Besora	N34	13.7	15.9	16.6	13.3	16.5	17.5
Ges	Sant Pere de Torelló	C033	15.9	17.6	17.7	15.6	17.3	17.7
Ges	Torelló	J091	13.3	12.6	13.5	15.8	17.2	16.4
Ter	Torelló	J034	14.1	13.5	13.0	14.1	15.1	13.7
Mèder	Santa Eulàlia de Riuprimer	N32	10.1	8.0	7.5	13.8	11.6	12.4
Ter	Roda de Ter	J019	11.8	11.1	10.9	12.8	12.3	9.7
Major	Sant Sadurní d'Osormort	C034	11.1	15.2	13.9	16.1	16.0	13.5
Ter	El Pasteral	J060	12.1	14.2	13.5	13.9	14.5	13
Brugent	Amer	C304	12.0	9.2	8.2	15.1	12.8	11.5
Osor	Anglès	C305	17.5	18.9	16.6	17	15.4	13.4
Ter	Bescanó	J110	11.2	13.8	13.4	14.1	14.5	12.2
Llémena	Sant Gregori	C306	12.0	12.2	12.8	17.1	18.7	17.5
Onyar	Quart	J020	8.0	6.1	5.4	9.9	8.5	7.7
Ter	Sant Julià de Ramis	J054	10.1	11.1	10.7	13.4	12.5	10.9
Terri	Sant Julià de Ramis	J028	8.4	10.0	9.2	11.4	11.3	11.1
Ter	Flaçà	J112	6.5	8.1	6.7	12.2	10.5	9.0
Ter	Torroella de Montgrí	J053	6.8	6.5	7.8	12.2	12.4	11.3
<b>Segre</b>								
Noguera Pallaresa	Alòs d'Isil	N48	18.7	19.4	16.8	20	19.1	16.6
Noguera Pallaresa	Esterri d'Àneu	C232	16.2	17.6	16.0	18.9	19.3	17.7
Noguera de Cardós	Lladorre	N44	17.7	16.0	17.7	17.4	18.7	17.7
Noguera de Vallferrera	Alins	N45	19.0	18.9	17.9	16.4	19.6	19.4
Noguera Pallaresa	Sort	J164	19.2	17.5	16.6	19	18.9	17.0
Flamicell	Lluçà	N46	20.0	19.3	17.5	20.0	19.3	17.9
Noguera Pallaresa	La Pobla de Segur	N47	20.0	18.9	17.0	17.8	17.3	16.8
Cadí	Cava	N38	16.3	18.5	17.5	20.0	19.4	17.9
Valira	La Seu d'Urgell	N43	15.0	13.9	12.4	14.9	17.1	10.7
Segre	La Seu d'Urgell	C229	16.9	15.6	14.1	17.9	17.7	15.6
Fontanet	Organyà	N41	15.8	17.6	16.8	18.9	19.2	17.9
Llobregós	Castellfollit de Riubregós	N37	16.8	18	17.2	13.5	12.8	13.9
Llobregós	Ponts	N39	11.3	14.2	12.4	11.0	13.4	12.8
Segre	Ponts	C231	12.6	14.8	14.3	13.0	14.3	12.8
Segre	Artesa de Segre	N42	12.9	13.9	13.0	14.8	15.4	13.4
Sió	La Sentiu de Sió	N40	11.2	11.3	11.6	10.6	6.3	6.1
Segre	Térmens	E207	10.8	12.8	12.8	17.1	17.1	15.1

Table 3. Pearson's correlation coefficients between diatom indices and environmental variables. Significance is indicated by asterisks: (\*\*\*)  $p < 0.001$ , (\*\*)  $p < 0.01$ , (\*)  $p < 0.05$ ,  $n = 62$ .

	IBD	IPS	CEE
pH	0.406(**)	0.450(***)	0.447(***)
Conductivity ( $\mu\text{S cm}^{-1}$ )	-0.563(***)	-0.525(***)	-0.412(***)
Water temperature ( $^{\circ}\text{C}$ )	-0.497(***)	-0.485(***)	-0.409(***)
Oxygen saturation (%)	0.248	0.301(*)	0.350(**)
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	-0.500(***)	-0.498(***)	-0.343(**)
$\text{Cl}^{-}$ ( $\text{mg L}^{-1}$ )	-0.713(***)	-0.707(***)	-0.664(***)
$\text{HCO}_3^{-}$ ( $\text{mg L}^{-1}$ )	-0.413(***)	-0.335(**)	-0.217
$\text{K}^{+}$ ( $\text{mg L}^{-1}$ )	-0.611(***)	-0.578(***)	-0.524(***)
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	-0.402(**)	-0.361(**)	-0.209
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	-0.402(**)	-0.344(**)	-0.146
$\text{Na}^{+}$ ( $\text{mg L}^{-1}$ )	-0.688(***)	-0.705(***)	-0.659(***)
$\text{NO}_3^{-}\text{-N}$ ( $\text{mg L}^{-1}$ )	-0.333(**)	-0.379(**)	-0.344(**)
$\text{NH}_4^{+}\text{-N}$ ( $\text{mg L}^{-1}$ )	-0.338(**)	-0.335(**)	-0.387(**)
$\text{PO}_4^{3-}\text{-P}$ ( $\mu\text{g L}^{-1}$ )	-0.537(***)	-0.484(***)	-0.494(***)
TOC ( $\text{mg C L}^{-1}$ )	-0.357(**)	-0.337(**)	-0.381(**)
Width (m)	0.064	0.083	0.098
Depth (cm)	-0.105	-0.140	-0.126
Altitude (m)	0.433(***)	0.435(***)	0.421(***)
Water velocity	0.454(***)	0.438(***)	0.308(*)
Riparian vegetation coverage	-0.318(*)	-0.241	-0.205
Water transparency	0.231	0.300(*)	0.201
Physical impact	-0.531(***)	-0.590(***)	-0.658(***)

*Mediterranean Intercalibration Process of Phytobenthos.* The bioassessment of water quality needs to be interpretable and representative of environmental disturbances (European Water Framework Directive, WFD, European Commission 2000), and also comparable among different fluvial ecosystems in Europe. Thus, the development of a common metric following an intercalibration process is a necessity. For this purpose, Spain, along with France and Portugal, was involved in a Phytobenthos Mediterranean Intercalibration process. The data presented up to this point along with data from Llobregat, Besòs, Francolí, Gaià, Foix, Riudecanyes, Segre (Noguera Ribagorçana) watersheds and the lower part of the main axis of Ebre River (Fig. 1 General Material and Methods) were those used for the intercalibration process, as part of Spanish Mediterranean river systems.

As each country had its own fluvial classification which was no comparable within groups, a new classification for intercalibration (IC) types was suggested. IC types of the Mediterranean Geographical Intercalibration (MED GIG) group were used to classify samples (Table 4).

Table 4. Description of the Mediterranean Intercalibrated types.

	R-M1	R-M2	R-M4	R-M5
Drainage area (Km <sup>2</sup> )	10-100	100-1000	10-1000	10-100
Altitude (m)	200-800	< 400	400-1500	< 300
Geology	mixed	mixed	non-siliceous	mixed
Flow regime	highly seasonal	highly seasonal	highly seasonal	temporary

All members participating in the intercalibration process justified the methods used to calculate their national metric following the Normative Definitions (NDs) of the WFD. In the case of Spain, because of the described considerations, the diatom index IPS was used as a national metric. Each country converted their national metric to an Ecological Quality Ratio (EQR), computed from observed and reference values, and this EQR was split into separated status classes (table 5). The classes defined by the NDs are High, Good and Moderate in terms of their deviation from the biota expected at the reference state.

Table 5. Boundary values expressed as the Spain national metric EQR.

	EQR-IPS		
	Reference	High/Good	Good/Moderate
R-M1	1	0.90	0.67
R-M2	1	0.93	0.70
R-M4	1	0.91	0.68
R-M5	1	0.95	0.71

Each state adopted their approach to split the EQR into classes. Spain adopted as a high/good boundary the 25th percentile of reference sites, and the high/good boundary\*0.75 was used to calculate the good/moderate boundary following REFCOND (Wallin et al. 2003). Selection of Reference conditions needed to follow criteria established by REFCOND in order to be standardized among all the members of the Mediterranean group.

Following this procedure 78 reference stations were selected from the ACA (2003) data set that were characterizing the 4 IC types previously described (table 6 and 7).

Table 6. Number of available sites in each river type.

	All	Reference
R-M1	64	33
R-M2	87	13
R-M4	35	26
R-M5	12	6

Table 7. Chemical values for reference sites.

	R-M1	R-M2	R-M4	R-M5
<b>Dissolved Oxygen (% saturation)</b>				
Mean	110.39	103.26	100.88	
90th percentile	138.82	143.62	114.45	
<b>NH<sub>4</sub><sup>+</sup>-N (mg L<sup>-1</sup>)</b>				
Mean	0.13	0.08	0.06	0.06
90th percentile	0.25	0.13	0.12	0.06
<b>PO<sub>4</sub><sup>3-</sup>-P (µg L<sup>-1</sup>)</b>				
Mean	16.44	52.42	45.01	47.52
90th percentile	43.93	101.38	127.78	72.02
<b>NO<sub>3</sub><sup>-</sup>-N (mg L<sup>-1</sup>)</b>				
Mean	0.45	1.95	1.04	0.64
90th percentile	0.96	4.38	2.32	1.14

The boundaries for Spain, France and Portugal were then translated to a common index named Intercalibration Common Metric (ICM) following the description in Intercalibration (Pollard et al. 2005), and finally compared. The acceptable range of boundary values was calculated as the median (mean for M5) boundary value  $\pm 0.05$  EQR units for all MS (table 8).

Table 8. Acceptable range of boundary values express as ICM.

	R-M1-M2-M4	R-M5
High/Good	0.80-0.90	0.88-0.98
Good/Moderate	0.61-0.71	0.60-0.70

Med GIG decided not to intercalibrate each IC type separately as IC typology resulted no to be statistically different. Therefore simply intercalibrated R-M1, R-M2 and R-M4 as a whole group separated from R-M5, considering that only three countries participate to the intercalibration process, and R-M5 was a very specific river type, as temporary rivers present a considerably higher natural variability.

## DISCUSSION

Diatom communities have been widely used as indicators of eutrophication and water pollution, as well as indicators of the integrity of biological habitats (Rott et al. 1998, Passy et al. 1999, Winter & Duthie 2000). Multivariate analyses performed with the data set from NE Iberian Peninsula showed a gradient of pollution as being the most important in structuring diatom communities in the area studied. A response of diatoms to nutrient enrichment along with river habitat appeared to be evident. Nitrate, phosphate and physical impact were amongst the significant environmental variables. Many studies have demonstrated that diatom communities vary along gradients of nutrient content (Potapova & Charles 2002, Soininen & Niemelä 2002, Leira & Sabater 2005, Tornés et al. 2007). On the other hand, although the measurement of river habitat was qualitative, general descriptors summarizing physical habitat (e.g. stream size and stream order) were also associated with diatom distribution. This being a rather common observation (Molloy 1992), their prevalence with respect to the chemical factors is not obvious. Soininen (2002) showed a clear significance of water chemistry on the communities of several Finnish rivers, although physical factors did have some influence also. In the NE Iberian Peninsula studied rivers appeared a community typically developing in headwaters, dominated by species of genera *Achnanthes*, *Cymbella* and *Denticula*, some of them typically from clean waters with low mineralization (Sabater et al. 1988). Downstream, mineralization and nutrient content increased both because natural and anthropic reasons. Under these conditions, *Navicula* become the dominant genus (Sabater & Sabater 1988). In the studied rivers there was a gradual change from the headwaters to the mouth in the diatom composition (Potapova & Charles 2002). From the results of this chapter it was possible to differentiate sites with low chemical and physical alteration, found at headwaters, from sites with a high degree of contamination, principally due to human-related activities, found at middle and low reaches. Diatom communities also responded to a gradient of water temperature and geochemical characteristics. Several studies have shown the importance of ionic composition for algal communities' distribution (Cholnoky 1968, Sabater & Roca 1992, Ziemann 1997). Furthermore, Patrick & Reimer (1966), Ziemann (1971, 1997), Sabater & Roca (1992), Round & Bukhtiyarova (1996), Pipp (1997) and Potapova & Charles (2003) pointed out the great difference between diatom communities in calcareous and calcium-poor rivers. At high alkalinity and relatively high water temperatures, *Cymbella helvetica*, *C. microcephala* and *C. affinis* (Sabater 1987) were the dominant species. Sabater & Roca (1992) noted that calcareous springs in the Pyrenees were dominated by various species of

*Cymbella*. Potapova & Charles (2003) found that species with highest affinity towards calcium belonged to this genus in a study in continental USA, Alaska and Hawaii. At low alkalinity and cold waters *Diatoma mesodon*, *Cymbella sinuata* and two *Nitzschia* species (*N. linearis* and *N. paleacea*) characterized diatom communities. *D. mesodon* has been found in cold waters (Carpenter & Waite 2000, Potapova & Charles 2002).

Complementary to multivariate analyses, indices are expected to be a rapid tool for bioassessment. However, indices at present have been developed mainly in central and northern Europe (e. g. Coste in CEMAGREF 1982, Lenoir & Coste 1996) to indicate the general state of water quality. Indices reflect both the organic and inorganic pollution sources (Descy 1979, CEMAGREF 1982). The three applied diatom indices reliably assessed the water quality of the sites and also reflected the seasonal differences, although they did not properly reflected the special situations of Mediterranean streams. For example, calcareous headwaters got a value of 18 as a maximum (see table 2, e.g. sites N29, N30, N34, C033), and not 19-20 which was expected after the identification of these sites by multivariate ordinations (see below, the second axis of CCA) as calcareous unpolluted waters. However, the best correlations with environmental variables were observed with IPS and IBD. It was observed that IBD did not give extreme values in some occasions, while at particular situations it gave the maximum value (20) when IPS and CEE never reached this value. Thus, IBD underestimate or overestimate particular situations in the studied Mediterranean streams. Because of this effect IPS was suggested to be the best index to assess water quality at the studied sites.

Further, the value provided by the indices locally had to be comparable among different fluvial ecosystems and methods used in Europe following the WFD. The Geographical Intercalibration Groups were created to make possible a common approach. However, IC types turned out to be significantly different from each other on statistical analysis. Typologies of biotic communities are necessary for the application of the WFD. The diatom communities in their natural state should be described for several river types (Soininen 2002). Although classifications can be applied both *a priori* and *a posteriori*, in some cases the largest variability in reference conditions has been observed in the *a posteriori* classification using biota of reference sites to form the groups (Hawkins & Carlisle 2001), as has been described in Chapter 2.

Very little work has been done on the application of diatom indices in Mediterranean rivers. The recent intercalibration work has proved to be a suitable exercise for the Mediterranean region. Irrespective of the method used to approach biological monitoring, uncertainties still exist concerning the uniqueness or general applicability of a given diagnosis provided by diatom communities (Leira & Sabater 2005). Especially

when other factors different from pollution or nutrient enrichment affect community composition. Sabater (2000) showed that diatom indices successfully indicated the effect of a heavy metal spill on a river system, although they did not properly reflect the recovery. Diatom indices were originally developed to assess water quality in general, but their potential use is not clear when other type of stress (e.g. heavy metal pollution) influence water quality (Barbour et al. 1999). Thus, from the results of this chapter it can be concluded that the Mediterranean diatom communities studied were distributed continuously along gradients of water chemistry and also geochemical characteristics, but to develop a powerful tool to biomonitor river systems across Mediterranean region and types for site classification still needs to be reappraised.





## **CHAPTER 4. DIVERSITY PATTERNS OF BENTHIC DIATOMS IN MEDITERRANEAN RIVERS**



## INTRODUCTION

Understanding why the number and abundance of species varies from place to place, and from time to time is amongst the major issues of interest in ecology. The diversity in local assemblages can be regulated by local factors (e.g. competition, disturbance, abiotic conditions) and by regional factors (e.g. history of climate, evolution, immigration). The relative importance of the regional and local factors is still uncertain since they act on different temporal and spatial scales (Hillebrand & Blenckner 2002). However, the regression between regional species richness and local species richness is highly biased and unsuitable to infer any reliable information about the relative strength of regional and local control of local diversity (Hillebrand 2005).

Diversity is distributed heterogeneously among habitats, landscapes and regions. Quantifying the heterogeneity in diversity can be approached by comparing components of diversity that occur within ( $\alpha$ ) and among samples ( $\beta$ ) at multiple sampling scales (Crist & Veech 2006). Whittaker (1960, 1972) originally proposed the  $\alpha$ ,  $\beta$  and gamma components to characterize different scales of diversity. Gamma-diversity ( $\gamma$ ) can be defined as the total number of species in a region, alpha-diversity ( $\alpha$ ) is the number of species per habitat, and beta-diversity ( $\beta$ ) accounts for the turnover of species between these habitats. Thus, the turnover of taxa is characterized by the  $\beta$  component of diversity. The beta-diversity can be measured in several different ways. Ward et al. (1999) defined the  $\beta$ -diversity as being the 1/mean number of habitats occupied by each species occurring in the region. Veech et al. (2002) proposed that the  $\beta$ -diversity accounted for the average amount of diversity not found in a single, randomly-chosen sample, or in other words the number of all the species of other samples not found in the analysed sample. Using multivariate dispersion Anderson et al. (2006) suggested the average dissimilarity from individual observation units to their group centroid in multivariate space to be a measure of  $\beta$ -diversity. Altogether, the diversity components can be related by additive partition (Lande 1996), being  $\gamma = \bar{\alpha} + \beta$ . Additive diversity partitions express  $\alpha$ - and  $\beta$ -diversity in the same measurement units so that their relative importance could be easily quantified and interpreted (Crist & Veech 2006).

The interaction of various spatial scales causes both bottom-up and top-down effects which affect the balance between the  $\alpha$  and the  $\beta$  components of diversity (Loreau 2000). However, the processes that strongly influence the average local richness within a site are not necessarily the same that account for the difference in local, plot-level richness between sites (Rajaniemi et al. 2006). Habitat selection creates linkages across multiple scales, and is an important factor affecting local and regional patterns

of biodiversity (Resetarits 2005). Similar habitats are expected to present very similar species assemblages of microscopic organisms, independent of the geographical location of the habitat (Fontaneto & Ricci 2006).

In the analysis of the present data set, the hypotheses to be tested were 1) that  $\beta$ -diversity increases with stream order, and 2) that diversity patterns are related to environmental disturbances and other environmental factors, with a regional dimension. Species-area relationships (SAR) describe the correlation between the species richness and the area. Increasing the area of sampling will generally result in an increase in species richness. These hypotheses were tested in watercourses of NE Iberian Peninsula, including morphological and climatic diversity determining an important spatial heterogeneity. Three watersheds were selected. Two of them, the Ter and Llobregat, show similar physical dimensions though physical and chemical differences. The third river is the Segre, which is of larger dimensions. The physical and chemical variability that encompasses the area determines the patterns of diversity in the diatom communities of the 3 studied watersheds. The aim was to determine if there existed any regularity in the diatom diversity between the 3 rivers or, on the contrary, if there was a different model for each river. The specific objectives of this study were therefore to assess how abiotic environment contribute to shape diversity patterns in each river system, and to determine whether the diversity patterns differed or not over watersheds of different size and characteristics.

## **MATERIAL AND METHODS**

### **Study area**

The study area was composed of 81 stream and river sites from three watersheds in NE Iberian Peninsula, Ter, Llobregat and Segre (Fig. 1). These sites covered a wide range of fluvial typologies and different levels of human disturbance. These three systems have their headwaters in the Pyrenees and their upper courses are partially subjected to a snow fed regime. The middle and lower parts of Ter, Llobregat and Segre are subjected to a Mediterranean climate, implying high hydrologic variability in these sections (see General material and methods).



length was analysed with Pearson's correlations using SPSS for Windows (version 15.0.1, SPSS, Chicago, Illinois). Diversity values were standardized for their representation in figures using the expression:

$$D_i' = \frac{D_i - D_{\min}}{D_{\max} - D_{\min}}$$

where  $D_i'$  is the transformed value,  $D_i$  is any value of diversity and  $D_{\max}$  and  $D_{\min}$  are, respectively, the maximum and minimum values of diversity. With this transformation the changes were made comparable between watersheds and sites.

## RESULTS

### The Ter watershed

Alpha-diversity was low in the headwaters in summer, when few species dominated the diatom community (Fig. 2A). *Fragilaria arcus* and *Achnanthes minutissima* characterized headwaters communities, accounting for ca. 60% of the total abundance at Te0. These species tolerate the environmental conditions that characterize the headwaters (high water velocity, low light conditions, or flood events). *A. minutissima* has been described in several studies as an early colonizer (Kelly 2002, Martínez de Fabricius et al. 2003) favoured by highly disturbed habitats (Peterson & Stevenson 1990, 1992, Biggs et al. 1998). The  $\alpha$ -diversity increased progressively from the headwaters downstream, and was maximal in the section upstream of the 3 consecutive reservoirs located in the middle course of the river. *Amphora pediculus*, *Fragilaria capucina* var. *vaucheriae*, *Navicula cryptotenella*, *Navicula gregaria*, *Thalassiosira pseudonana*, *Navicula subminuscula*, *Nitzschia inconspicua*, *Cocconeis pediculus* and *Navicula minima* increased their abundance until these reservoirs. This section of the river flows in an area of important agricultural, cattle raising and industrial activity. The waters have high concentrations of nitrate, phosphate and total organic carbon (TOC). At this part of the river the water mineralization and nutrient content increased. The taxa characteristic in these sites are tolerant to organic pollution (e.g. Soininen 2002, Leira & Sabater 2005). *A. minutissima* was present along the main axis but its abundance was lower than in the headwater. In the upper-middle section of the river, the Ter received oligotrophic tributaries from high-mountain siliceous and calcareous ranges, which had diatom communities with higher  $\alpha$ -diversity than those in the main axis.

Immediately after the reservoirs, the  $\alpha$ -diversity fluctuated (diminished, and then increased again) and was minimal in the river mouth. The diatom community developing downstream the reservoirs was characterised by *Fragilaria construens* var. *venter* and *N. cryptotenella*, which reached ca. 50% of the total abundance, along with *A. pediculus*, *Nitzschia fonticola* and *Nitzschia dissipata*. The diatom community responded to the physical change of the river caused by the reservoirs. The dominant taxa in that section were *F. construens* var. *venter*, *Nitzschia amphibia*, *N. dissipata*, *A. pediculus*, *Rhoicosphenia abbreviata*, *Navicula cryptotenella*, *Cocconeis placentula* and *Achnanthes lanceolata*. From this section to the mouth, few species dominate. *F. construens* var. *venter* and *N. amphibia*, and later on *T. pseudonana* accounted for the 65% of the total abundance alone. In the section from the reservoirs to the mouth, the main axis received water from mid-mountain polluted tributaries. The mouth had the lowest  $\alpha$ -diversity, as few species were able to tolerate the high degree of contamination that suffers this part of the river.

The  $\beta$ -diversity (species turnover) in the Ter followed the inverse pattern as that described for the  $\alpha$ -diversity (Fig. 3A). Thus, the species turnover diminished from headwaters to the reservoirs. After these structures, the turnover diminished again, but was maximal in the mouth. The  $\beta$ -diversity was always higher in the tributaries than in the main axis.

A higher homogeneity of the  $\alpha$ - and  $\beta$ -diversity along the main axis occurred in spring 2003 than in summer 2002 (Fig. 2A and 3A). A slight increment of  $\alpha$ -diversity occurred in spring from the source to the middle reaches. The  $\alpha$ -diversity was relatively constant in the main axis, and always higher than in the tributaries. The reservoirs had little effect on the  $\alpha$ -diversity during this period. As in summer 2002, the  $\beta$ -diversity during spring 2003 followed an inverse longitudinal pattern than the  $\alpha$ -diversity. There was a fall in species turnover from headwaters to middle stretches along the main axis. This trend changed to higher constancy from that section to the mouth. The species turnover was always lower in the main axis than in the tributaries. The reservoirs had also little effect to  $\beta$ -diversity. The differences between summer and spring could be explained by the increment of the water discharge in the latter, which exerted dilution effects on the water quality.

Species distribution was quite similar to that of summer. *A. minutissima*, *Gomphonema pumilum*, *F. arcus* and *Cymbella minuta* characterized the diatom community in the headwaters. Altogether they accounted for the 76% of the total contribution at Te0. From headwaters to mouth more species became important in diatom communities in terms of abundance. Alpha-diversity incremented and  $\beta$ -diversity diminished. *A. pediculus*, *Navicula atomus* var. *permitis*, *N. gregaria*, *C. minuta*, *Nitzschia dissipata*, *N.*



*fonticola*, *N. inconspicua* along with *A. minutissima* characterized diatom communities until the reservoirs. After the reservoirs appeared also *C. placentula* and *F. construens* var. *venter*. There was a little diminution in  $\alpha$ -diversity downstream the reservoirs, but downstream where the strong diminution was observed in summer. At this point *Nitzschia fonticola*, *Navicula reichardtiana*, *N. gregaria* and *Gomphonema olivaceum* reached ca. 60% of the total abundance. From this point to the mouth *F. construens* var. *venter*, *N. atomus* var. *permitis*, *N. gregaria*, *Nitzschia fonticola* and *N. inconspicua* dominated the communities, and  $\alpha$ -diversity increased again.

### The Llobregat watershed

The Llobregat River is a highly disturbed system since its source. Alpha-diversity was high in the source of the Llobregat in summer (Fig. 2B). *Achnanthes biasoletiana*, *A. minutissima* and *Cymbella minuta* characterized the headwaters of this River. This diatom community was characteristic of upstream sites with low human impact (Martínez de Fabricius et al. 2003, Soininen 2004, Leira & Sabater 2005). However, also *Navicula saprophila*, *N. atomus* var. *permitis*, *N. cryptotenella*, *Cymbella silesiaca* and *Nitzschia pusilla* have a relative high proportion in the headwaters, taxa characteristic of polluted sites due to the relative high nutrient content of water in these sites.

From the headwaters to the middle stretches some species appeared to characterize these communities. The most characteristic were *Amphora pediculus*, *Cocconeis pediculus*, *C. placentula* and *Rhoicosphenia abbreviata*, which are eutrophic species but sensitive to organic pollution (Steinberg & Schiefele 1988, Kwadrans et al. 1998, Kelly 2002). After the reservoir  $\alpha$ -diversity fluctuated, first diminishing, later on recovering, and finally diminishing suddenly. After that,  $\alpha$ -diversity kept relatively constant until the mouth, even after the entrance of the two main tributaries, the Cardener and Anoia. From the middle stretches to the mouth, few species were able to tolerate the high degree of contamination present in the main axis of Llobregat. *Nitzschia inconspicua* and *N. frustulum* represented ca. 60% of the total abundance respectively in two different sites. A minor but significant presence of *Skeletonema potamos*, *Cyclotella meneghiniana*, *Cyclotella atomus*, *Nitzschia palea* and *Navicula recens* occurred in that section. Finally, *Nitzschia capitellata*, *N. palea* and *Entomoneis paludosa* characterized the river mouth. All these taxa characterized this part of the river, with waters with high nutrient and organic matter concentrations.

The  $\beta$ -diversity increased from the headwaters to the middle stretches in the Llobregat (Fig. 3B). After the Cardener entered the Llobregat, there was a sudden diminution of species turnover, but  $\alpha$ -diversity kept constant. Downstream, after the entrance of the

Anoia there was an increase in the  $\beta$ -diversity, but  $\alpha$ -diversity still kept constant. The two main tributaries had opposite effects on  $\beta$ -diversity of Llobregat.

There were remarkable differences between the two periods (summer and spring) (Fig. 2B and 3B). In spring  $\alpha$ -diversity was low in the headwaters and incremented progressively up to the input of the Cardener. *A. biasolettiana* alone reached 72% of the total abundance in the Llobregat headwaters, and the  $\alpha$ -diversity was low. Other species such as *A. minutissima* and *Gomphonema pumilum* are also characteristic of headwaters with low nutrient conditions (Lange-Bertalot 1980, Kelly 2002). After that, there was a progressive change along the main axis from the source to the middle stretches. Downstream, *A. minutissima* reached 50-65% of the total abundance, though *A. biasolettiana*, *Cymbella affinis*, *C. minuta* and *Gomphonema olivaceum* were also present. In the middle stretches, *R. abbreviata*, *C. placentula*, *C. pediculus*, *Amphora pediculus* and *Achnanthes lanceolata* ssp. *frequentissima* characterized these communities. In the upstream section of the river to the entrance of the Cardener there was a peak of  $\alpha$ -diversity, because of the occurrence of several species such as *Navicula atomus* var. *permitis*, *N. gregaria*, *N. saprophila*, *N. subminuscula*, *Nitzschia capitellata* and *N. palea* and. However, the relevance of these taxa indicated the polluted character of this section of the river. Downstream of the Cardener, the  $\alpha$ -diversity diminished and *N. capitellata* achieved ca. 70% of the total abundance alone. This species was replaced downstream by *N. saprophila*, which reached ca. 60% of the total abundance. After the Anoia, several species characterized the diatom community in the mouth of Llobregat River. These were *Navicula lanceolata*, *Cyclotella meneghiniana*, *R. abbreviata*, *Nitzschia umbonata*, *Gomphonema parvulum*, *Navicula veneta* and *N. saprophila*. Altogether, they caused an increasing of the  $\alpha$ -diversity. Unlike in summer, the two main tributaries of Llobregat affected the  $\alpha$ -diversity. Nutrient and organic matter concentration was higher in spring.

The  $\beta$ -diversity followed the inverse pattern that characterized the  $\alpha$ -diversity. The species turnover was high in the headwaters and then decreased until the middle stretches. After the entrance of the Cardener,  $\beta$ -diversity increased again, to diminish slightly after the Anoia.

### **The Segre watershed**

The  $\alpha$ -diversity progressively increased from the headwaters downstream in summer 2002 (Fig 2C). *Achnanthes biasolettiana*, *Gomphonema minutum*, *Fragilaria capucina* var. *vaucheriae* and *Cymbella minuta* characterized the headwater communities. Downstream of the reservoirs *Diatoma vulgare* reached ca. 50% of the total abundance. *Nitzschia fonticola*, *Navicula capitatoradiata* and *N. tripunctata* were also

present. *D. vulgaris* have been found in current and rapid mountain waters (Sabater 1987). Before the reception of the two main tributaries, the Noguera Pallaresa and the Noguera Ribagorçana, *Nitzschia dissipata*, *N. palea* and *Amphora pediculus* became the most abundant species. After the input of the two main tributaries, the  $\alpha$ -diversity in the Segre diminished and small species characterized the communities. These mostly were *Cocconeis placentula*, *Navicula minima*, *Amphora pediculus*, *Achnanthes minutissima*, *Fragilaria brevistriata*. The autoecological signature of this community indicated that this part of the river received high inputs of nutrients. In the final part of the river the  $\alpha$ -diversity reached minimal values, *C. placentula* and *Navicula subminuscula* reached ca. 60% of the total abundance. Diversity in the main axis was always higher than at tributaries.

The  $\beta$ -diversity followed the inverse pattern as  $\alpha$ -diversity (Fig. 3C). Species turnover was high in the source and then began to decrease.

Unlike in summer, the  $\alpha$ -diversity in spring remained relatively constant along the main axis (Fig. 2C). The  $\alpha$ -diversity in the tributaries was lower than that of the main axis of Segre. A number of species of oligotrophic headwaters such as *A. biasoletiana*, *N. dissipata* and *Cymbella microcephala* characterized the headwaters of the main Segre axis. A peak of diversity occurred in the headwaters, mostly after the reservoirs. This peak was located where in summer occurred sudden diminution of diversity. *Nitzschia fonticola*, *C. minuta*, *A. minutissima*, *Navicula cryptotenella*, *N. reichardtiana* and *Melosira varians* were the most abundant species in this site, characteristic taxa of middle stretches with certain degree of contamination. After the Noguera Pallaresa had entered the Segre, *A. minutissima* and *A. biasoletiana* were the most abundant taxa, reaching ca. 50% of the total abundance, along with *Nitzschia dissipata*, *N. fonticola*, *N. inconspicua* and *Navicula cryptotenella*. In the final part, *Navicula saprophila* reached ca. 40% of the total abundance and characterized this part of the river. Accompanying taxa were *N. dissipata*, *N. fonticola*, *N. inconspicua*, *G. minutum* and *A. minutissima*.

The species turnover was high in the headwaters, and then suffered a sudden diminution and incremented again to the final part of the river (Fig. 3C).

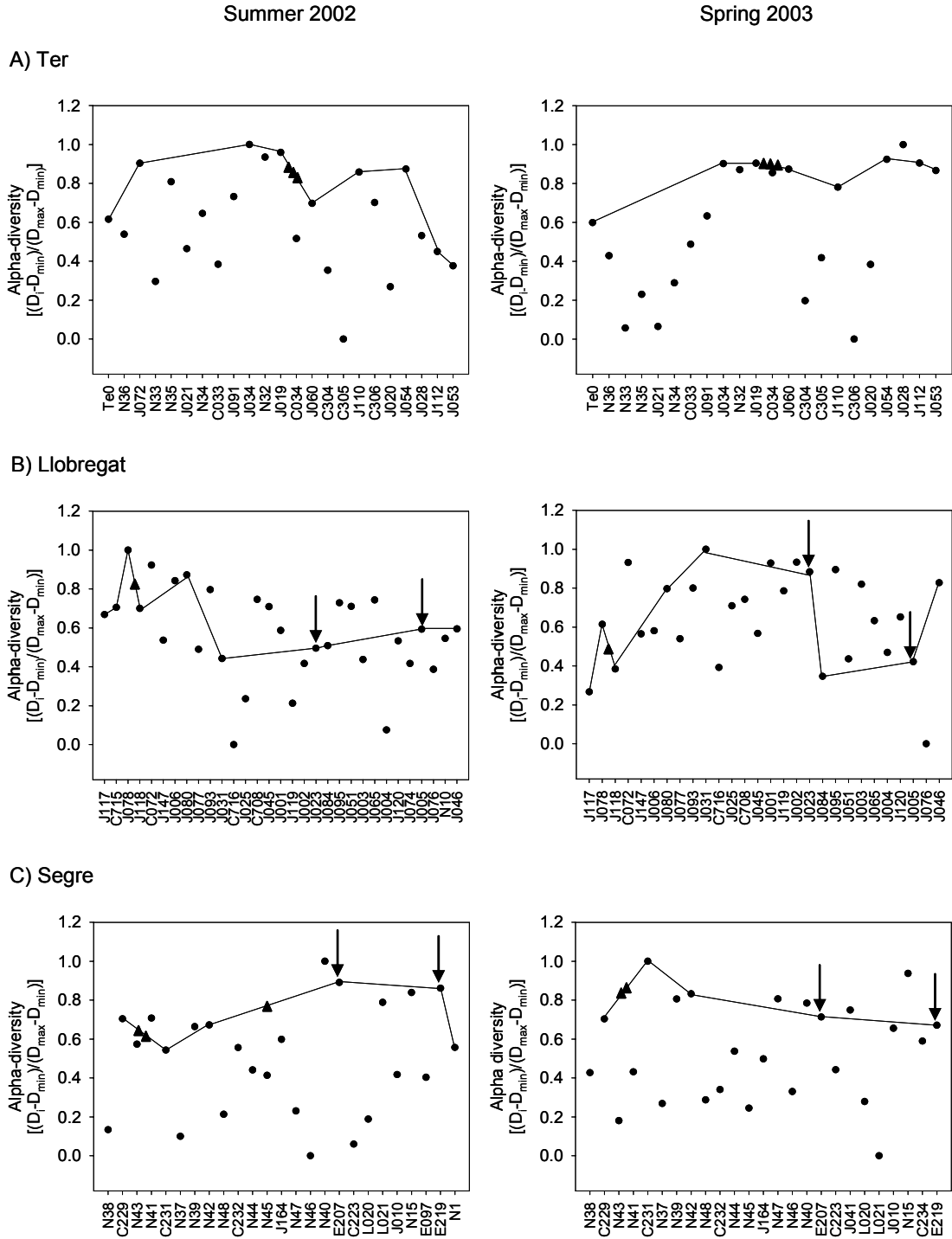


Fig. 2. Alpha-diversity of the studied sites arranged from headwaters to mouth. Dots represent each sampling point and lines represent the main axis. Reservoirs are indicated with a triangle and the entrance of the main tributaries with an arrow.

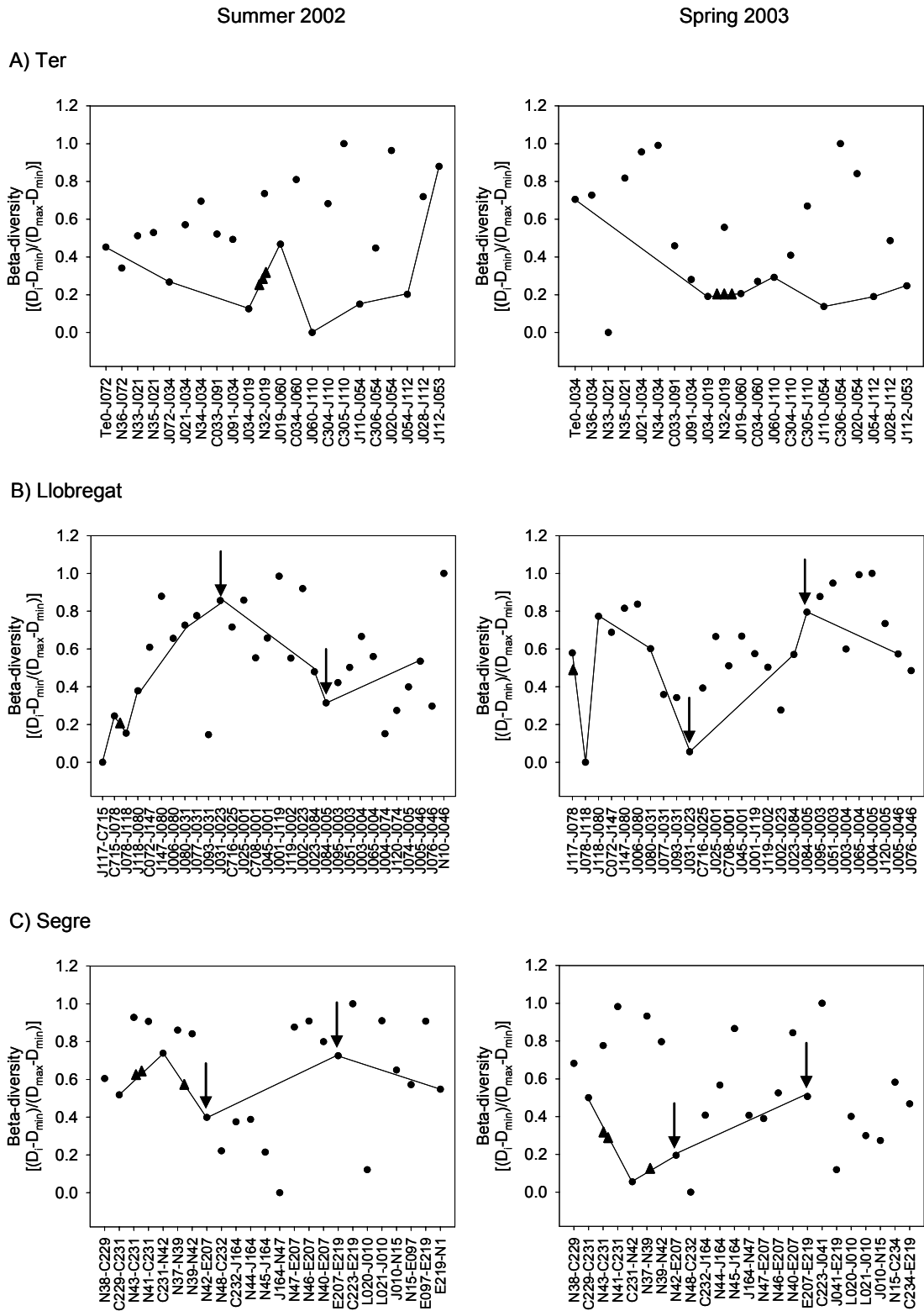


Fig. 3. Beta-diversity of the studied sites arranged from headwaters to mouth. Dots represent each sampling point and lines represent the main axis. Reservoirs are indicated with a triangle and the entrance of the main tributaries with an arrow.

### Effects of environment and watershed on diversity

Watersheds were significantly different between them for  $\alpha$ - and  $\beta$ -diversity (MANOVA,  $p < 0.001$ ). However, significant differences due to the sampling period in neither  $\alpha$ - nor  $\beta$ -diversity were not observed ( $p = 0.777$ ). The interaction between the watershed and the period was non-significant ( $p = 0.135$ ).

The relationships between diversity and the watershed area and main river length was analysed separately according to the degree of disturbance. Hence, the Llobregat watershed was analysed on one side, while the Segre and Ter watershed were analysed on the other side. The tributaries Anoia and Cardener in the case of Llobregat, and Noguera Pallaresa and Noguera Ribagorçana in the case of Segre were considered separately. No correlation was observed between the 3 diversity components and the area and length of the river in the case of the Llobregat watershed (Llobregat, Anoia and Cardener). However, the  $\gamma$ - and  $\alpha$ - diversity correlated well with the main river length in the case of Segre, Noguera Pallaresa, Noguera Ribagorçana and Ter. Such a correlation could not be observed with the area. The  $\beta$ -diversity correlated with the area of the watershed and the main river length (Table 1).

Table 1. Pearson's correlation coefficients between the  $\gamma$ -,  $\alpha$ - and  $\beta$ -diversity values and the area of the watershed and the main river length. (\*) Indicate significant correlation at  $p < 0.001$ . Llobregat watershed  $n = 52$ , Segre and Ter watershed  $n = 85$ .

	Llobregat watershed		Segre and Ter watershed	
	Watershed area	Main river length	Watershed area	Main river length
Gamma	0.230	0.225	0.180	0.376(*)
Alpha	0.269	0.265	0.095	0.285(*)
Beta	-0.181	-0.186	0.313(*)	0.329(*)

## DISCUSSION

The analyses of diversity on benthic freshwater algae have shown controversial results. While some have described increasing diversity related to increased nutrient supply (Marcus 1980, Pringle 1990), other studies have observed that diversity decrease in these situations (Miller et al. 1992). These apparently contrasting results indicate a unimodal relationship between nutrient richness and diversity (Hillebrand & Sommer 2000). Species richness is low at the lowest productivities because of a shortage of resources, but also declines at the highest productivities, where competitive exclusions increase rapidly. Diversity may be highest at intermediate levels of productivity (Waide et al. 1999).

This same pattern could be observed in the analysis of the rivers described in this chapter. Headwaters are highly disturbed habitats, where high water current, low light conditions or flood events make few species capable to grow under these environmental conditions. Mouths are also impacted habitats, both physically and chemically, and few species are able to tolerate the high degree of contamination. In the middle, stretches environmental conditions (e.g. substratum type, current velocity and light) favour the growth of benthic algae. As it was expected, in the Ter and Segre alpha diversity was low in the headwaters, incremented progressively in the middle stretches and then diminished in the mouths. The  $\alpha$ -diversity pattern for the Segre watershed was comparable with that of the Ter in summer as in spring, although differences were still significant. The  $\alpha$ -diversity remained relatively constant in spring in the two rivers. In summer, under low water flow and high spatial differences in water chemistry, the  $\alpha$ -diversity showed a consistent increase from the headwaters to the middle stretches, and a decrease towards the lower parts of the rivers. In both watersheds, the presence of the reservoirs had an effect on  $\alpha$ -diversity. However, the effect of the reservoirs was not the same in the Ter and in the Segre. In the Ter, there was a diminution of the diversity after the reservoirs, while in the Segre the effect was the contrary in spring.

The Llobregat River followed a completely different pattern from that in the Ter and the Segre Rivers. The  $\alpha$ -diversity did not show any consistent pattern between the two periods despite differences were non-significant. Previous studies analysing the distribution of diatom communities in the same area determined that the main gradient structuring diatom communities was mainly a nutrient gradient, which arranged oligotrophic highland sites to eutrophic sites of low elevation (Leira & Sabater 2005, Tornés et al. 2007). Thus, it can be considered that the distribution of the diatom diversity from headwaters to the mouth was interfered by this gradient previously described, making a highly different pattern than in that of the Ter and the Segre.

Generally, organisms with high dispersal ability show a weaker strength towards the predicted relationship between species richness and area. Diatoms have relatively efficient passive dispersal over large spatial extents, although limited (Vyverman et al. 2007, Soininen et al. 2007). However, the spatial scale of the study (31896 Km<sup>2</sup>) is not too extensive to lead to pronounced dispersal limitation for stream diatoms (see Soininen & Heino 2007). Thus, the lack of correlation in the Llobregat between the diversity and the area of the watershed and the main river length can be determined by the relevant role of the pollution in this system. In homogeneous systems, species turnover should generally exhibit shorter scale-dependency (Soininen et al. 2007). The degree of contamination governed the distribution of the diversity in this watershed and

masked physiographic effects. Instead, the correlation between  $\gamma$ -,  $\alpha$ - and  $\beta$ -diversity and physiographical parameters in the Segre and the Ter, and the consistent patterns between summer and spring, indicated that the longitudinal pattern of diversity in these rivers was modulated mostly by physiography.

The  $\beta$ -diversity followed an inverse pattern than that of the  $\alpha$ -diversity in all cases except for the Llobregat watershed in summer. Therefore in general, when the number of species per habitat ( $\alpha$ -diversity) increased, the species turnover between these habitats ( $\beta$ -diversity) decreased; and vice versa. In the case of the Llobregat in summer, however, the  $\alpha$ -diversity remained constant from the middle stretches, while the turnover of species between habitats incremented or decreased. In this river, the number of species was the same between sites, but species in one site and the other were different.

The case of the Llobregat suggested that there was a saturation of taxa. A community is saturated when it can not support any more species. Saturation of species may be an inevitable consequence of physical limitation, irrespective of interactions among species, when local habitat represents a few part of the regional area. If the local community is defined at a scale close to that of the total region,  $\alpha$ -diversity will incorporate almost all of  $\gamma$ -diversity and increase parallel to the latter, irrespective of interactions among species (Loreau 2000). Since diversity values were standardized, it can be assumed that the community from the middle stretches to the mouth of Llobregat in summer may be saturated, unable to support further species interactions. Contamination causes habitat degradation and homogenization, which is detected by a loss of species turnover between habitats (Passy & Blanchet 2007). Under natural conditions, the stream habitat is highly heterogeneous, with distinct transverse gradients of depth and current velocity and longitudinal alternation of riffles, runs, and pools of differing sediment types, nutrient availability, and often canopy. This heterogeneity creates a patch mosaic of stream algal communities (Pringle et al. 1988), and has been identified as one of the major mechanisms generating  $\beta$ -diversity (Connor & McCoy 1979). This diversity might be lost in the highly disturbed systems such as the Llobregat. Beta-diversity was high in the headwaters due to habitat heterogeneity. Diversity patterns in Llobregat watershed did not follow the trends for the Ter and the Segre, and this might be justified by the degree of contamination that affects this watershed (Leira & Sabater 2005, ACA 2003).





**CHAPTER 5. THE EFFECT OF HABITAT ON THE  
DISTRIBUTION OF BENTHIC ALGAE AND  
CYANOBACTERIA IN A FORESTED STREAM**



## INTRODUCTION

The distribution patterns of biological communities are the result of a complex interplay of physical and biotic processes that operate over a wide range of spatial and temporal scales (Menge & Olson 1990). In river ecosystems, water chemistry, light availability, variations in temperature, current velocity, or substrata type induce spatial heterogeneity, as observed on a range of scales in the river system (Frissell et al. 1986). The variability of these environmental characteristics causes habitats for stream and river algae to be more or less available, and this might be reflected in the algal community structure at the habitat scale (Walker et al. 1999, Cardinale et al. 2000). Light availability is the primary limiting factor for growth of the benthic algae in forested streams, while nutrients may be more relevant where the canopy cover is low (Hill & Knight 1988, Hill & Harvey 1990). Both in open and forested streams, water temperature and hydrologic variation are also modulating the metabolism of primary producers (Hill et al. 1995, Acuña et al. 2004, Uehlinger 2006). Since most streams have changing longitudinal patterns of canopy cover, stream bed substratum or water velocities, the algal communities are structured in mosaics of patches, each at a distinct point along succession dynamics (Matthaei et al. 2003).

The variability of habitats and the associated implications for the structure of benthic algae communities have been reported in several studies. Variations of in situ dissolved oxygen in a prairie stream suggested spatial shifts across distances of decimeters or less (Kemp & Dodds 2001). Passy (2001) showed that the architecture of diatom patches on natural substrata depended on their location within the stream. Soininen (2003) reported that a scale of meters is relevant for diatom distribution patterns in a turbid river. At the habitat scale, algae arrive from upstream reaches or from neighbouring patches as a result of continuous cell immigration. Hence, the algal community developing in a given patch is the result of cell settlement and attachment, the respective growth rates of the cells integrating the patch, interaction with other algae and biota, and finally random factors. However, the relative influence of environmental factors (that is, those that define the physical and chemical suitability of a given habitat for algal growth) on the spatial distribution of the taxa is not clearly established. Since the small-scale variation of environmental variables may be reflected by the spatial distribution of organisms (Pringle et al. 1988), it is pertinent to study the processes that maintain diversity in undisturbed natural systems. Here the effects of environmental factors on the distribution of algal communities in an undisturbed stream were examined. It was specifically of interest to determine the factors that affected the microdistribution of biomass and composition of benthic algal

and cyanobacterial taxa. The algal and cyanobacterial community was examined by multivariate analyses that consider the overall response of the community and the separate effects of environmental variables.

## METHODS

### Sampling

Temporal and spatial patterns of benthic algae and cyanobacteria distribution were studied in winter (December) 2005 and spring (May) 2006 in Fuirosos, a forested Mediterranean stream in NE Iberian Peninsula (Acuña et al. 2004). Sampling was conducted in 2 reaches, differing mostly in riparian cover, and ca. 200 m apart (Fig. 1).

Fig. 1. The shaded reach (A) and the unshaded reach (B) of Fuirosos stream in spring.



The proportion of benthic substrata in these reaches is similar and consists of boulders and cobbles overlying sand and gravel. Water samples for analysis and physicochemical variables were taken and measured, respectively, along 3 perpendicular transects in each of the 2 reaches (Fig. 2). Transects were ca. 6 m apart.



Fig. 2. Detail of a transect and the streambed.

Water depth, water velocity, incident light, pH, conductivity, percentage of oxygen saturation, water temperature, chlorophyll fluorescence ( $F_0$ ), and substratum type (rocks and sand) were measured every 10 cm along each transect at a position near to the substrata (see Appendix 3, page 155 and attached CD). The number of measurements in each transect ranged from 20 to 40, depending on its width. Conductivity, water temperature, percentage of oxygen saturation, and pH were measured using WTW meters. Incident light was measured using a Li-Cor quantum sensor (Li-192SB). Water velocity readings were taken with a current meter (MiniAir2 Schiltknecht 43221). Water depth at each position was measured with a ruler. The Reynolds and Froude numbers were calculated from water velocity and depth. The Reynolds number quantifies the ratio of inertial to viscous forces within a fluid, and can be used to distinguish between less turbulent to laminar regimes (low Reynolds number), and turbulent flow (high Reynolds number). The Froude number represents the ratio of inertial forces to gravitational forces, and differentiates steady flow from turbulent flows, and implies the greater or lower easiness for an organism to remain attached to a given substratum (Allan 1995).

Fluorescence in situ along each transect was measured by means of a pulse amplitude modulation (PAM) fluorometer (MINI-PAM, WALZ, Effeltrich, Germany). The PAM-method applies  $\mu$ s-light pulses to determine chlorophyll fluorescence, which may vary between a quasi-dark level ( $F_0$ ), when all Photosystem II reaction centres are open, and a maximal level ( $F_m$ ), when all these centres are closed (Schreiber et al. 2002). Therefore,  $F_0$  gives an estimate of chlorophyll *a* (chl *a*) content (Geel 1997). Fifteen periphyton samples were selected randomly from the 6 transects on the basis of the  $F_0$  range of values recorded previously every 10 cm along each transect. These samples were collected and used to extract chl *a* in the laboratory. Chl *a* samples were collected following Stockner & Armstrong (1971) (see below), rinsed in distilled water, and transported to the laboratory. Suspended material was retained in GF/F filters, which were then wrapped in aluminium foil and frozen until analysis. Chl *a* was measured after extraction with cold (4°C) 90% (v/v) acetone overnight. Chl *a* was estimated from spectrophotometric readings (Lambda UV/VIS spectrophotometer; Perkin-Elmer) following Jeffrey & Humphrey (1975). These measurements were compared to their respective  $F_0$  values, and the calibration curve between the 2 parameters was then used to transform the values for  $F_0$  measures along the transects to chl *a* ( $r^2 = 0.64$ ,  $p < 0.001$ ). The transformed chl *a* values were then used in the final estimates of algal biomass.

As it was not feasible to sample all identified spots (177 in winter and 141 in spring), the physical variables (light, temperature, water depth) and the  $F_0$  measured in the

field in each transect were used to establish the areas to be sampled in every transect. Within those areas, different spots were selected randomly, and sampled. Following this procedure, benthic algae and cyanobacteria were collected in up to 7 spots per transect, with a total of 42 samples per sampling period.

Samples for water chemistry were collected following the same criteria as for the algal samples. Water samples were passed through Whatman Nylon membrane filters with a pore diameter of 0.2  $\mu\text{m}$  in the field. Samples were then stored at 4°C and frozen in the laboratory until analysis. Nitrate was analysed by Ion-chromatography (Metrohm Ltd. Herisau Switzerland). Phosphate concentration was measured following the method described by Murphy & Riley (1962). Ammonium was analysed following HACH (1992). See also Appendix 3 for chemical data.

### **Algae collection and analysis**

Benthic algae and cyanobacteria were sampled from rocks and sand. Rocky samples were collected by means of a brush-syringe system adapted from Stockner & Armstrong (1971) (Fig. 3). Sandy samples were collected coring an area ca. 2 cm depth with an untapped syringe. Sand surface was estimated after applying a conversion factor obtained by granulometry (Artigas et al. 2004). These systems allowed the collection of the samples without relevant alteration of the stream bottom.

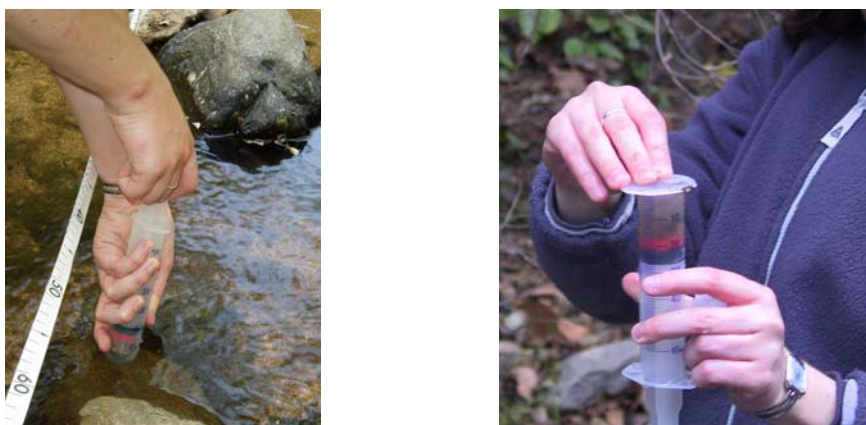


Fig. 3. Benthic algae and cyanobacteria collection using a brush-syringe system adapted from Stockner & Armstrong (1971).

The sample retained in the brush or in the untapped syringe was rinsed in 5 mL of river water and preserved in 4% formaldehyde until analysis. Each algal sample was partitioned for the taxonomic analysis of diatom and non-diatom algae, and cyanobacteria. Diatom frustules were cleaned from organic material using sulphuric acid, dichromate potassium, and hydrogen peroxide. Quantitative slides were prepared

by using Naphrax (r.i. 1.74; Brunel Microscopes Ltd., Chippenham, Wiltshire, UK). Up to 400 valves were counted on each slide using random microscopy fields under a light microscopy. A Nikon Eclipse E600W light microscope equipped with Nomarski differential interference contrast optics at a magnification of 1000x was used for diatom counts. Taxa were identified following mainly Krammer & Lange-Bertalot (1991-1997), and Lange-Bertalot (2001). Non-diatom algae and cyanobacteria were identified under light microscopy at a magnification of 1000x. However, large algal species were counted at lower magnification. The monographies used for the identification of the non-diatom algae and cyanobacteria were by Kann (1978) and Sabater (1987). This algal fraction was determined after counting 50 random microscope fields per aliquot. The quantitative method throughout the process considered the brushed surface, the dilutions performed, and the number of microscope fields counted.

### **Biovolume calculation**

Algal and cyanobacterial biovolume was calculated following Hillebrand et al. (1999), after measuring at least 10 randomly selected individuals of each taxon. The biovolume of species not included in Hillebrand et al. (1999) was calculated by the best fitting of the cells to geometrical models. In the case of the red alga *Lemanea* sp., cells counts were not possible and the volume was calculated for the entire thalli at 40x. For *Cladophora glomerata* mats, the extended filaments present in microscopic fields at 40x were used to calculate biovolume. In all cases, biovolume was expressed as  $\mu\text{m}^3 \text{cm}^{-2}$ . See Appendix 4 for biovolume data (page 155 and attached CD).

### **Data analysis**

Model II linear regression (geometric mean regression) using SPSS for Windows (version 14.0.1, SPSS, Chicago, Illinois) was conducted to analyse the relationship between F0 and chl *a*, because both variables were measurements (with errors; Sokal & Rohlf 1995). Environmental data and chl *a* were analysed by multivariate analysis of variance (MANOVA, SPSS for Windows, version 14.0.1, SPSS, Chicago, Illinois) to test for significant effects on sampling period, reach, and substrata type as factors.

Biovolume data of the algae and cyanobacteria were analysed by means of detrended correspondence analysis (DCA) (Hill & Gauch 1980) to determine the length of the gradient for the first two axes. DCA revealed that the gradient length was shorter than 3 standard deviation units; therefore linear ordination techniques were more appropriate (Lepš & Šmilauer 2003). Consequently, Principal component analysis (PCA) was used to examine the trends of the algal distribution in the sites without making *a priori* assumptions about possible factors influencing community structure.



Constrained ordination, redundancy analysis (RDA) was used to select predictors that best explained the variance of the algal data (ter Braak & Šmilauer 2002). Partial RDAs were finally used to separate and examine the relative importance of 2 groups of explanatory variables for the species data. Two groups of explanatory variables (environmental data and spatial data) were used for the constrained analyses (Borcard et al. 1992). Environmental data included in the analyses were substratum type, water depth, water velocity, Reynolds number, Froude number, conductivity, incident light, percentage of oxygen saturation, water temperature, ammonium concentration, phosphate concentration, and nitrate concentration.

Spatial data were defined as the position in the space occupied by the samples within each transect. These data were generated by means of a polynomial trend surface regression equation on the  $x$  (along the stream) and  $y$  coordinates (across the stream) (Legendre & Legendre 1998, Borcard et al. 1992). A third-order polynomial regression was applied to ensure not only the extraction of the linear gradient patterns in species data, but also more complex features like patches or gaps, which require correct description of the quadratic and cubic terms of the coordinates, and their interactions (Borcard et al. 1992). The spatial matrix consisted of the 9 terms of the equation ( $z = b_1x + b_2y + b_3x^2 + b_4xy + b_5y^2 + b_6x^3 + b_7x^2y + b_8xy^2 + b_9y^3$ ). There is no need for an intercept term ( $b_0$ ) since the species data are centered on the origin in the redundancy analyses solution (Borcard et al. 1992).

According to this preliminary RDA, collinear variables were identified and a subset of variables based on inspection of variance inflation factors ( $VIF < 20$ ) were selected (ter Braak & Verdonschot 1995). The 2 groups of explanatory variables (environmental and spatial) were submitted to a step-wise forward selection procedure in which the statistical significance of each variable was tested by the Monte Carlo permutation test (999 permutations) at a cut-off point of  $p = 0.05$ . Probabilities for multiple comparisons were corrected using Bonferroni correction. After that, variation partitioning was conducted in several steps: 1) RDA of the species matrix constrained by the environmental matrix; 2) RDA of the species matrix constrained by the spatial matrix; 3) partial RDA of the species matrix constrained by the environmental matrix and using the spatial matrix as covariables; and 4) partial RDA of the species matrix constrained by the spatial matrix and using the environmental matrix as covariables.

Taxa biovolumes with a relative proportion of 3% and occurring in more than 1 sample were included in the analyses. Taxa biovolumes were logarithmically transformed before analyses. Environmental data (except pH, percentage of oxygen saturation, and substratum type, expressed as dummy variables) were logarithmically transformed before analyses to reduce skewed distributions. Analyses including biovolume referred

to the entire benthic community, algae (diatom and non-diatom algae) and cyanobacteria. PCA, RDA, and partial RDA were undertaken using CANOCO for Windows (version 4.5, Microcomputer Power, Ithaca, New York).

## RESULTS

### Site characterization

The environmental variables (Table 1) showed significantly different values in winter than in spring (ANOVA,  $p < 0.001$ ), except in the case of water velocity and the Froude number (ANOVA,  $p = 0.677$  and  $p = 0.632$ ). These findings showed that the data required separate analysis per period. In winter, differences between the 2 reaches were due to light availability, water temperature, and ammonium and phosphate concentration (ANOVA,  $p < 0.05$ ). In spring, significant differences between the reaches were detected in water depth, incident light, Reynolds number, percentage of oxygen saturation, and ammonium concentration (ANOVA,  $p < 0.01$ ). Incident light, percentage of oxygen saturation, and Reynolds number differed with respect to substratum type (ANOVA,  $p < 0.01$ ) in winter, though only depth was significantly different between substratum type in spring (ANOVA,  $p < 0.05$ ).

Table 1. Mean values (SE) of physical and chemical variables for the reaches studied each sampling period.

Environmental variables	Winter		Spring	
	Unshaded reach	Shaded reach	Unshaded reach	Shaded reach
Depth (cm)	22.39 (0.67)	18.57 (0.81)	5.95 (0.47)	9.08 (0.55)
Velocity ( $m s^{-1}$ )	0.02 (0.00)	0.07 (0.01)	0.02 (0.00)	0.02 (0.00)
Conductivity ( $\mu S cm^{-1}$ )	187.52 (0.04)	198.39 (0.75)	231.17 (0.10)	229.23 (0.09)
Oxygen (%)	112.17 (1.38)	107.48 (1.04)	96.76 (0.43)	89.36 (0.45)
Water temperature ( $^{\circ}C$ )	5.07 (0.12)	2.87 (0.03)	15.92 (0.16)	15.84 (0.12)
$NH_4^+-N$ ( $\mu g L^{-1}$ )	224.78 (10.73)	154.01 (21.49)	11.27 (2.36)	18.52 (3.57)
$PO_4^{3-}-P$ ( $\mu g L^{-1}$ )	7.72 (0.32)	11.92 (0.69)	5.35 (0.17)	5.92 (0.27)
$NO_3^- -N$ ( $\mu g L^{-1}$ )	259.69 (31.46)	364.30 (22.71)	33.31 (1.68)	41.34 (1.67)
Chl a ( $\mu g cm^{-2}$ )	0.53 (0.07)	0.69 (0.08)	0.56 (0.07)	0.44 (0.06)
Light ( $\mu mol photons m^{-2} s^{-1}$ )	45.31 (2.02)	27.30 (0.49)	957.15 (57.08)	79.05 (7.49)
Reynolds number	3747.51 (405.66)	9197.99 (1869.55)	914.52 (102.23)	1756.31 (453.46)

### Chlorophyll distribution

The transformed chl *a* (surrogate of F0) values were significantly different only between substrata type in winter (ANOVA,  $p < 0.001$ ). Estimated chl *a* ranged from 0 to 2.8  $\mu\text{g cm}^{-2}$  in the unshaded reach, and from 0 to 2.6  $\mu\text{g cm}^{-2}$  in the shaded one during winter. In spring, chl *a* ranged from 0 to 2.9  $\mu\text{g cm}^{-2}$  in the unshaded reach, and from 0 to 2.3  $\mu\text{g cm}^{-2}$  in the shaded one (Fig. 1A). Chl *a* in winter ranged from 0 to 2.8  $\mu\text{g cm}^{-2}$  on sand to 0 to 2.6  $\mu\text{g cm}^{-2}$  on rock substrata. In spring, maximum chl *a* reached 0.6  $\mu\text{g cm}^{-2}$  on the former substrate and 2.9  $\mu\text{g cm}^{-2}$  on the latter (Fig. 1B).

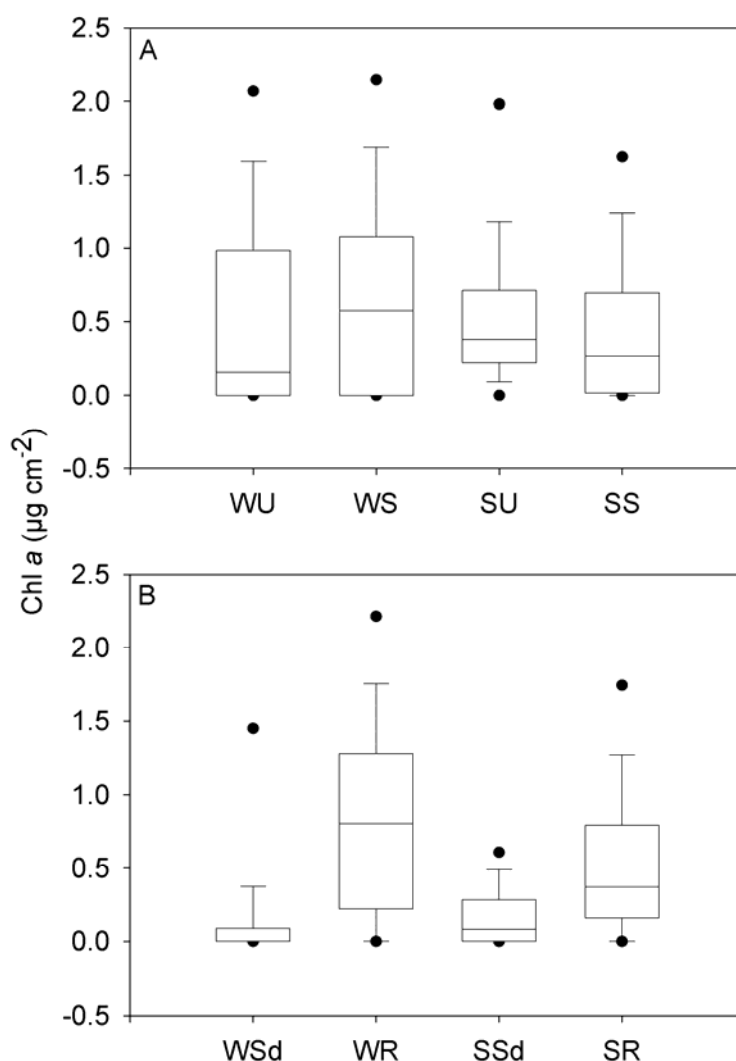


Fig. 1. (A) Chl *a* transformed values in winter (W) and spring (S) for the 2 reaches, unshaded (U) and shaded (S). (B) Chl *a* values of winter (W) and spring (S) for the 2 substratum types: sand (Sd) and rocks (R). Boxes represent the median, and 25th and 75th quartiles. Figures also show (dots) the 5th and 95th percentiles.

### Spatial distribution of taxa biovolume

*Dermocarpa kernerii*, *Nitzschia dissipata*, and *Chantransia* stage made up ~60% of total algal biovolume in winter, whereas *Lemanea* sp., *Spirogyra* sp., and *Cladophora glomerata* accounted for 81% of the total algal biovolume in spring. Most of the winter biovolume was related to the occurrence of *N. dissipata*, *Melosira varians*, and *Fragilaria ulna* in the unshaded reach, and that of *D. kernerii* and *Chantransia* stage in the shaded reach. In spring, *Spirogyra* sp. and *C. glomerata* prevailed in the unshaded reach, while *Lemanea* sp. alone contributed to 91% of the biovolume recorded in the shaded reach in spring.

The first PCA axis carried out with the taxa biovolume measurements separated samples of the unshaded from the shaded reach. This axis was most probably associated with a gradient of light incidence in the transects. In winter, 24.1% of the total variance was explained in this first axis, while in spring it accounted for 28.3%. The maximum biovolumes for most of the species occurred in the unshaded reach. *F. ulna*, *Navicula gregaria*, *M. varians*, *Nitzschia palea*, and *N. dissipata* characterized the illuminated habitats in winter, while *Fragilaria ulna* var. *acus*, *F. ulna*, *Cocconeis pediculus*, and *N. dissipata* characterized these spots in spring. *D. kernerii* characterized the shaded habitats in winter, while *Lemanea* sp. accounted for most of the biovolume in spring. The second PCA axis expressed the relevance of substratum type for biovolume distribution, since sandy samples were clustered together and separated from rocky samples. This axis accounted for 13.8% of variance in winter and 15.7% in spring. *D. kernerii*, *Gongrosira debaryana*, and *Nitzschia linearis* accounted for the highest biovolume in rocky habitats, while *Cocconeis placentula*, *C. pediculus*, *Fragilaria biceps*, and *Phormidium* sp. were the most abundant in sandy habitats in winter. In spring, *G. debaryana*, *Homoeothrix* sp., *Pleurocapsa minor*, and *Oedogonium* sp. occupied rocky habitats, while *F. biceps* was typical of the communities in sandy habitats.

### Variation partitioning of biovolume

RDA with forward selection showed that Reynolds number, incident light, water temperature, and substratum type were the environmental variables most related to the winter biovolume of the taxa. Partial RDA showed that these environmental variables accounted for 15.7% of the total variation (Fig. 2A). In spring, Reynolds number, percentage of oxygen saturation, incident light, and conductivity were statistically significant in RDA, accounting for 14.6% of the total variation in partial RDA (Fig. 2B). Spatial variation was best described by a third-order equation. The terms retained in the selection for the two periods in RDA were third-degree monomials ( $z = b_7x^2y + b_9y^3$

in winter,  $z = b_8xy^2 + b_9y^3$  in spring). The spatial position of the taxa (spatial variation, not shared by the environmental variation) accounted for the 6.4% of total variation in winter and 4.3% in spring in partial RDA. Up to 6.1% of the variation in algal data was shared between the environmental and spatial variables in winter, while in spring the percentage shared increased to 9.8%.

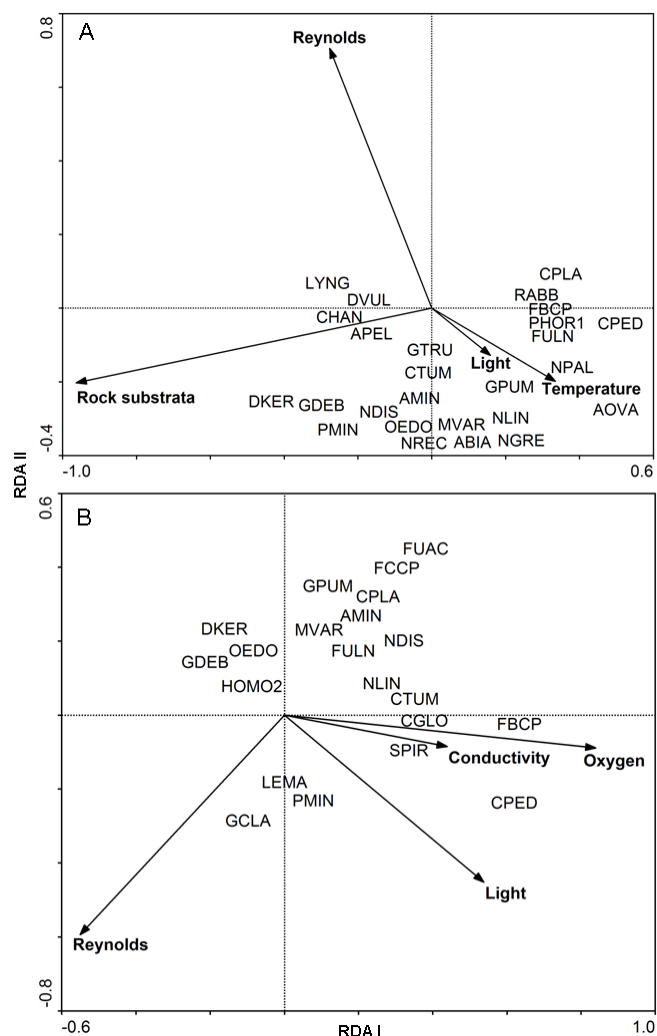


Fig. 2. Partial RDA results in the ordination space of the first and second axis. Ordination of the biovolumes of algae and cyanobacteria in winter (A) and spring (B). Taxa codes correspond to those used in Table 2.

### Species preferences

The biovolume distribution of several taxa was related mostly to the environmental variables (Table 2). Amongst these, *Navicula gregaria*, *Gongrosira debaryana*, *Cymbella tumida*, *Achnanthes biasolettiana*, *Diatoma vulgare*, *Nitzschia recta*, *Melosira varians*, and *Achnanthes minutissima* had their distribution mostly explained by environmental variables in winter. *Fragilaria biceps*, *Cocconeis pediculus*, *Pleurocapsa minor*, *Lemanea* sp., and *Cladophora glomerata* were the species most related to the

environmental variables in spring. In contrast, the biovolume distribution of *Amphipleura pellucida*, *Chantransia* stage, *Cocconeis placentula*, *Fragilaria ulna*, *Gomphonema pumilum*, and *Lyngbya* sp. were explained both by the environmental and spatial variables in winter. *A. minutissima*, *Gomphonema clavatum*, *M. varians*, and *Oedogonium* sp. were amongst the species affected by both the environment and space in spring. None of these taxa was related only to the spatial variables.

Table 2. Results of the partial redundancy analyses (RDA) with forward selection of the variables in winter (A) and spring (B). The table shows the percentage of variance explained by environmental and spatial variables with respect to the total and constrained variance.

A)

Taxon	Code	Fraction of total variance		Fraction of explained variance	
		Environment	Space	Environment	Space
<i>Achnanthes biasolettiana</i> Grunow	ABIA	20.82	1.46	93.45	6.55
<i>Achnanthes minutissima</i> Kützing	AMIN	15.67	1.49	91.32	8.68
<i>Amphipleura pellucida</i> Kützing	APEL	16.66	14.93	52.74	47.26
<i>Amphora ovalis</i> (Kützing) Kützing	AOVA	34.87	20.69	62.76	37.24
<i>Chantransia</i> stage	CHAN	3.81	2.88	56.95	43.05
<i>Cocconeis pediculus</i> Ehrenberg	CPED	25.19	6.68	79.04	20.96
<i>Cocconeis placentula</i> Ehrenberg	CPLA	12.11	10.44	53.70	46.30
<i>Cymbella tumida</i> (Brébisson) Van Heurck	CTUM	29.64	1.79	94.30	5.70
<i>Dermocarpa kernerii</i> (Hansgirg) Bourrelly	DKER	25.52	7.25	77.88	22.12
<i>Diatoma vulgare</i> Bory 1824	DVUL	6.39	0.48	93.01	6.99
<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot	FBCP	6.97	2.11	76.76	23.24
<i>Fragilaria ulna</i> (Nitzsch) Lange-Bertalot	FULN	8.15	10.59	43.49	56.51
<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	GPUM	12.76	12.14	51.24	48.76
<i>Gomphonema truncatum</i> Ehrenberg	GTRU	1.05	3.10	25.30	74.70
<i>Gongrosira debaryana</i> Rabenhorst	GDEB	22.36	1.17	95.03	4.97
<i>Lyngbya</i> sp.	LYNG	6.28	6.01	51.10	48.90
<i>Melosira varians</i> Agardh	MVAR	14.57	1.14	92.74	7.26
<i>Navicula gregaria</i> Donkin	NGRE	20.14	0.94	95.54	4.46
<i>Nitzschia dissipata</i> (Kützing) Grunow	NDIS	10.40	4.57	69.47	30.53
<i>Nitzschia linearis</i> (Agardh) W. Smith	NLIN	13.52	8.55	61.26	38.74
<i>Nitzschia palea</i> (Kützing) W. Smith	NPAL	15.25	2.35	86.65	13.35
<i>Nitzschia recta</i> Hantzsch in Rabenhorst	NREC	15.28	1.19	92.77	7.23
<i>Oedogonium</i> sp.	OEDO	11.06	7.31	60.21	39.79
<i>Phormidium</i> sp.	PHOR1	7.80	13.44	36.72	63.28
<i>Pleurocapsa minor</i> Hansgirg	PMIN	19.88	2.90	87.27	12.73
<i>Rhoicosphenia abbreviata</i> (C. Agardh) Lange-Bertalot	RABB	7.11	3.35	67.97	32.03

B)

Taxon	Code	Fraction of total variance		Fraction of explained variance	
		Environment	Space	Environment	Space
<i>Achnanthes minutissima</i> Kützing	AMIN	15.31	16.66	47.89	52.11
<i>Cladophora glomerata</i> (Linnaeus) Kützing	CGLO	15.39	1.58	90.69	9.31
<i>Cocconeis pediculus</i> Ehrenberg	CPED	39.55	0.91	97.75	2.25
<i>Cocconeis placentula</i> Ehrenberg	CPLA	14.87	4.74	75.83	24.17
<i>Cymbella tumida</i> (Brébisson) Van Heurck	CTUM	14.61	6.70	68.56	31.44
<i>Dermocarpa kernerii</i> (Hansgirg) Bourrelly	DKER	8.07	4.75	62.95	37.05
<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot	FBCP	33.45	0.63	98.15	1.85
<i>Fragilaria capucina</i> Desmazières	FCCP	27.41	4.27	86.52	13.48
var. <i>capitellata</i> (Grunow) Lange-Bertalot					
<i>Fragilaria ulna</i> (Nitzsch) Lange-Bertalot	FULN	7.77	12.51	38.31	61.69
<i>Fragilaria ulna</i> (Nitzsch) Lange-Bertalot	FUAC	34.91	6.49	84.32	15.68
var. <i>acus</i> (Kützing) Lange-Bertalot					
<i>Gomphonema clavatum</i> Ehrenberg	GCLA	8.58	6.78	55.86	44.14
<i>Gomphonema pumilum</i> (Grunow)	GPUM	12.48	2.61	82.70	17.30
Reichardt & Lange-Bertalot					
<i>Gongrosira debaryana</i> Rabenhorst	GDEB	7.87	0.94	89.33	10.67
<i>Homoeothrix</i> sp.	HOMO2	2.50	4.06	38.11	61.89
<i>Lemanea</i> sp.	LEMA	7.48	0.68	91.67	8.33
<i>Melosira varians</i> Agardh	MVAR	8.35	11.95	41.13	58.87
<i>Nitzschia dissipata</i> (Kützing) Grunow	NDIS	12.93	4.10	75.92	24.08
<i>Nitzschia linearis</i> (Agardh) W. Smith	NLIN	6.14	2.88	68.07	31.93
<i>Oedogonium</i> sp.	OEDO	5.16	7.24	41.61	58.39
<i>Pleurocapsa minor</i> Hansgirg	PMIN	4.60	0.32	93.50	6.50
<i>Spirogyra</i> sp.	SPIR	19.32	7.44	72.20	27.80

## DISCUSSION

Several environmental variables (i.e. temperature, substratum type, light, local hydraulic conditions) explained most of the variation of the biovolume distribution in the stream. The position of samples in the space (the spatial matrix in this study) can be considered as a synthetic descriptor of unmeasured underlying processes that contribute to contagious distribution. This includes the settlement of the cells or randomness, which do not have a direct relationship with the variables that were included in the analyses. The spatial distribution of the algal and cyanobacterial taxa in the stream was therefore weakly related to the factors associated to dispersion in the reach and settlement on the substrata. Even so, the amount of unexplained variation was high, probably due to the local effects of unmeasured (biotic and abiotic) variables, or to spatial structures that were overlooked because they require the description of more complex functions (Borcard et al. 1992). The fine taxonomic level used in this study may account for higher unexplained variation, compared with analyses that pool taxa in coarser taxonomic groups or size classes (Cattaneo et al. 1993). However, a

finer taxonomic level is necessary to understand complex successional processes or mechanisms (Connell & Slatyer 1977, Pickett et al. 1987).

Because of the homogenous chemical environment in the Fuirosos stream, physical variables (temperature, light, flow, substrata type) were the most prevalent in determining the distribution and abundance of the benthic algae. Concerning hydraulic conditions, most of the species were associated to less turbulent habitats (lower values of Reynolds number). Because Fuirosos is an oligotrophic stream (Table 1), turbulent flow may have negative effects on benthic algal metabolism and growth. This antagonist effect has been observed in high-velocity, low-nutrient habitats (Borchardt 1994). However, other algae like *Lemanea* and *Cladophora* preferred habitats characterised by turbulent flow (higher Reynolds numbers). These taxa have been reported to withstand the drag of current (Stevenson 1996b, Sheath 2003), their growth being favoured by turbulent flow.

Light and temperature are relevant factors of phototrophic growth (Hill 1996), and in the Fuirosos the 2 factors determine relevant changes in algal biomass and taxonomic composition between seasons (Veraart et al. 2008). This study revealed that mostly in spring, light was one of the most important factors determining algal biovolume distribution. Diatoms, which contributed most of the biovolume in winter and spring, preferred the unshaded sectors. Filamentous green algae (e.g. *Cladophora glomerata* and *Spirogyra* sp.) also showed a preference for unshaded habitats, but red algae (e.g. *Lemanea* sp.) and colonial cyanobacteria (e.g. *Dermocarpa kernerii*) preferred low light conditions. Light limitation has been observed to negatively affect the development of diatoms (Kawecka 1986, Lowe et al. 1986, Robinson & Rushforth 1987). Filamentous green algae increase in stream sections with high incident light (Shortreed & Stockner 1983, Lowe et al. 1986). Cyanobacteria have been observed to prefer irradiances of < 50-100  $\mu\text{mol photons m}^{-2} \text{s}^{-1}$  (Steinman et al. 1989). However, the relative proportion of filamentous taxa increase when light energy is elevated (Duncan & Blinn 1989). Prostrate cyanobacteria (which occurred in the Fuirosos stream) may have physiological mechanisms that allow them to persist under low-light conditions at the bottom of benthic algal mats (Hill 1996). Freshwater Rhodophyta are adapted to low light and most exhibit low saturating levels of illumination for photosynthesis (35-400  $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ ) (Sheath 2003). Likewise, members of Lemnaceae occur more frequently at low irradiance (Mullahy 1952, Thirb & Benson-Evans 1983).

The relevance of substratum type in algal distribution in the Fuirosos is more important in winter. The physical properties of substrata affect benthic algal development (Burkholder 1996, Bergey 2005, Murdock & Dodds 2007). The higher occurrence of *Cocconeis placentula* and *C. pediculus* on sand grains is related to their prostrate



growth form. Prostrate taxa are non-motile forms that adhere tightly in spite of the constant movement of the sand grains (Miller et al. 1987). Rosette-forming diatoms like *F. biceps* use flexible mucilage pads to adhere strongly to the substrata and can colonize sand grains. Organic mucilage secreted by bacteria or diatoms facilitates the subsequent colonization of substrata (Sekar et al. 2004) by prostrate forms, some of which colonize only preconditioned substrata (Hoagland et al. 1982, Korte & Blinn 1983). In contrast, mucilage pads or stalked forms colonize bare substrata, with no organic film (Hamilton & Duthie 1984, Steinman & McIntire 1986). The growth form of mucilage pads provide elongate shapes with relatively large surface area available for attachment (Steinman & McIntire 1986). Taxa found on sand grains are mostly pioneer species, typically observed during early stages of succession (Miller et al. 1987, Sekar et al. 2004). Diatom taxa as *Nitzschia linearis*, filamentous green algae (e.g. *Gongrosira debaryana* and *Oedogonium* sp.), and cyanobacteria (e.g. *Homoeothrix* sp. and *Pleurocapsa minor*) comprise late phase communities (Sabater 1989, Sekar et al. 2004). Instead, rocks provided stable substrata and allowed the development of well structured communities.

The relative importance of environmental factors on stream periphyton shifted seasonally (Rosemond et al. 2000). As an example, *Achnanthes minutissima* and *Melosira varians* had a ubiquitous distribution in spring while in winter their abundance was explained mostly by the incidence of light. However, these results suggest that some taxa are environmentally demanding (only occurring under certain environmental conditions) while others are more tolerant. This assertion needs to be obviously made with caution because of the 2 only periods included in the analysis.

Community assembly is a result of historical and environmental factors (Chase 2003). The high dispersal rate between areas or patches within a stream minimizes the barriers between areas (historical factor) and causes environmental factors to become the most relevant. Habitat heterogeneity associated with environmental variability can therefore be taken as the major driver of community diversity in lotic systems and is expressed at the substrata scale (Bergey 2005, Murdock & Dodds 2007), the reach scale (Passy 2001, Matthaei et al. 2003) and the watershed scale (Leira & Sabater 2005, Tornés et al. 2007). The results of this chapter demonstrate the relevance of small-scale heterogeneity in streams, and how it affects the structure of these communities. While some species show a definite response, others are more plastic and their response is unpredictable.

# **CONCLUSIONS**

**(English)**



### **Indicator taxa of benthic diatom communities: a case study in Mediterranean streams**

1. Four groups of streams types were defined in Catalonia, which showed the existence of distinctly different communities among them.
2. Type-specific taxa from near-natural streams were coincident with the indicator taxa for high ecological status.
3. Physiographical differences were only evident in undisturbed sites, while nutrient enrichment and other human disturbances may mask the regional differences in the distribution of the diatom communities. Human impact reduced the typological heterogeneity of the diatom community composition.
4. The use of diatoms as an ecological tool needs to take into account of the different autoecological characteristics of the diatom taxa in different regions, and be adapted if it is to provide a reliable diagnosis of specific river systems.

### **Classification strength of reference conditions. Are biological classifications of stream benthic diatom communities concordant with ecoregions?**

5. Ecoregions and subecoregions were stronger classifiers than watersheds and geographical position, and concordant with the classification based only on diatom communities, showing that diatom communities' composition in NE Iberian Peninsula reflects ecoregional variability.

### **Distribution of diatom communities along environmental gradients in Mediterranean streams. Application and usefulness of diatom indices**

6. Nutrient enrichment and river habitat appeared to be the most important environmental variables in structuring diatom communities in the Mediterranean streams studied. Diatom communities also responded to a gradient of water temperature and geochemical differences.
7. The 3 diatom indices applied (IPS, IBD and CEE) reliably assessed water quality of the sites and also reflected the seasonal differences, although in some cases they did

not properly reflected special situations in Mediterranean streams as calcareous headwaters.

8. The best correlations with environmental variables were observed with IPS and IBD. However, IPS is suggested as the best index to assess water quality at the studied sites as IBD underestimate or overestimate particular situations in the Mediterranean streams studied.

9. The intercalibration process has proved to be a suitable exercise for the Mediterranean region. However, further investigation is still needed to develop a powerful tool to biomonitor river systems across Mediterranean region and types for site classification should be reappraised.

#### **Diversity patterns of benthic diatoms in Mediterranean rivers**

10. The diversity patterns of benthic diatoms were similar in the Ter and Segre, completely different from Llobregat.

11. The diversity pattern for rivers Ter and Segre were modulated mostly by their physiography. However, the longitudinal diversity pattern (from the headwaters to the mouth) was interfered by a nutrient gradient in the Llobregat River.

12. Contamination caused habitat degradation and homogenization, which was detected by a loss of species turnover between habitats and a community saturation of species.

#### **The effect of habitat on the distribution of benthic algae and cyanobacteria in a forested stream**

13. Physical variables (i.e. temperature, light, local hydraulic conditions, substratum type) were the major determinants of the distribution of species in Fuirosos stream. The spatial distribution of the algae and cyanobacteria in Fuirosos was therefore weakly related to factors associated to dispersion in the reach and settlement on the substrata.

14. The factors affecting distribution varied between periods, suggesting that some species are environmental demanding only under certain conditions, while others show a wider tolerance to environmental conditions.

15. Algal and cyanobacterial communities had a heterogeneous distribution at the habitat scale, in spite of the small dimension of the stream. Thus, habitat heterogeneity is of great importance to benthic community distribution in a small stream.



## **CONCLUSIONS**

**(Català)**





### **Espècies indicadores de comunitats de diatomees bentòniques. Un cas d'estudi en rius mediterranis**

1. Es van definir quatre grups de tipologies de rius a Catalunya, les quals van mostrar l'existència de comunitats clarament diferents entre elles.
2. Els taxons específics dels rius de condicions gairebé naturals eren coincidents amb els taxons indicadors d'estatus ecològic elevat.
3. Les diferències fisiogràfiques eren evidents solament en punts no pertorbats, mentre que l'enriquiment de nutrients i altres pertorbacions humanes poden emascarar les diferències regionals en la distribució de les comunitats de diatomees. L'impacte humà redueix l'heterogeneïtat de tipologies de la composició de les comunitats de diatomees.
4. L'ús de les diatomees com a eines ecològiques requereix que tinguin en compte les diferents característiques autoecològiques de les espècies en les diferents regions, i que siguin adaptades si es vol que proporcionin una diagnosi fiable dels sistemes fluvials específics.

### **Solidesa de la classificació de les condicions de referència. Les classificacions biològiques de diatomees bentòniques fluvials concorden amb les ecoregions?**

5. Les ecoregions i les subecoregions van ser classificacions més fortes que les conques fluvials i la posició geogràfica, i concordants amb la classificació basada només en les comunitats de diatomees, demostrant que la composició de les comunitats de diatomees al NE de la Península Ibèrica reflecteix la variabilitat ecoregional.

### **Distribució de les comunitats de diatomees en gradients ambientals. Aplicació i utilitat d'índexs de diatomees**

6. L'enriquiment de nutrients i l'hàbitat fluvial van ser les variables ambientals més importants en l'estructuració de les comunitats de diatomees en els rius mediterranis estudiats. Les comunitats de diatomees van respondre també a un gradient de temperatura de l'aigua i de diferències geoquímiques.

7. Els tres índexs aplicats (IPS, IBD i CEE) no van fallar en l'avaluació de la qualitat de l'aigua dels punts i a més van reflectir les diferències estacionals, tot i que no van reflectir correctament algunes situacions especials dels rius mediterranis com les capçaleres calcàries.

8. Les millors correlacions amb les variables ambientals es van observar amb l'índex IPS i l'IBD. No obstant, es suggereix l'IPS com al millor índex per a avaluar la qualitat de l'aigua ja que l'IBD subestima o sobreestima situacions particulars en els rius mediterranis estudiats.

9. El procés d'intercalibració ha resultat ser un exercici adequat per a la regió mediterrània. Tot i això, es necessita una investigació més a fons per a desenvolupar una eina potent de biomonitoratge dels sistemes fluvials per a la regió mediterrània, i les tipologies de classificació haurien de ser reavaluades.

#### **Patrons de diversitat de diatomees bentòniques en rius mediterranis**

10. Els patrons de diversitat de les diatomees bentòniques eren similars al Ter i al Segre, i completament diferents dels del Llobregat.

11. Els patrons de diversitat dels rius Ter i Segre estaven modulats principalment per la seva fisiografia. No obstant, els patrons longitudinals de diversitat (des de la capçalera a la desembocadura) del Llobregat estaven interferits per un gradient de nutrients.

12. La contaminació va causar degradació de l'hàbitat i homogeneïtzació, que va ser detectada per una pèrdua de recanvi d'espècies entre hàbitats i una saturació d'espècies a la comunitat.

#### **L'efecte de l'hàbitat en la distribució d'algues i cianobacteris bentònics en una riera forestada**

13. Les variables físiques (com temperatura, llum, condicions hidràuliques locals, tipus de substrat) van ser els principals determinants de la distribució d'espècies a la Riera de Fuirosos. La distribució espacial d'algues i cianobacteris a Fuirosos va estar, per tant, poc relacionada amb factors associats a la dispersió en el tram o a l'establiment al substrat.

14. Els factors que afecten la distribució variaven entre períodes, suggerint que algunes espècies són ambientalment exigents només sota determinades condicions, mentre que d'altres mostren una tolerància àmplia a les condicions ambientals.

15. Les comunitats d'algues i cianobacteris tenien una distribució heterogènia a escala d'hàbitat, a pesar de les petites dimensions de la riera. D'aquesta manera, l'heterogeneïtat de l'hàbitat és de gran importància per a la distribució de les comunitats bentòniques en una riera petita.



## **REFERENCES**



- Aboal, M., Puig, M. A. & Soler, G. 1996. Diatom assemblages in some Mediterranean temporary streams in southeastern Spain. *Arch. Hydrobiol.* 136: 509-527.
- ACA. 2003. Anàlisi de la viabilitat i proposta d'indicadors fitobentònics de la qualitat de l'aigua per als cursos fluvials de Catalunya. Report of the Agència Catalana de l'Aigua, Barcelona, Spain.
- Acuña, V., Giorgi, A., Muñoz, I., Uehlinger, U. & Sabater, S. 2004. Flow extremes and benthic organic matter shape the metabolism of a headwater Mediterranean stream. *Freshw. Biol.* 49: 960-971.
- Allan, J. D. 1995. *Stream Ecology: Structure and function of running waters*. Chapman & Hall, London, UK, 388 pp.
- Anderson, M. J., Ellingsen, K. E. & McArdle, B. H. 2006. Multivariate dispersion as a measure of beta diversity. *Ecol. Lett.* 9: 683-693.
- Artigas, J., Romani, A. M. & Sabater, S. 2004. Organic matter decomposition by fungi in a Mediterranean forested stream: contribution of streambed substrata. *Ann. Limnol.* 40: 269-277.
- Aschmann, H. 1973. Distribution and peculiarity of Mediterranean ecosystems. In di Castri, F. & Mooney, H. A. (eds.) *Mediterranean-Type Ecosystems: Origin and Structure*. Springer-Verlag, New York, NY, USA, pp. 11-19.
- Azim, M. E. & Asaeda, T. 2005. Periphyton structure, diversity and colonization. In Azim, M. E., Verdegem, M. C. J., van Dam, A. A. & Beveridge, M. C. M. (eds.) *Periphyton: Ecology, Exploitation and Management*. CABI Publishing, Wallingford, UK, pp. 15-33.
- Barbour, M. T., Gerritsen, J., Snyder, B. D. & Stribling, J. B. 1999. *Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish*. Environmental Protection Agency, Office of Water, Washington, D. C.
- Bergey, E. A. 2005. How protective are refuges? Quantifying algal protection in rock crevices. *Freshw. Biol.* 50: 1163-1177.



## REFERENCES

- Biggs, B. J. F. 1996. Patterns in benthic algae of streams. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal Ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 31-56.
- Biggs, B. J. F., Duncan, M. J., Jowett, I. G., Quinn, J. M., Hickey, C. W., Davies-Colley, R. J. & Close, M. E. 1990. Ecological characterisation, classification and modelling of New Zealand rivers: an introduction and synthesis. *N. Z. J. Mar. Freshw. Res.* 24: 277-304.
- Biggs, B. J. F., Stevenson, R. J. & Lowe, R. L. 1998. A habitat matrix conceptual model for stream periphyton. *Arch. Hydrobiol.* 143: 21-56.
- Borcard, D., Legendre, P. & Drapeau, P. 1992. Partialling out the spatial component of ecological variation. *Ecology* 73: 1045-1055.
- Borchardt, M. A. 1994. Effects of flowing water on nitrogen -and phosphorus- limited photosynthesis and optimum N:P ratios by *Spirogyra fluviatilis*. *J. Phycol.* 30: 418-430.
- Burkholder, J. M. 1996. Interactions of benthic algae with their substrata. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal Ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 253-297.
- Cardinale, B. J., Nelson, K. & Palmer, M. A. 2000. Linking species diversity to the functioning of ecosystems: on the importance of environmental context. *Oikos* 91: 175-183.
- Carpenter, K. D. & Waite, I. R. 2000. Relations of habitat-specific algal assemblages to land use and water chemistry in the Willamette Basin, Oregon. *Environ. Monit. Assess.* 64: 247-257.
- Cattaneo, A., Legendre, P. & Niyonsenga, T. 1993. Exploring periphyton unpredictability. *J. North Am. Benthol. Soc.* 12: 418-430.
- CEMAGREF. 1982. Étude des méthodes biologiques d'appréciation quantitative de la qualité des eaux. Rapport Division Qualité des Eaux Cemagref Lyon. Agence de l'Eau Rhône-Méditerranée-Corse, Lyon.

- CEN. European Committee for Standardization. 2000. Water quality. Guidance standard for the routine sampling and pre-treatment of benthic diatoms from rivers for water quality assessment. European Standard. prEN 13946.
- CEN. European Committee for Standardization. 2001. Water quality. Guidance standard for the identification and enumeration of benthic diatom samples from rivers and their interpretation. European Standard. TC 230 WI 00230164.
- Chase, J. M. 2003. Community assembly: when should history matter? *Oecologia* 136: 489-498.
- Cholnoky, B. J. 1968. Die Ökologie der Diatomeen in Binnengewässern. J. Cramer, Lehre, 699 pp.
- Connell, J. H. & Slatyer, R. O. 1977. Mechanisms of succession in natural communities and their role in community stability and organization. *Am. Nat.* 111: 1119-1144.
- Connor, E. F. & McCoy, E. O. 1979. The statistics and biology of the species-area relationships. *Am. Nat.* 113: 791-833.
- Crist, T. O. & Veech, J. A. 2006. Additive partitioning of rarefaction curves and species-area relationships: unifying  $\alpha$ -,  $\beta$ - and  $\gamma$ -diversity with sample size and habitat area. *Ecol. Lett.* 9: 923-932.
- Cushing, C. E., Cummins, K. W., Minshall, G. W. & Vannote, R. L. 1983. Periphyton, chlorophyll *a*, and diatoms of the Middle Fork of the Salmon River, Idaho. *Holarct. Ecol.* 6: 221-227.
- Dell, B., Havel, J. J. & Malajczuk, N. 1989. *The Jarrah Forest: A Complex Mediterranean Ecosystem*. Kluwer, London, UK, 408 pp.
- DeNicola, D. M., Eyto, E. D., Wemaere, A. & Irvine, K. 2004. Using epilithic algal communities to assess trophic status in Irish lakes. *J. Phycol.* 40: 481-495.
- Descy, J. P. 1979. A new approach to water quality estimation using diatoms. *Nova Hedwigia* 64: 305-323.

## REFERENCES

- Descy, J. P. & Coste, M. 1990. Utilisation des diatomées benthiques pour l'évaluation de la qualité des eaux courantes. Rapport final, Université de Namur-Cemagref Bordeaux.
- Dufrêne, M. & Legendre, P. 1997. Species assemblages and indicator species: the need for a flexible asymmetrical approach. *Ecol. Monogr.* 67: 345-366.
- Duncan, S. W. & Blinn, D. W. 1989. Importance of physical variables on the seasonal dynamics of epilithic algae in a highly shaded canyon stream. *J. Phycol.* 25: 455-461.
- European Commission. 2000. Directive 2000/60/EC of The European Parliament and of the Council-Establishing a Framework for Community Action in the Field of Water Policy. Brussels, Belgium, 23 October 2000.
- Fawzi, B., Loudiki, M., Oubraim, S., Sabour, B. & Chlaida, M. 2002. Impact of wastewater effluent on the diatom assemblages structures of a brackish small stream: Oued Hassar (Morocco). *Limnologica* 32: 54-65.
- Fontaneto, D. & Ricci, C. 2006. Spatial gradients in species diversity of microscopic animals: the case of bdelloid rotifers at high altitude. *J. Biogeogr.* 33: 1305-1313.
- Frissell, C. A., Liss, W. J., Warren, C. E. & Hurley, M. D. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. *Environ. Manag.* 10: 199-214.
- Gasith, A. & Resh, V. H. 1999. Streams in Mediterranean climate regions: abiotic influences and biotic responses to predictable seasonal events. *Annu. Rev. Ecol. Syst.* 30: 51-81.
- Gasse, F., Talling, J. F. & Kilham, P. 1983. Diatom assemblages in East Africa: classification, distribution and ecology. *Rev. Hydrobiol. Trop.* 16: 3-34.
- Geel, C. 1997. Photosystem II electron flow as a measure for phytoplankton gross primary production. PhD Thesis, Wageningen University, Wageningen, The Netherlands, 110 pp.

- Goebel, P. C. & Hix, D. M. 1996. Development of mixed-oak forests in southeastern Ohio: a comparison of second-growth and old-growth forests. *For. Ecol. Manag.* 84: 1-21.
- Goebel, P. C. & Hix, D. M. 1997. Changes in the composition and structure of mixed-oak, second-growth forest ecosystems during the understory reinitiation stage of stand development. *Ecoscience* 4: 327-339.
- Gomà, J., Ortiz, R., Cambra, J. & Ector, L. 2004. Water quality evaluation in catalonian mediterranean rivers using epilithic diatoms as bioindicatos. *Vie Milieu* 54: 81-90.
- HACH. 1992. HACH, Water analysis handbook. HACH Company, Loveland, CO, USA, 831 pp.
- Hamilton, P. B. & Duthie, H. C. 1984. Periphyton colonization of rock surfaces in a boreal forest stream studied by scanning electron microscopy and track autoradiography. *J. Phycol.* 20: 525-532.
- Hawkins, C. P. & Carlisle, D. M. 2001. Use of predictive models for assessing the biological integrity of wetlands and other aquatic habitats. In Rader, R. B., Batzer, D. P. & Wissinger, S. A. (eds.) *Bioassessment and Management of North American Freshwater Wetlands*. John Wiley & Sons, Inc., New York, USA, pp. 59-83.
- Hawkins, C. P. & Norris, R. H. 2000. Performance of different landscape classifications for aquatic bioassessments: introduction to the series. *J. North Am. Benthol. Soc.* 19: 367-369.
- Hawkins, C. P., Norris, R. H., Gerritsen, J., Hughes, R. M., Jackson, S. K., Johnson, R. K. & Stevenson, R. J. 2000. Evaluation of the use of landscape classifications for the prediction of freshwater biota: synthesis and recommendations. *J. North Am. Benthol. Soc.* 19: 541-556.
- Hill, M. O. & Gauch, H. G., Jr. 1980. Detrended correspondence analysis: an improved ordination technique. *Vegetatio* 42: 47-58.

## REFERENCES

- Hill, W. R. 1996. Effects of light. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 121-148.
- Hill, W. R. & Harvey, B. C. 1990. Periphyton responses to higher trophic levels and light in a shaded stream. *Can. J. Fish. Aquat. Sci.* 47: 2307-2314.
- Hill, W. R. & Knight, A. W. 1988. Nutrient and light limitation of algae in two northern California streams. *J. Phycol.* 24: 125-132.
- Hill, W. R., Ryon, M. G. & Schilling, E. M. 1995. Light limitation in a stream ecosystem: responses by primary producers and consumers. *Ecology* 76: 1297-1309.
- Hillebrand, H. 2005. Regressions of local on regional diversity do not reflect the importance of local interactions or saturation of local diversity. *Oikos* 110: 195-198.
- Hillebrand, H. & Azovsky, A. I. 2001. Body size determines the strength of the latitudinal diversity gradient. *Ecography* 24: 251-256.
- Hillebrand, H. & Blenckner, T. 2002. Regional and local impact on species diversity: from pattern to processes. *Oecologia* 132: 479-491.
- Hillebrand, H., Durselen, C. D., Kirschtel, D., Pollinger, U. & Zohary, T. 1999. Biovolume calculation for pelagic and benthic microalgae. *J. Phycol.* 35: 403-424.
- Hillebrand, H. & Sommer, U. 2000. Diversity of benthic microalgae in response to colonization time and eutrophication. *Aquat. Bot.* 67: 221-236.
- Hoagland, K. D., Roemer, S. C. & Rosowski, J. R. 1982. Colonization and community structure of two periphyton assemblages, with emphasis on the diatoms (Bacillariophyceae). *Am. J. Bot.* 69: 188-213.
- Hughes, R. M. & Gammon, J. R. 1987. Longitudinal changes in fish assemblages and water quality in the Willamette River, Oregon. *Trans. Am. Fish. Soc.* 116: 196-209.

- Hughes, R. M., Rexstad, E. & Bond, C. E. 1987. The relationship of aquatic ecoregions, river basins and physiographic provinces to the ichthyogeographic regions of Oregon. *Copeia* 423-432.
- Jeffrey, S. W. & Humphrey, G. F. 1975. New spectrophotometric equations for determining chlorophylls *a*, *b*, and *c* in higher plants, algae and natural phytoplankton. *Biochem. Physiol. Pflanzen* 167: 191-194.
- Jenkins, M. A. & Parker, G. R. 1998. Composition and diversity of woody vegetation in silvicultural openings of southern Indiana forests. *For. Ecol. Manag.* 109: 57-74.
- John, J. 2004. Diatom assemblages as indicators of wastewater discharge in a temporary stream in Western Australia. In Poulin, M. (ed.) *Proceedings of the 17th International Diatom Symposium 2002*, pp. 129-145.
- Kann, E. 1978. Systematik und Ökologie der Algen österreichischer Bergbäche. *Arch. Hydrobiol. Suppl.* 53 (Monographische Beiträge) 4: 405-643.
- Kawecka, B. 1986. The effect of light deficiency on communities of sessile algae in the Olczyski stream (Tatra Mts, Poland). *Acta Hydrobiol.* 28: 379-386.
- Kelly, M. G. 1998. Use of the trophic diatom index to monitor eutrophication in rivers. *Water Res.* 32: 236-242.
- Kelly, M. G. 2002. Role of benthic diatoms in the implementation of the Urban Wastewater Treatment Directive in the River Wear, North-East England. *J. Appl. Phycol.* 14: 9-18.
- Kelly, M. G., Cazaubon, A., Coring, E., DellUomo, A., Ector, L., Goldsmith, B., Guasch, H., Hurlimann, J., Jarlman, A., Kawecka, B., Kwandrans, J., Laugaste, R., Lindstrom, E. A., Leitao, M., Marvan, P., Padisak, J., Pipp, E., Prygiel, J., Rott, E., Sabater, S., vanDam, H. & Vizinet, J. 1998. Recommendations for the routine sampling of diatoms for water quality assessments in Europe. *J. Appl. Phycol.* 10: 215-224.
- Kemp, M. J. & Dodds, W. K. 2001. Centimeter-scale patterns in dissolved oxygen and nitrification rates in a prairie stream. *J. North Am. Benthol. Soc.* 20: 347-357.

## REFERENCES

- Kolkwitz, R. & Marsson, M. 1908. Ökologie die pflanzlichen Saprobien. Ber. Dt. Bot. Ges. 26a: 505-519.
- Korte, V. L. & Blinn, D. W. 1983. Diatom colonization on artificial substrata in pool and riffle zones studied by light and scanning electron microscopy. J. Phycol. 19: 332-341.
- Krammer, K. & Lange-Bertalot, H. 1991-1997. Bacillariophyceae. In Ettl, H., Gerloff, J., Heynig, H. & Mollenhauer, D. (eds.) Süßwasserflora von Mitteleuropa, 2 (1-4). Fischer, Stuttgart, Germany.
- Kwandrans, J. P., Eloranta, B., Kawecka, B. & Wojtan, K. 1998. Use of benthic diatom communities to evaluate water quality in rivers of southern Poland. J. Appl. Phycol. 10: 193-201.
- Lande, R. 1996. Statistics and partitioning of species diversity, and similarity among multiple communities. Oikos 76: 5-13.
- Lange-Bertalot, H. 1979. Pollution tolerance of diatoms as a criterion for water quality estimation. Nova Hedwigia 64: 285-304.
- Lange-Bertalot, H. 1980. Ein Beitrag zur Revision der Gattungen *Rhoicosphenia* Grun., *Gomphonema* C. Ag., *Gomphoneis* Cl. Bot. Not. 133: 585-594.
- Lange-Bertalot, H. 2001. *Navicula* sensu stricto, 10 genera separated from *Navicula* sensu lato, *Frustulia*. In Lange-Bertalot, H. (ed.) Diatoms of Europe, 2. A. R. G. Gantner Verlag K. G., Ruggell, Liechtenstein, pp. 526.
- Legendre, P. & Legendre, L. 1998. Numerical Ecology: Developments in Environmental Modelling, 20. Elsevier, Amsterdam, 853 pp.
- Leira, M. & Sabater, S. 2005. Diatom assemblages distribution in catalan rivers, NE Spain, in relation to chemical and physiographical factors. Water Res. 39: 73-82.

- Leland, H. V. 1995. Distribution of phytobenthos in the Yakima River basin, Washington, in relation to geology, land use, and other environmental factors. *Can. J. Fish. Aquat. Sci.* 52: 1108-1129.
- Lenoir, A. & Coste, M. 1996. Development of a practical diatom index of overall water quality applicable to the French National Water Board Network. In Whitton, B. A. & Rott, E. (eds.) *Use of Algae for Monitoring Rivers II*. Institut für Botanik, Univ. Innsbruck, Innsbruck, pp. 29-43.
- Lepš, J. & Šmilauer, P. 2003. *Multivariate Analysis of Ecological Data Using CANOCO*. Cambridge University Press, Cambridge, UK, 269 pp.
- Licursi, M. & Gómez, N. 2002. Benthic diatoms and some environmental conditions in three lowland streams. *Ann. Limnol.* 38: 109-118.
- Loreau, M. 2000. Are communities saturated? On the relationship between  $\alpha$ ,  $\beta$  and  $\gamma$  diversity. *Ecol. Lett.* 3: 73-76.
- Lowe, R. L., Golladay, S. W. & Webster, J. R. 1986. Periphyton response to nutrient manipulation in streams draining clearcut and forested watersheds. *J. North Am. Benthol. Soc.* 5: 221-229.
- Marcus, M. D. 1980. Periphytic community response to chronic nutrient enrichment by a reservoir discharge. *Ecology* 61: 387-399.
- Martínez de Fabricius, A. L., Maidana, N., Gómez, N. & Sabater, S. 2003. Distribution patterns of benthic diatoms in a Pampean river exposed to seasonal floods: the Cuarto River (Argentina). *Biodivers. Conserv.* 12: 2443-2454.
- Matthaei, C. D., Guggelberger, C. & Huber, H. 2003. Local disturbance history affects patchiness of benthic river algae. *Freshw. Biol.* 48: 1514-1526.
- McCune, B. & Mefford, M. J. 1999. *PC-ORD. Multivariate analysis of ecological data, Version 4.20*. MjM Software, Gleneden Beach, OR, USA.



## REFERENCES

- McDonough, T. A. & Barr, W. C. 1977. An analysis of fish associations in Tennessee and Cumberland drainage impoundments. Proc. Annu. Conf. Southeast Assoc. Fish. Wildl. Agencies 31: 555-563.
- Menge, B. A. & Olson, A. M. 1990. Role of scale and environmental factors in regulation of community structure. Trends Ecol. Evol. 5: 52-57.
- Miller, A. R., Lowe, R. L. & Rotenberry, J. T. 1987. Succession of diatom communities on sand grains. J. Ecol. 75: 693-709.
- Miller, M. C., De Oliveira, P. & Gibeau, G. 1992. Epilithic diatom community response to years of PO<sub>4</sub>-fertilization: Kuparuk River, Alaska (68°N Latitude). Hydrobiologia 240: 103-119.
- Minshall, G. W. 1978. Autotrophy in stream ecosystems. BioScience 28: 767-771.
- Molloy, J. M. 1992. Diatom communities along stream longitudinal gradients. Freshw. Biol. 28: 59-69.
- Moss, D., Furse, M. T., Wright, J. F. & Armitage, P. D. 1987. The prediction of the macro-invertebrate fauna of unpolluted running-water sites in Great Britain using environmental data. Freshw. Biol. 17: 41-52.
- Mulholland, P. J. 1996. Role in nutrient cycling in streams. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) Algal Ecology: Freshwater Benthic Ecosystems. Academic Press, San Diego, CA, USA, pp. 609-639.
- Mullahy, J. H. 1952. The morphology and cytology of *Lemanea australis* Atk. Bull. Torrey Bot. Cl. 79: 393-406, 471-484.
- Munné, A. & Prat, N. 2004. Defining river types in a Mediterranean Area: a methodology for the implementation of the EU Water Framework Directive. Environ. Manag. 34: 711-729.
- Murdock, J. N. & Dodds, W. K. 2007. Linking benthic algal biomass to stream substratum topography. J. Phycol. 43: 449-460.

- Murphy, J. & Riley, J. P. 1962. A modified single solution method for the determination of phosphate in natural waters. *Anal. Chim. Acta* 27: 31-36.
- Nijboer, R. C., Johnson, R. K., Verdonschot, P. F. M., Sommerhäuser, M. & Buffagni, A. 2004. Establishing reference conditions for European streams. *Hydrobiologia* 516: 91-105.
- Omernik, J. M. & Griffith, G. E. 1991. Ecological regions versus hydrologic units: frameworks for managing water quality. *J. Soil Water Conserv.* 46: 334-340.
- Palik, B. J., Goebel, P. C., Kirkman, L. K. & West, L. 2000. Using landscape hierarchies to guide restoration of disturbed ecosystems. *Ecol. Appl.* 10: 189-202.
- Pan, Y., Herlihy, A., Kaufmann, M., Wigington, J., Van Sickle, J. & Moser, T. 2004. Linkages among land-use, water quality, physical habitat conditions and lotic diatom assemblages: a multi-spatial scale assessment. *Hydrobiologia* 515: 59-73.
- Pan, Y. D., Stevenson, R. J., Hill, B. H., Kaufmann, P. R. & Herlihy, A. T. 1999. Spatial patterns and ecological determinants of benthic algal assemblages in Mid-Atlantic streams, USA. *J. Phycol.* 35: 460-468.
- Passy, S. I. 2001. Spatial paradigms of lotic diatom distribution: a landscape ecology perspective. *J. Phycol.* 37: 370-378.
- Passy, S. I. & Blanchet, F. G. 2007. Algal communities in human-impacted stream ecosystems suffer beta-diversity decline. *Divers. Distrib.* 13: 670-679.
- Passy, S. I., Pan, Y. D. & Lowe, R. L. 1999. Ecology of the major periphytic diatom communities from the Mesta River, Bulgaria. *Int. Rev. Hydrobiol.* 84: 129-174.
- Patrick, R. & Reimer, C. W. 1966. *The Diatoms of United States, Vol. 1. Monographs of The Academy of Natural Sciences of Philadelphia, No. 13, Philadelphia, PA, USA.*
- Peterson, C. G. & Stevenson, R. J. 1990. Post-spate development of epilithic algal communities in different current environments. *Can. J. Bot.* 68: 2092-2102.

## REFERENCES

- Peterson, C. G. & Stevenson, R. J. 1992. Resistance and resilience of lotic algal communities: importance of disturbance timing and current. *Ecology* 73: 1445-1461.
- Pickett, S. T. A., Collins, S. L. & Armesto, J. J. 1987. Models, mechanisms and pathways of succession. *Bot. Rev.* 53: 335-371.
- Pipp, E. 1997. Klassifikation Oberösterreichischer Fließgewässer anhand der Kieselalgen. Bundesministerium für Landund Forstwirtschaft. Wasserwirtschaftskataster, Wien, Österreich.
- Pollard, P., Irmer, U., Martínez, P.-J., Wasson, J.-G., Ofenboeck, G., Buffagni, A., Nygaard, K., Ortiz-Casas, J., Toro, M., Heiskanen, A.-S. & van de Bund, W. 2005. Intercalibration. Guidance on the Intercalibration Process 2004-2006. Common Implementation Strategy of the Water Framework Directive. Luxemburg. European Communities.
- Potapova, M. 1996. Epilithic algal communities in rivers of the Kolyma mountains, NE Siberia, Russia. *Nova Hedwigia* 63: 309-334.
- Potapova, M. G. & Charles, D. F. 2002. Benthic diatoms in USA rivers: distributions along spatial and environmental gradients. *J. Biogeogr.* 29: 167-187.
- Potapova, M. G. & Charles, D. F. 2003. Distribution of benthic diatoms in U.S. rivers in relation to conductivity and ionic composition. *Freshw. Biol.* 48: 1311-1328.
- Pringle, C. M. 1990. Nutrient spatial heterogeneity: effects on community structure, physiognomy, and diversity of stream algae. *Ecology* 71: 905-920.
- Pringle, C. M., Naiman, R. J., Bretschko, G., Karr, J. R., Oswood, M. W., Webster, J. R., Welcomme, R. L. & Winterbourn, M. J. 1988. Patch dynamics in lotic systems: the stream as a mosaic. *J. North Am. Benthol. Soc.* 7: 503-524.
- Prygiel, J., Carpentier, P., Almeida, S., Coste, M., Druart, J. C., Ector, L., Guillard, D., Honore, M. A., Iserentant, R., Ledeganck, P., Lalanne Cassou, C., Lesniak, C., Mercier, I., Moncaut, P., Nazart, M., Nouchet, N., Peres, F., Peeters, V., Rimet, F., Rumeau, A., Sabater, S., Straub, F., Torrisi, M., Tudesque, L., Van de Vijver,

- B., Vidal, H., Vizinet, J. & Zydek, N. 2002. Determination of the biological diatom index (IBD NF T 90-354): results of an intercomparison exercise. *J. Appl. Phycol.* 14: 27-39.
- Puig, M. A., Armengol, J., González, G., Peñuelas, J., Sabater, S. & Sabater, F. 1987. Chemical and biological changes in the River Ter induced by a series of reservoirs. In Craig, J. F. & Kemper, J. B. (eds.) *Advances in Regulated Stream Ecology*. Plenum Press, New York, NY, USA, pp. 373-382.
- Pusch, M., Fiebig, D., Brettar, I., Eisenmann, H., Ellis, B. K., Kaplan, L. A., Lock, M. A., Naegeli, M. W. & Traunspurger, W. 1998. The role of micro-organisms in the ecological connectivity of running waters. *Freshw. Biol.* 40: 453-495.
- R Development Core Team. 2004. *R: A Language and Environment for Statistical Computing*, R Foundation for Statistical Computing. Vienna, Austria, ISBN (2004) ISBN 3-900051-00-3 (<http://www.r-project.org>).
- Rajaniemi, T. K., Goldberg, D. E., Turkington, R. & Dyer, A. R. 2006. Quantitative partitioning of regional and local processes shaping regional diversity patterns. *Ecol. Lett.* 9: 121-128.
- Rakowska, B. 2004. Benthic diatoms in polluted river sections of central Poland. *Oceanol. Hydrobiol. Stud.* 33: 11-21.
- Resetarits, W. J., Jr. 2005. Habitat selection behaviour links local and regional scales in aquatic systems. *Ecol. Lett.* 8: 480-486.
- Reynoldson, T. B., Bailey, R. C., Day, K. E. & Norris, R. H. 1995. Biological guidelines for freshwater sediment based on Benthic Assessment of Sediment (the BEAST) using a multivariate approach for predicting biological state. *Aust. J. Ecol.* 20: 198-219.
- Reynoldson, T. B., Norris, R. H., Resh, V. H., Day, K. E. & Rosenberg, D. M. 1997. The reference condition: a comparison of multimetric and multivariate approaches to assess water-quality impairment using benthic macroinvertebrates. *J. North Am. Benthol. Soc.* 16: 833-852.

## REFERENCES

- Robinson, C. T. & Rushforth, S. R. 1987. Effects of physical disturbance and canopy cover on attached diatom community structure in an Idaho stream. *Hydrobiologia* 154: 49-59.
- Robinson, C. T., Rushforth, S. R. & Minshall, G. W. 1994. Diatom assemblages of streams influenced by wildfire. *J. Phycol.* 30: 209-216.
- Rosemond, A. D., Mulholland, P. J. & Brawley, S. H. 2000. Seasonally shifting limitation of stream periphyton: response of algal populations and assemblage biomass and productivity to variation in light, nutrients, and herbivores. *Can. J. Fish. Aquat. Sci.* 57: 66-75.
- Rosenzweig, M. L. 1995. *Species diversity in space and time*. Cambridge University Press, Cambridge, UK, pp. 436.
- Rott, E. 1991. Methodological aspects and perspectives in the use of periphyton for monitoring and protecting rivers. In Whitton, B. A., Rott, E. & Friedrich, G. (eds.) *Use of Algae for Monitoring Rivers*. Institut für Botanik, Universität Innsbruck, Innsbruck, Austria, pp. 9-16.
- Rott, E. 1995. Diatoms of the Grand River, Ontario, Canada restudied after 25 years. *Limnologica* 25: 165-192.
- Rott, E., Duthie, H. C. & Pipp, E. 1998. Monitoring organic pollution and eutrophication in the Grand River, Ontario, by means of diatoms. *Can. J. Fish. Aquat. Sci.* 55: 1443-1453.
- Round, F. E. 1981. *The Ecology of Algae*. Cambridge University Press, Cambridge, UK, 653 pp.
- Round, F. E. & Bukhtiyarova, L. 1996. Epipsammic diatoms-communities of British rivers. *Diatom Res.* 11: 363-372.
- Sabater, F., Guasch, H., Martí, E., Armengol, J. & Sabater, S. 1995. The Ter: a Mediterranean river case-study in Spain. In Cushing, C. E., Cummins, K. W. & Minshall, G. W. (eds.) *River Ecosystems of the World*. Elsevier, Amsterdam, The Netherlands, pp. 419-438.

- Sabater, S. 1987. Estudi de les poblacions d'algues del riu Ter. PhD Thesis, Universitat de Barcelona, Barcelona, Spain, 478 pp.
- Sabater, S. 1989. Encrusting algal assemblages in a Mediterranean river basin. *Arch. Hydrobiol.* 114: 555-573.
- Sabater, S. 2000. Diatom communities as indicators of environmental stress in the Guadiamar River, S-W. Spain, following a major mine tailings spill. *J. Appl. Phycol.* 12: 113-124.
- Sabater, S. & Admiraal, W. 2005. Biofilms as biological indicators in managed aquatic ecosystems. In Azim, M. E., Verdegem, M. C. J., van Dam, A. A. & Beveridge, M. C. M. (eds.) *Periphyton: Ecology, Exploitation and Management*. CAB International, Wallingford, UK, pp. 159-177.
- Sabater, S. & Roca, J. R. 1992. Ecological and biogeographical aspects of diatom distribution in Pyrenean springs. *Br. Phycol. J.* 27: 203-213.
- Sabater, S. & Sabater, F. 1988. Diatom assemblages in the River Ter. *Arch. Hydrobiol.* 111: 397-408.
- Sabater, S., Sabater, F. & Armengol, J. 1988. Relationships between diatom assemblages and physico-chemical variables in the River Ter (NE Spain). *Int. Rev. Gesamt. Hydrobiol.* 73: 171-179.
- Sabater, S., Sabater, F. & Tomas, X. 1987. Water quality and diatom communities in two Catalan rivers (N.E. Spain). *Water Res.* 21: 901-911.
- Scheiner, S. M. 1993. MANOVA: Multiple response variables and multispecies interactions. In Scheiner, S. M. & Gurevitch, J. (eds.) *Design and Analysis of Ecological Experiments*. Chapman & Hall, New York, NY, USA, pp. 94-112.
- Schreiber, U., Müller, J. F., Haugg, A. & Gademann, R. 2002. New type of dual-channel PAM chlorophyll fluorometer for highly sensitive water toxicity biotests. *Photosynth. Res.* 74: 317-330.

## REFERENCES

- Sekar, R., Venugopalan, V. P., Nandakumar, K., Nair, K. V. K. & Rao, V. N. R. 2004. Early stages of biofilm succession in a lentic freshwater environment. *Hydrobiologia* 512: 97-108.
- Sheath, R. G. 2003. Red algae. In Wehr, J. D. & Sheath, R. G. (eds.) *Freshwater algae of North America: ecology and classification*. Academic Press, San Diego, CA, USA, pp. 197-224.
- Shortreed, K. R. S. & Stockner, J. G. 1983. Periphyton biomass and species composition in a coastal rainforest stream in British Columbia: effects of environmental changes caused by logging. *Can. J. Fish. Aquat. Sci.* 40: 1887-1895.
- Simpson, J. & Norris, R. H. 2000. Biological assessment of water quality: development of AUSRIVAS models and outputs. In Wright, J. F., Sutcliffe, D. W. & Furse, M. T. (eds.) *RIVPACS and Similar Techniques for Assessing the Biological Quality of Freshwaters*. Freshwater Biological Association and Environment Agency, Ambleside, Cumbria, UK, pp. 125-142.
- Soininen, J. 2002. Responses of epilithic diatom communities to environmental gradients in some Finnish rivers. *Int. Rev. Hydrobiol.* 87: 11-24.
- Soininen, J. 2003. Heterogeneity of benthic diatom communities in different spatial scales and current velocities in a turbid river. *Arch. Hydrobiol.* 156: 551-564.
- Soininen, J. 2004. Determinants of benthic diatom community structure in boreal streams: the role of environmental and spatial factors at different scales. *Internat. Rev. Hydrobiol.* 89: 139-150.
- Soininen, J. & Heino, J. 2007. Variation in niche parameters along the diversity gradient of unicellular eukaryote assemblages. *Protist* 158: 181-191.
- Soininen, J., McDonald, R. & Hillebrand, H. 2007. The distance decay of similarity in ecological communities. *Ecography* 30: 3-12.
- Soininen, J. & Niemelä, P. 2002. Inferring the phosphorus levels of rivers from benthic diatoms using weighted averaging. *Arch. Hydrobiol.* 154: 1-18.

- Soininen, J., Paavola, R. & Muotka, T. 2004. Benthic diatom communities in boreal streams: community structure in relation to environmental and spatial gradients. *Ecography* 27: 330-342.
- Sokal, R. R. & Rohlf, F. J. 1995. *Biometry: the Principles and Practice of Statistics in Biological Research*. W. H. Freeman and Company, New York, NY, USA, 887 pp.
- Steinberg, C. & Schiefele, S. 1988. Biological indication of trophic and pollution of running waters. *Z. Wasser-Abwasser Forsch.* 21: 227-234.
- Steinman, A. D. & McIntire, D. 1986. Effects of current velocity and light energy on the structure of periphyton assemblages in laboratory streams. *J. Phycol.* 22: 352-361.
- Steinman, A. D., McIntire, C. D., Gregory, S. V. & Lamberti, G. A. 1989. Effects of irradiance and grazing on lotic algal assemblages. *J. Phycol.* 25: 478-485.
- Steinman, A. D., Mulholland, P. J. & Hill, W. R. 1992. Functional responses associated with growth form in stream algae. *J. North Am. Benthol. Soc.* 11: 229-243.
- Stevenson, R. J. 1996a. An introduction to algal ecology in freshwater benthic habitats. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal Ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 3-30.
- Stevenson, R. J. 1996b. The stimulation and drag of current. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 321-340.
- Stevenson, R. J. & Pan, Y. 1999. Assessing environmental conditions in rivers and streams using diatoms. In Stoermer, E. F. & Smol, J. P. (eds.) *The Diatoms: Application for the Environmental and Earth Sciences*. Cambridge University Press, Cambridge, UK, pp. 11-40.
- Stockner, J. G. & Armstrong, F. A. J. 1971. Periphyton of the Experimental Lakes Area, NW Ontario. *J. Fish. Res. Board Can.* 28: 215-229.



## REFERENCES

- Stoermer, E. F. & Smol, J. P. 1999. *The Diatoms: Application for the Environmental and Earth Sciences*. Cambridge University Press, Cambridge, UK, 469 pp.
- ter Braak, C. J. F. & Šmilauer, P. 2002. *CANOCO Reference Manual and CanoDraw for Windows User's Guide: Software for Canonical Community Ordination, version 4.5*. Microcomputer Power, Ithaca, NY, USA, 500 pp.
- ter Braak, C. J. F. & Verdonschot, P. F. M. 1995. Canonical correspondence analysis and related multivariate methods in aquatic ecology. *Aquat. Sci.* 57: 225-289.
- Thirb, H. H. & Benson-Evans, K. 1983. The effect of different light intensities and wavelengths on carpospore germination and the apical tips of the red alga *Lemanea* Bory. *Nova Hedwigia* 37: 669-682.
- Tornés, E., Cambra, J., Gomà, J., Leira, M., Ortiz, R. & Sabater, S. 2007. Indicator taxa of benthic diatom communities: a case study in Mediterranean streams. *Ann. Limnol.* 43: 1-11.
- Tuchman, N. C. 1996. The role of heterotrophy in algae. In Stevenson, R. J., Bothwell, M. L. & Lowe, R. L. (eds.) *Algal Ecology: Freshwater Benthic Ecosystems*. Academic Press, San Diego, CA, USA, pp. 299-319.
- Uehlinger, U. 2006. Annual cycle and inter-annual variability of gross primary production and ecosystem respiration in a floodprone river during a 15-year period. *Freshw. Biol.* 51: 938-950.
- Van Sickle, J. & Hughes, R. M. 2000. Classification strengths of ecoregions, catchments and geographic clusters for aquatic vertebrates in Oregon. *J. North Am. Benthol. Soc.* 19: 370-384.
- Veech, J. A., Summerville, K. S., Crist, T. O. & Gering, J. C. 2002. The additive partitioning of species diversity: recent revival of an old idea. *Oikos* 99: 3-9.
- Veraart, A. J., Romaní, A. M., Tornés, E. & Sabater, S. 2008. Algal response to nutrient enrichment in forested oligotrophic stream. *J. Phycol.* 44: 564-572.

- Vidal, H. & Gentili, R. 2000. Évolution de la qualité d'un petit cours d'eau méditerranéen, la Bouillide, après réhabilitation d'une station d'épuration. In Ector, L., Compère, P., Vidal, H., Semprini, M. & Gentili, R. (eds.) *Compte rendu du 18e colloque de l'Association des diatomistes de langue française (Cryptogamie Algol.)*, pp. 245-246.
- Vymazal, J. 1988. The use of periphyton communities for nutrient removal from polluted streams. *Hydrobiologia* 166: 225-237.
- Vyverman, W., Verleyen, E., Sabbe, K., Vanhoutte, K., Sterken, M., Hodgson, D. A., Mann, D. G., Juggins, S., Van de Vijver, B., Jones, V., Flower, R., Roberts, D., Chepurinov, V. A., Kilroy, C., Vanormelingen, P. & De Wever, A. 2007. Historical processes constrain patterns in global diatom diversity. *Ecology* 88: 1924-1931.
- Waide, R. B., Willig, M. R., Steiner, C. F., Mittelbach, G., Gough, L., Dodson, S. I., Juday, G. P. & Parmenter, R. 1999. The relationship between productivity and species richness. *Annu. Rev. Ecol. Syst.* 30: 257-300.
- Walker, B., Kinzig, A. & Langridge, J. 1999. Plant attribute diversity, resilience, and ecosystem function: the nature and significance of dominant and minor species. *Ecosystems* 2: 95-113.
- Wallin, M., Wiederholm, T. & Johnson, R. K. 2003. REFCOND. Rivers and Lakes-Typology, Reference Conditions and Classification systems. Common Implementation Strategy of the Water Framework Directive (2000/60/EC). Luxemburg. European Communities.
- Ward, J. V., Tockner, K. & Schiemer, F. 1999. Biodiversity of floodplain river ecosystems: ecotones and connectivity. *Regul. Rivers: Res. & Mgmt.* 15: 125-139.
- Whittaker, R. H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. *Ecol. Monogr.* 30: 279-338.
- Whittaker, R. H. 1972. Evolution and measurement of species diversity. *Taxon* 21: 213-251.

## REFERENCES

- Winter, J. G. & Duthie, H. C. 2000. Epilithic diatoms as indicators of stream total N and total P concentration. *J. North Am. Benthol. Soc.* 19: 32-49.
- Zelinka, M. & Marvan, P. 1961. Zur Präzisierung der biologischen Klassifikation der Reinheit fließender Gewässer. *Arch. Hydrobiol.* 57: 389-407.
- Ziemann, H. 1971. Die Wirkung des Salzgehaltes auf die Diatomeenflora als Grundlage für eine biologische Analyse und Klassifikation der Binnengewässer. *Limnologica* 8: 505-525.
- Ziemann, H. 1997. The influence of different ion ratios on the biological effect of salinity in running waters of Thuringia (Germany). *Limnologica* 27: 19-28.
- Zimmerman, G. M., Goetz, H. & Mielke, P. W. J. 1985. Use of an improved statistical method for group comparisons to study effects of prairie fire. *Ecology* 66: 606-611.
- Zobel, M. 1997. The relative role of species pools in determining plant species richness: an alternative explanation of species coexistence? *Trends Ecol. Evol.* 12: 266-269.

## **APPENDICES**



Appendices are attached to the Thesis as a CD. Data contained in the CD is detailed next:

APPENDIX 1. Environmental data collected in summer (July-August) 2002 and spring 2003 (May-June) for the 152 stream and river sites in NE Iberian Peninsula. Sites are arranged first by the watershed and then by their code.

APPENDIX 2. Diatom data corresponding to summer (July-August) 2002 and spring (May-June) 2003 for the 152 stream and river sites in NE Iberian Peninsula. Data is presented as the relative percentage of each taxon for each of the studied sites, with the complete name of each taxon following the literature cited, new synonymities, the acronyms and the synonymities acronyms. Sites are arranged first by the watershed and then by their code.

APPENDIX 3. Environmental and spatial data corresponding to winter (December) 2005 and spring (May) 2006 in Fuirosos. Sites are arranged by reach (unshaded, US, and shaded, S) and by transect (1, 2 and 3). The numbers following the reach code and the transect correspond to the position in the transect (in centimeters) where the sample was taken respect to one stream bank.

APPENDIX 4. Benthic algae and cyanobacteria data corresponding to winter (December) 2005 and spring (May) 2006 in Fuirosos. Data is presented as biovolume per square centimeter of each taxon for each of the sites, with the complete name of each taxon following the literature cited, new synonymities, the acronyms and the synonymities acronyms. Sites are arranged by reach (unshaded, US, and shaded, S) and by transect (1, 2 and 3). The numbers following the reach code and the transect correspond to the position in the transect (in centimeters) where the sample was taken respect to one stream bank.





**Universitat de Girona**  
**Institut d'Ecologia Aquàtica**

**PhD Thesis**

**DISTRIBUTIONAL PATTERNS OF DIATOM  
COMMUNITIES IN MEDITERRANEAN RIVERS**

**APPENDICES**

**Elisabet Tornés Bes**

**2009**





## **APPENDIX 1**

Environmental data collected in summer (July-August) 2002 and spring 2003  
(May-June) for the 152 stream and river sites in NE Iberian Peninsula.



## **SUMMER 2002**

Environmental data collected in summer (July-August) 2002  
for the 152 stream and river sites in NE Iberian Peninsula.



Code	J017	J035	J037	J043	J048	J069	J075	J082	J086	J088	N16
River	Avencó	Mogent	Congost	Besòs	Besòs	Besòs	Ripoll	Tenes	Caldes	Congost	Caldes
Site	Aiguafreda	Montornès del Vallès	La Garriga	Reixac	Barcelona	Montmeló	Castellar del Vallès	Mollet del Vallès	Caldes de Montbui	Balenyà	Gallifa
Watershed	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs
UTM X	438962	438800	440028	432745	433470	436397	423754	435948	429766	435789	428399
UTM Y	4624225	4599896	4614444	4593970	4589092	4599652	4604047	4599638	4610728	4630719	4614049
pH	8.52	7.10	8.23	7.70	7.13	7.76	8.03	7.68	8.20	8.31	8.00
Conductivity ( $\mu\text{S cm}^{-1}$ )	220	1706	1071	1720	1590	2750	2042	2167	648	1048	563
Water temperature ( $^{\circ}\text{C}$ )	20.20	20.70	21.80	21.00	19.50	23.20	23.10	22.90	19.90	22.90	
Dissolved oxygen ( $\text{mg L}^{-1}$ )											
Oxygen saturation (%)											
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.07	4.02	0.70	3.95	3.89	2.11	2.91	2.27	1.82	8.95	0.01
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.09	0.92	0.08	16.23	11.00	3.86	0.51	2.72	0.09	0.16	
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	56.74	104.74	357.87	890.31	715.74	842.31	1115.08	1348.56	181.12	24.00	21.82
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	25	126	117	205	204	160	204	119	65	346	32
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	8.40	194.00	141.40	463.07	382.67	406.20	410.00	90.30	31.87	53.85	17.20
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	116.70	364.00	312.87	336.60	408.20	333.33	406.40	329.80			346.20
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.93	18.39	7.70	21.10	20.13	18.48	15.76	3.56			0.97
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	32.10	126.00	101.00	135.67	124.67	86.00	119.00	89.00			70.80
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	9.80	18.00	27.50	23.00	22.67	17.00	36.00	24.00			38.80
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	10.11	102.00	83.50	276.67	242.00	308.00	260.00	41.00			11.50
TOC ( $\text{mg L}^{-1} \text{ C}$ )	2.93	11.80	4.23	12.00	10.20	11.10	10.10	6.90	3.87	2.97	3.20
Width (m)	6			15	10				0.35		
Depth (cm)	10			5	20						
Current velocity (1)	3	3	3	3	3	4	4	3	3	3	
Canopy cover (2)	4	3	3	3	1	3	3	3	4	3	
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	
Water transparency (3)	3	2	1	2	1	1	3	3		3	
Altitude a.s.l (m)	411	78	227	32	11	62	190	63	223	556	355
Surface geology	siliceous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	siliceous	siliceous	calcareous	calcareous

(1) Very fast:4, fast:3, slow: 2, stagnant: 1

(2) Closed canopy: 4, open canopy: 3, narrow vegetation strip:2, riparian vegetation absent: 1

(3) Clear: 3, turbid: 2, very turbid : 1

Code	N19	N23	C223	C229	C231	C232	E097	E121	E207	E219
River	Vall d'Horta	Daró	Ondara	Segre	Segre	Noguera Pallaresa	Noguera Ribagorçana	Ebre	Segre	Segre
Site	Can Brossa	Gualta	Vilagrassa	La Seu d'Urgell	Ponts	Esterri d'Àneu	Pinyana (Alfarràs)	Flix	Térmens	Torres del Segre
Watershed	Besòs	Daró	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
UTM X	421292	506000	342410	372800	350750	346500	299030	294486	313500	291902
UTM Y	4615344	4653000	4613150	4690000	4643500	4721200	4633850	4567810	4621250	4601449
pH	7.60	8.07	7.95	8.40	7.90	7.80	8.10	8.30	8.20	7.90
Conductivity ( $\mu\text{S cm}^{-1}$ )	635	790	2420	197.6	244	98.4	285	1180	872	1223
Water temperature ( $^{\circ}\text{C}$ )		29.00	16.80	19.90	21.00	14.50	12.70	13.70	22.00	13.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )		9.96		8.63	13.20	9.80			11.70	
Oxygen saturation (%)		130.00		102.70	154.00	108.10			138.00	
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.01	2.06	0.01				0.45	2.33	2.37	3.13
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )			5.44				0.04	0.11	0.11	1.36
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	19.64	13.09	1241.64				2.18	78.56	43.64	104.74
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	24	132	769				47	227	140	246
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	19.60	80.40						166.10	39.30	31.43
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	427.80	166.40					99.00	199.67		164.20
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.78	4.12						3.29	1.93	5.00
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	93.50	85.00						114.33	97.33	128.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	34.90	12.50						25.67	16.00	34.00
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	6.70	46.05						67.33	30.67	70.00
TOC ( $\text{mg L}^{-1} \text{ C}$ )	2.80	4.30	9.55					1.23		1.77
Width (m)		25	1	75	100	15			50	60
Depth (cm)		30	5	30	30	15			100	
Current velocity (1)		2	3	4	4	4			4	3
Canopy cover (2)		2	4	2	2	2			2	1
Substratum type (dominance of)		silt	silt	rocks	rocks	rocks			slab	rocks
Water transparency (3)		2	2	2	2	3			2	1
Altitude a.s.l (m)	489	14	338	668	350	954	282	41	186	112
Surface geology	calcareous	calcareous	calcareous	siliceous	calcareous	siliceous	calcareous	calcareous	calcareous	calcareous

Code	J010	J032	J057	J164	L020	L021	N1	N11
River	Noguera Ribagorçana	Garona	Ebre	Noguera Pallaresa	Noguera Ribagorçana	Noguera de Tor	Segre	Matarranya
Site	El Pont de Suert	Canejan	Campredò	Sort	Senet	Balneari de Boí	Aiguabarreig- Granja d'Escarp	Besseit
Watershed	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
UTM X	314196	314685	294770	346200	316092	324112	278843	262270
UTM Y	4696818	4745249	4513975	4697150	4716708	4717143	4589939	4524000
pH	7.64	7.72	7.64	7.96				
Conductivity ( $\mu\text{S cm}^{-1}$ )	106	121	1111	131				
Water temperature ( $^{\circ}\text{C}$ )	13.60	12.30	24.73	20.00				
Dissolved oxygen ( $\text{mg L}^{-1}$ )				9.56				
Oxygen saturation (%)				113.20				
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.50	0.56	1.85	4.97	0.16	0.14		
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.05	0.04	0.05	0.09	0.06	0.10		
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	54.55	58.92	24.00	15.28	2.18	2.18		
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	12	9	238	13				
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )				8.40				
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	75.30	66.20		38.00				
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.19			0.05				
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	29.00			17.00				
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	1.00			1.00				
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	1.00			2.00				
TOC ( $\text{mg L}^{-1} \text{ C}$ )	0.97	0.27	2.43	0.50	0.05	0.05		
Width (m)		9		30	8	4		
Depth (cm)		35		50	25	15		
Current velocity (1)	4	4	2	4	4	4		
Canopy cover (2)	3	4	2	1	3	3		
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks		
Water transparency (3)	3	3	2	2	3	3		
Altitude a.s.l (m)	828	601	5	687	1426	1746	73	551
Surface geology	calcareous	siliceous	calcareous	siliceous	siliceous	siliceous	calcareous	calcareous





Code	N43	N44	N45	N46	N47	N48	F0	J011
River	Valira	Noguera de Cardós	Noguera de Vallferrera	Flamicell	Noguera Pallaresa	Noguera Pallaresa	Fluvià	Fluvià
Site	La Seu d'Urgell	Lladorre	Alins	Lluçà	La Pobla de Segur	Alòs d'Isil	Hostalets d'en Bas	St. Pere Pescador
Watershed	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Fluvià	Fluvià
UTM X	373000	356000	363000	330000	334000	345000	455727	505405
UTM Y	4692000	4720000	4713000	4686000	4680000	4728000	4660101	4669835
pH	7.82	7.50	7.60	8.30	8.57	7.99	8.05	8.70
Conductivity ( $\mu\text{S cm}^{-1}$ )	178	31	49.1	337	231	104	490	10770
Water temperature ( $^{\circ}\text{C}$ )	17.50	15.10	15.00	17.60	21.80	14.80	16.50	25.40
Dissolved oxygen ( $\text{mg L}^{-1}$ )	8.54	10.22	10.40	9.18	11.68	9.18	11.38	13.00
Oxygen saturation (%)	99.00	115.30	117.50	105.00	140.90	106.00	123.40	160.40
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.86	0.01	0.01	0.09	0.01	0.01		2.55
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )								0.04
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	39.28	21.82	24.00	19.64	17.46	17.46		10.91
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	21	8	12	66	22	6	23	252
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	9.10	8.60	23.00	9.20	9.50	3.50	6.83	48.25
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )		12.80	118.10	86.40	58.40	54.40	296.13	232.00
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.66	0.11	0.13	0.33	0.34	0.08	1.75	2.59
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	34.90	5.00	58.20	51.20	22.30	18.70	91.70	163.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	2.60	0.50	0.50	5.80	2.80	0.50	16.63	19.50
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	4.28	0.05	0.54	3.51	6.52	0.05	4.83	21.50
TOC ( $\text{mg L}^{-1} \text{ C}$ )	1.60	1.30	0.90	1.20	1.50	1.50		0.50
Width (m)	18	10	7	10	30	20	1.5	65
Depth (cm)	30	25	20	30	15	15	14	50
Current velocity (1)	4	4	4	4	3	4	4	3
Canopy cover (2)	4	2	3	2	2	2	4	2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand
Water transparency (3)	1	3	3	3	3	3	3	2
Altitude a.s.l (m)	800	1062	1240	684	615	1709	510	0
Surface geology	calcareous	siliceous	siliceous	calcareous	calcareous	siliceous	calcareous	calcareous





Code	N9	C072	C708	C715	C716	J001	J002	J003	J004	J005
River	Gaià	Clarà	Negre	Llobregat	Cardener	Cardener	Cardener	Anoia	Anoia	Llobregat
Site	Pont d'Armentera	Casseres	Clariana de Cardener	Guardiola	La Coma	Cardona	Manresa	Vilanova del Camí	Sant Sadurní d'Anoia	Martorell
Watershed	Gaià	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
UTM X	363536	403964	386848	406803	382120	391402	404413	388325	398918	413636
UTM Y	4583670	4653817	4643122	4674503	4671930	4640974	4615145	4602414	4588918	4592032
pH	7.80					8.25	7.82	7.63	8.08	7.95
Conductivity ( $\mu\text{S cm}^{-1}$ )	961	470				540	1900	3790	1260	14184
Water temperature ( $^{\circ}\text{C}$ )		13.00				16.00	20.80	20.00	14.00	23.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )										
Oxygen saturation (%)										
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	1.45	1.17	5.24			0.53	1.16	16.15	1.25	1.63
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )		0.04	0.11			0.09	1.75	0.90	1.29	0.25
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	24.00	15.28	1082.34			115.65	89.47	1760.99	353.51	170.21
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	357	70				64	134	636	466	199
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	26.10	27.20				19.50	328.40	607.85	400.90	365.43
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	274.50					208.90	251.75	336.40	428.90	275.87
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	1.68					0.80	27.23	24.51	14.86	29.22
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	147.20					72.00	102.50	275.50	194.00	126.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	53.60					13.00	31.00	77.50	59.00	36.67
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	13.88					6.00	165.00	4.64	295.00	182.33
TOC ( $\text{mg L}^{-1} \text{ C}$ )	1.20	2.60	5.90			1.80	3.00	16.37	13.53	3.33
Width (m)		2		8		6	4		2	40
Depth (cm)				20		50		15	20	
Current velocity (1)		1	4	3	4	3	3	3	3	4
Canopy cover (2)		3	4	3	4	3	3	3	3	3
Substratum type (dominance of)		rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	silt
Water transparency (3)		1	2	3	3	3	2	1	2	1
Altitude a.s.l (m)	356	506	438	699	1143	391	161	273	124	35
Surface geology	calcareous	calcareous	salts	calcareous	calcareous	salts	calcareous	calcareous	calcareous	siliceous

Code	J006	J023	J025	J031	J045	J046	J051	J065	J074	J076
River	Merlès	Llobregat	Cardener	Llobregat	Aiguadora	Llobregat	Castellolí	Carme	Anoia	Rubí
Site	Santa Maria	Castellbell	Olius	El Pont de Vilomara	Cardona	El Prat de Llobregat	Vilanova del Camí	La Pobla de Claramunt	Martorell	El Papiol
Watershed	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
UTM X	415000	404996	381843	406135	389370	426317	388402	388647	410460	416185
UTM Y	4649670	4611315	4651375	4617934	4642874	4575155	4602550	4600213	4592171	4589265
pH	8.36	7.90	8.16	8.16	8.44	7.75	7.76	7.98	8.21	7.97
Conductivity ( $\mu\text{S cm}^{-1}$ )	390	1538	429	1033	445	2040	770	950	2426	2370
Water temperature ( $^{\circ}\text{C}$ )	19.90	20.40	12.60	19.00	19.30	18.50	12.50	13.00	26.80	20.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )										
Oxygen saturation (%)										
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.44	1.02	0.41	0.75	1.29	0.71	1.34	3.25	0.81	2.65
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.16	0.38	0.09	0.13	0.06	6.28	0.09	0.05	0.09	15.01
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	54.55	80.74	54.55	39.28	80.74	309.86	19.64	13.09	218.21	645.91
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	46	154	53	153		385	428	271	477	198
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	14.10	418.87	21.10	228.13		2040.47	162.20	38.50	422.70	432.07
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	276.40	235.73	225.40	227.93		396.67			339.93	454.13
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.71	35.14	0.48	21.22		141.73			17.05	30.86
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	87.00	124.67	88.00	108.50		220.33			196.33	122.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	17.00	35.67	11.00	26.00		98.00			55.33	27.50
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	4.00	179.67	4.00	107.00		1045.33			288.67	263.00
TOC ( $\text{mg L}^{-1} \text{ C}$ )	3.13	2.83	1.60	2.17	1.47	16.47	3.73	1.63	8.90	10.87
Width (m)		4		5		10	2	2		4
Depth (cm)						10	20	10		15
Current velocity (1)	4	3	4	3	3	2	3	1		3
Canopy cover (2)	3	1	3	3	4	3	4	4		3
Substratum type (dominance of)	rocks	rocks	rocks		rocks	rocks	rocks	silt		rocks
Water transparency (3)	2	1	3	2	3	1	2	2		1
Altitude a.s.l (m)	504	149	527	183	419	1	274	276	47	39
Surface geology	calcareous	calcareous	calcareous	calcareous	salts	calcareous	calcareous	calcareous	calcareous	calcareous

Code	J077	J078	J080	J084	J093	J095	J117	J118	J119	J120	J147
River	Gavarresa	Llobregat	Llobregat	Llobregat	Calders	Anoia	Llobregat	Llobregat	Cardener	Avernó	Clarà
Site	Cabrianes	Guardiola de Berguedà	Balsareny	Abreira	Navarcles	Jorba	La Pobla de Lillet	Olvan	Súria	Sant Sadurní d'Anoia	Gironella
Watershed	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
UTM X	409978	406808	407106	409900	408615	379090	414345	406484	397249	400787	407748
UTM Y	4626882	4674500	4635046	4595207	4623275	4606309	4676946	4658120	4629039	4586716	4650990
pH	7.76	8.34	8.24	8.10	8.23	7.49	8.40	8.25	8.29	8.05	8.38
Conductivity ( $\mu\text{S cm}^{-1}$ )	2588	436	488	1587	633	3030	295	491	2318	2060	563
Water temperature ( $^{\circ}\text{C}$ )	20.10	13.50	16.40	22.40	21.70	12.00	12.00	12.90	20.40	16.00	18.50
Dissolved oxygen ( $\text{mg L}^{-1}$ )											
Oxygen saturation (%)											
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	1.11	0.48	0.62	1.78	0.80	1.58	0.54	0.63	0.69	1.69	0.91
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.19	0.13	0.12	0.13	0.12	1.13	0.12	0.14	0.55	0.54	0.05
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	78.56	15.28	24.00	104.74	76.38	10.91	24.00	24.00	39.28	3600.54	87.29
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )		88	91	156	64	977		114	102	210	72
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )		53.30	28.47	343.93	50.57	488.03		33.70	603.40	350.30	26.40
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )		186.60	226.80	243.57	357.20			191.60	225.60	462.70	278.30
$\text{K}^+$ ( $\text{mg L}^{-1}$ )		1.05	1.08	29.15	3.85			0.97	44.44	28.95	2.35
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )		92.00	103.00	114.67	84.50			92.00	88.00	120.00	86.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )		8.00	12.00	32.00	22.50			10.00	31.00	44.00	20.00
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )		27.00	13.00	154.00	5.05			16.00	318.00	230.00	12.00
TOC ( $\text{mg L}^{-1} \text{ C}$ )	3.93	1.40	2.33	3.53	1.95	2.77	1.47	1.80	1.93	7.37	5.00
Width (m)	2	5		4	10	1		9		1	
Depth (cm)						20				10	
Current velocity (1)	3	2	2	2	1	2	4	2	3	3	2
Canopy cover (2)	3	3	3	1	3	4	4	2	3	3	4
Substratum type (dominance of)	rocks	rocks	silt	silt	rocks	silt	rocks	rocks	rocks	rocks	rocks
Water transparency (3)	1		1	1	1	2	3	1	2	1	1
Altitude a.s.l (m)	247	696	300	54	227	350	820	475	256	105	441
Surface geology	calcareous	calcareous	calcareous	siliceous	calcareous	gypsum	calcareous	calcareous	calcareous	calcareous	calcareous

Code	N10	C014	J012	J030	J052	J100	J101	J103	N29
River	Tres Serres	Figueres/Manol	Muga	Orlina	Muga	Llobregat de la Muga	Muga	Àlguema	Muga
Site	Collserola	Vilanova	Boadella	Peralada	Castelló d'Empúries	Peralada	Vilanova de la Muga	Sta. Llogaia d'Àlguema	Albanyà
Watershed	Llobregat	Muga	Muga	Muga	Muga	Muga	Muga	Muga	Muga
UTM X	417447	503528	488502	500672	506058	500898	503589	497410	476000
UTM Y	4588893	4680620	4687167	4685024	4678241	4683682	4680647	4676372	4686000
pH	7.70	7.27	7.78	7.78	7.88	7.41	7.28	7.15	7.79
Conductivity ( $\mu\text{S cm}^{-1}$ )	697	681	319	319	644	592	570	815	514
Water temperature ( $^{\circ}\text{C}$ )		20.00	15.20	15.20	24.70	21.00	22.00	19.50	22.30
Dissolved oxygen ( $\text{mg L}^{-1}$ )		3.22	10.00	10.00	17.00	9.44	7.40	8.00	9.43
Oxygen saturation (%)		33.00	100.00	100.00	132.00	106.00	82.00	79.00	108.50
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.01	12.42	0.60	2.03	2.41	5.72	20.11		0.01
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )		0.04	0.04	0.04	3.34	0.12	11.06		
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	17.46	10.91	50.19	28.37	312.05	28.37	1243.82		15.28
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	110		36		62	54	74		116
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	53.10		6.63		41.50	30.00	53.40		10.40
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	272.30		211.00		264.50	153.60	369.00		127.70
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.13				4.69	2.07	4.78		0.70
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	98.20		69.00		81.50	56.90	123.00		66.20
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	22.20		8.00		9.50	9.85	12.00		17.20
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	26.57		3.00		29.00	20.24	33.00		2.62
TOC ( $\text{mg L}^{-1} \text{ C}$ )	2.50	0.50	3.43	0.50	3.37	0.50	5.73		1.20
Width (m)		12	20	20	8	10	8	2.5	25
Depth (cm)		16	35	35	35	45	20	25	30
Current velocity (1)		2	3	3	3	3	3	3	3
Canopy cover (2)		3	3	3	2	2	3	3	3
Substratum type (dominance of)		rocks	rocks	rocks	sand	rocks	rocks	rocks	rocks
Water transparency (3)		2	2	2	3	3	3	3	3
Altitude a.s.l (m)	82	11	85	19	2	16	9	29	309
Surface geology	calcareous	calcareous	calcareous	siliceous	calcareous	siliceous	calcareous	calcareous	calcareous



Code	N30	N31	J014	N17	C033	C034	C304	C305	C306
River	Muga	Orlina	Riudecanyes	Riudecanyes	Ges	Major	Brugent	Osor	Llèmena
Site	St Llorenç de la Muga	Rabós	Duesaigües	Riudecanyes	St. Pere de Torelló	St. Sadurní d'Osormort	Amer	Aigües amunt Anglès	St. Gregori
Watershed	Muga	Muga	Riudecanyes	Riudecanyes	Ter	Ter	Ter	Ter	Ter
UTM X	483000	503000	326856	329013	443000	451251	468166	469445	480481
UTM Y	4685000	4693000	4556937	4555597	4659240	4643005	4648899	4645740	4648142
pH	7.70	6.48	7.87		8.39	8.12	7.90	7.90	8.20
Conductivity ( $\mu\text{S cm}^{-1}$ )	479	371	538	624	325	268	797	481	617
Water temperature ( $^{\circ}\text{C}$ )	22.50	21.70	17.00	17.00	20.90	13.50	18.30	17.40	20.20
Dissolved oxygen ( $\text{mg L}^{-1}$ )	9.12	3.29			9.00	8.95	8.23	9.15	12.00
Oxygen saturation (%)	107.00	36.80			110.00	90.30	87.10	98.80	133.90
$\text{NO}_3^-$ -N ( $\text{mg L}^{-1}$ )	0.01	0.01	0.72		0.45	1.81	2.26	0.90	2.71
$\text{NH}_4^+$ -N ( $\text{mg L}^{-1}$ )			0.07		0.04	0.19	0.04	0.04	0.04
$\text{PO}_4^{3-}$ -P ( $\mu\text{g L}^{-1}$ )	13.09	87.29	104.74		130.93	21.82	43.64	43.64	21.82
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	105	25	184		30	14	89	19	29
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	7.30	27.90	39.40		10.90	12.40	18.90	13.00	24.00
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	114.50	138.90	242.80		266.60		296.75		
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.61	3.30	1.82		2.07		1.94		
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	64.10	36.50	119.20		98.80		136.35		
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	11.70	9.70	25.83		19.00		23.80		
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	3.05	20.78	16.71		6.99		16.96		
TOC ( $\text{mg L}^{-1}$ C)	1.60	4.50	1.87		0.50	3.00	0.50	0.50	0.50
Width (m)	30	1	1	0.5	15	3	4	7	30
Depth (cm)	15	10	20	20	5	20	15	30	20
Current velocity (1)	3	2	3	3	3	3	3	3	2
Canopy cover (2)	2	1	4	4	2	4	2	4	2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	slab	rocks	rocks	rocks	rocks
Water transparency (3)	3	3	3	3	3	2	2	1	2
Altitude a.s.l (m)	222	112	233	173	599	445	159	148	89
Surface geology	calcareous	siliceous	siliceous	calcareous	calcareous	siliceous	calcareous	siliceous	calcareous

Code	J019	J020	J021	J028	J034	J053	J054	J060	J072	J091	J110
River	Ter	Onyar	Freser	Terri	Ter	Ter	Ter	Ter	Ter	Ges	Ter
Site	Roda de Ter	Quart	Ripoll	St. Julià de Ramis	Torelló	Torroella de Montgrí	St. Julià de Ramis	El Pasteral	Abans Ripoll	Torelló	Bescanó
Watershed	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter
UTM X	443016	486931	433288	488409	440624	512714	488177	467193	436924	438661	479399
UTM Y	4647062	4646082	4672251	4654349	4648776	4652834	4652531	4648385	4674735	4655306	4646609
pH	7.88	7.18	8.60	7.60	8.10	8.14	7.00	7.86	8.30	8.54	7.71
Conductivity ( $\mu\text{S cm}^{-1}$ )	550	1062	380	1537	325	766	680	599	249	323	546
Water temperature ( $^{\circ}\text{C}$ )	19.90	23.80	22.00	20.40	17.80	23.90	19.70	14.40	15.90	21.50	16.40
Dissolved oxygen ( $\text{mg L}^{-1}$ )	9.87	3.99	10.00	9.14	8.50	14.90	8.10	13.15	8.70	11.00	9.29
Oxygen saturation (%)	117.00	47.00	127.00	101.70	95.00	177.60	89.59	130.00	96.00	131.90	96.00
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	2.18	2.94	0.97	5.35	1.51	2.26	1.51	1.51	0.60	1.81	1.36
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.09	1.64	0.04	1.37	0.04	0.17	0.47	0.04	0.09	0.39	0.04
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	34.91	595.73	39.28	349.14	50.19	43.64	65.46	28.37	26.19	26.19	28.37
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	62	72	31	481	48	150	101	55	24	73	69
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	47.77	200.00	5.00	73.13	27.40	181.93	66.50	46.17	9.50	24.80	49.10
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	165.00	302.50	144.00	180.33	139.60	233.00	228.67	160.33	134.00	233.50	258.00
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	3.05	12.33	0.43	5.43	0.88	15.03	4.41	2.97	0.40	2.84	2.05
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	72.00	91.50	54.00	263.00	56.70	125.33	97.67	62.00	44.00	89.00	92.00
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	10.67	14.50	8.00	31.00	8.50	15.00	13.00	9.00	6.00	16.50	13.00
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	22.33	130.00	3.00	60.00	6.63	98.00	37.00	25.67	3.00	26.50	23.00
TOC ( $\text{mg L}^{-1} \text{ C}$ )	2.23	5.57	0.50	1.37	1.93	3.67	3.67	3.73	0.50	3.43	2.90
Width (m)	100	5	5	20	60	100	100	40	20	20	50
Depth (cm)	10	20	5	30	70	30	200	50	40	5	10
Current velocity (1)	2	2	3	3	2	3	2	4	3	3	3
Canopy cover (2)	1	3	3	2	2	2	2	2	3	2	3
Substratum type (dominance of)	slab	rocks	rocks	rocks	silt	silt	silt	phylamentous algae	rocks	slab	rocks
Water transparency (3)	1	1	3	2	1	2	2	3	3	3	3
Altitude a.s.l (m)	430	71	677	45	435	4	44	180	716	502	96
Surface geology	calcareous	siliceous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	siliceous	calcareous	calcareous







## **SPRING 2003**

Environmental data collected in spring 2003 (May-June) for  
the 152 stream and river sites in NE Iberian Peninsula.



Code	J017	J035	J037	J043	J048	J069	J075	J086	J088	N16	N4
River	Avencó	Mogent	Congost	Besòs	Besòs	Besòs	Ripoll	Caldes	Congost	Caldes	Rossinyol
Site	Aiguafreda	Montornès del Vallès	La Garriga	Reixac	Barcelona	Montmeló	Castellar del Vallès	Caldes de Montbui	Balenya	Gallifa	St. Miquel del Fai
Watershed	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs
UTM X	438962	438800	440028	432745	433470	436397	423754	429766	435789	428399	432990
UTM Y	4624225	4599896	4614444	4593970	4589092	4599652	4604047	4610728	4630719	4614049	4618750
pH	7.95	7.75	8.89	8.01	8.05	8.10	8.36	8.08	7.87	8.14	7.93
Conductivity ( $\mu\text{S cm}^{-1}$ )	167	997	888	2050	1744	2480	1262	519	840	475	463
Water temperature ( $^{\circ}\text{C}$ )	16.00	19.00	20.00	25.00	22.00	25.00	20.00	14.00	13.00	15.00	18.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )											
Oxygen saturation (%)											
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.20	5.67		3.94	3.28		2.44	4.50	15.73	0.11	
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.04	1.74		12.59	13.91		3.01	0.04	0.06		
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	10.91	37.10		305.50	427.70		261.86	104.74	13.09	2.18	
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	25	100		181	182		96	72	348	53	
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	8.40	139.17		345.30	320.10		143.00	32.50	52.87	10.80	
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	116.70	321.33		405.97	417.37		413.30	410.70	315.23	235.80	
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.93	16.63		20.05	21.04		8.17	3.74	4.96	4.69	
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	32.10	119.80		139.13	135.00		117.80	106.90	185.77	59.90	
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	9.80	17.33		26.07	26.83		36.60	40.90	66.13	21.10	
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	10.11	106.97		277.57	263.63		109.60	22.01	26.86	2.43	
TOC ( $\text{mg L}^{-1} \text{ C}$ )	1.80	5.40		11.33	10.87		5.90	2.70	2.10	0.80	
Width (m)	6		8	10	25	10	3	2	1	1.5	1.5
Depth (cm)	30		30	30	15	20	10	10	15	20	15
Current velocity (1)	2	3	2	3	3	3	3	2	3	2	2
Canopy cover (2)	3	3	3	2	1	4	3	3	3	3	
Substratum type (dominance of)	rocks	rocks	silt	rocks	silt	silt	rocks	rocks	rocks	rocks	rocks
Water transparency (3)	3	2	3	2	2	3	3	3	3	3	3
Altitude a.s.l (m)	411	78	227	32	11	62	190	223	556	355	507
Surface geology	siliceous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	siliceous	calcareous	calcareous	calcareous

(1) Very fast:4, fast:3, slow: 2, stagnant: 1

(2) Closed canopy: 4, open canopy: 3, narrow vegetation strip:2, riparian vegetation absent: 1

(3) Clear: 3, turbid: 2, very turbid : 1



Code	N7	N23	C121	C223	C229	C231	C232	C234	E121	E207
River	Tenes	Daró	Siurana	Ondara	Segre	Segre	Noguera Pallaresa	Noguera Ribagorçana	Ebre	Segre
Site	St. Miquel del Fai	Gualta	El Masroig (Garcia)	Vilagrassa	La Seu d'Urgell	Ponts	Esterrí d'Aneu	Corbins	Flix	Térmens
Watershed	Besòs	Daró	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
UTM X	432490	506000	309618	342410	372800	350750	346500	309147	294486	313500
UTM Y	4619995	4653000	4558095	4613150	4690000	4643500	4721200	4617500	4567810	4621250
pH	8.11	8.21	8.54	7.48	8.10	8.28	7.79	8.28	6.80	8.31
Conductivity ( $\mu\text{S cm}^{-1}$ )	493	883	409		129.4	192.7	73.4	296		262
Water temperature ( $^{\circ}\text{C}$ )	16.00	19.90	23.00	16.00		14.60	12.50	15.00	18.00	16.80
Dissolved oxygen ( $\text{mg L}^{-1}$ )		11.77	7.8	3.10	10.12	12.44	14.30	10.80		11.65
Oxygen saturation (%)		129.60	96.00	34.00	104.00	128.00	146.40	112.00	63.00	123.90
$\text{NO}_3^-$ -N ( $\text{mg L}^{-1}$ )				2.64					2.47	0.88
$\text{NH}_4^+$ -N ( $\text{mg L}^{-1}$ )				3.67					0.09	0.05
$\text{PO}_4^{3-}$ -P ( $\mu\text{g L}^{-1}$ )				1898.46					24.00	10.91
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )				239					113	85
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )				176.00					63.60	21.00
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )				270.50					192.07	127.77
$\text{K}^+$ ( $\text{mg L}^{-1}$ )				21.97					2.30	0.93
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )				91.00					96.60	72.07
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )				26.80					15.23	9.17
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )				184.00					43.96	13.69
TOC ( $\text{mg L}^{-1} \text{ C}$ )				12.10						1.27
Width (m)	5	25	10	2	75	100	8	10		75
Depth (cm)	25	30	20	20	100	95	20	30		85
Current velocity (1)	3	2	3	2	4	4	4	4	2	4
Canopy cover (2)	3	3	2	2	1	2	2	3	2	2
Substratum type (dominance of)	rocks	rocks	rocks	silt	rocks	rocks	rocks	rocks	silt	rocks
Water transparency (3)	3	2	3	1	1	2	2	3	1	2
Altitude a.s.l (m)	660	14	73	338	668	350	954	170	41	186
Surface geology	calcareous	calcareous	calcareous	calcareous	siliceous	calcareous	siliceous	calcareous	calcareous	calcareous

Code	E219	J010	J032	J041	J057	J164	L020	L021
River	Segre	Noguera Ribagorçana	Garona	Corb	Ebre	Noguera Pallaresa	Noguera Ribagorçana	Noguera de Tor
Site	Torres del Segre	El Pont de Suert	Canejan	Vilanova	Campredò	Sort	Senet	Balneari de Boí
Watershed	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
UTM X	291902	314196	314685	309902	294770	346200	316092	324112
UTM Y	4601449	4696818	4745249	4616791	4513975	4697150	4716708	4717143
pH	8.13	8.10	8.28	8.28	8.05	7.83	8.17	7.84
Conductivity ( $\mu\text{S cm}^{-1}$ )	284		72.8	853	651	76.6	133.1	45.9
Water temperature ( $^{\circ}\text{C}$ )	17.00		8.00	21.00	19.00	12.30	9.00	9.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )	10.20		11.70			15.07	12.50	8.80
Oxygen saturation (%)	80.00	97.00	99.00	84.00		152.00	96.00	96.00
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	1.52	0.25		6.56	1.98			
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.36	0.10		0.15	0.09			
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	37.10	8.73		74.19	21.82			
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	124	19		237	106	13		
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	31.43	5.90		34.10	57.83	8.40		
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	164.20	100.07		209.15	197.47	38.00		
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	2.01	0.51		3.38	2.26	0.05		
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	83.93	38.53		120.30	95.37	17.00		
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	14.77	3.70		30.30	14.07	1.00		
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	30.28	3.74		40.99	37.98	2.00		
TOC ( $\text{mg L}^{-1} \text{ C}$ )	1.77	0.90		3.05	3.17			
Width (m)	60	15	20	4	65	30	25	7
Depth (cm)		100	1	25		50	15	30
Current velocity (1)	3	4	4	3	2	4	3	4
Canopy cover (2)	1	2	3	3	2	2		2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	phylamentous algae	rocks	silt	rocks
Water transparency (3)	1	3	3	3	1	2		3
Altitude a.s.l (m)	112	828	601	170	5	687	1426	1746
Surface geology	calcareous	calcareous	siliceous	calcareous	calcareous	siliceous	siliceous	siliceous



Code	N44	N45	N46	N47	N48	F0	J011	J013	J016
River	Noguera de Cardós	Noguera de Vallferrera	Flamicell	Noguera Pallaresa	Noguera Pallaresa	Fluvià	Fluvià	Fluvià	Fluvià
Site	Lladorre	Alins	Lluçà	La Pobla de Segur	Alòs d'Isil	Hostalets d'en Bas	St. Pere Pescador	Olot	Esponellà
Watershed	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Fluvià	Fluvià	Fluvià	Fluvià
UTM X	356000	363000	330000	334000	345000	455727	505405	459669	483466
UTM Y	4720000	4713000	4686000	4680000	4728000	4660101	4669835	4671043	4669792
pH	7.37	7.58	8.15	8.20	7.82	8.37	7.75	8.40	7.88
Conductivity ( $\mu\text{S cm}^{-1}$ )	19.2	40.6	238	313	97.1	472	1051	657	1062
Water temperature ( $^{\circ}\text{C}$ )	8.90	12.90	16.60	24.00	13.00	15.60	19.90	15.90	18.90
Dissolved oxygen ( $\text{mg L}^{-1}$ )	12.60	9.90	12.50	8.92	11.50	9.94	9.43	10.15	8.79
Oxygen saturation (%)	126.00	106.00	136.70	114.00	124.00	105.50	103.30	107.00	95.50
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	0.01		0.23		0.01	0.93	2.70		2.51
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )						0.05	0.05		0.07
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	21.82		2.18		17.46	19.64	32.73		41.46
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	8	66	38		6	23	264	39	300
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	8.60	9.20	3.50		3.50	6.83	32.30	14.60	32.87
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	12.80	86.40	235.10		54.40	296.13	239.43	309.00	273.77
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	0.11	0.33	0.52		0.08	1.75	3.06	1.83	3.19
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	5.00	51.20	38.30		18.70	91.70	174.73	101.00	196.20
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	0.50	5.80	4.10		0.50	16.63	20.63	15.00	64.40
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	0.05	3.51	3.04		0.05	4.83	21.93	6.00	69.27
TOC ( $\text{mg L}^{-1} \text{ C}$ )	1.30		0.05		1.50	0.93	1.20		1.40
Width (m)	5	5	10	40	20	1.5	65	7	20
Depth (cm)	50	50	30	50	20	10	50	20	200
Current velocity (1)	4	4	3	2	4	2	2	2	1
Canopy cover (2)	3	4	2	3	2	4	2	4	3
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	silt	rocks	rocks
Water transparency (3)	3	3	2	3	3	3	3	3	1
Altitude a.s.l (m)	1062	1240	684	615	1709	510	0	400	93
Surface geology	siliceous	siliceous	calcareous	calcareous	siliceous	calcareous	calcareous	calcareous	calcareous





Code	C716	J001	J002	J003	J004	J005	J006	J023	J025	J031	J045
River	Cardener	Cardener	Cardener	Anoia	Anoia	Llobregat	Merlès	Llobregat	Cardener	Llobregat	Aiguadora
Site	La Coma	Cardona	Manresa	Vilanova del Camí	Sant Sadurní d'Anoia	Martorell	Santa Maria	Castellbell	Olius	El Pont de Vilomara	Cardona
Watershed	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
UTM X	382120	391402	404413	388325	398918	413636	415000	404996	381843	406135	389370
UTM Y	4671930	4640974	4615145	4602414	4588918	4592032	4649670	4611315	4651375	4617934	4642874
pH	8.06	8.24	8.00	7.83	7.71	8.07	8.38	8.22	8.43	8.56	8.50
Conductivity ( $\mu\text{S cm}^{-1}$ )	170	446	1248	3320	910	1126	377	936	420	818	395
Water temperature ( $^{\circ}\text{C}$ )	8.00	15.00	21.50	22.00	18.00	20.00	21.00	22.50	9.00	21.00	19.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )					3.90						
Oxygen saturation (%)					33.00						
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )		1.76	2.21	1.94			1.08	2.08	1.24	1.70	
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )		0.10	1.95	24.59			0.10	0.57	0.05	0.39	
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )		10.91	124.38	340.41			13.09	61.10	24.00	39.28	
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )		78	151	762			50	139	66	133	
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )		20.70	260.33	540.53			10.40	201.67	13.43	147.17	
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )		231.10	274.57	475.77			302.70	259.17	200.90	286.80	
$\text{K}^+$ ( $\text{mg L}^{-1}$ )		1.34	31.18	20.37			1.44	18.67	0.84	16.71	
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )		96.20	114.27	248.53			108.00	117.53	90.60	121.23	
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )		17.90	42.87	82.80			21.50	32.53	12.83	25.37	
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )		11.36	112.03	422.97			7.28	106.50	8.94	81.70	
TOC ( $\text{mg L}^{-1} \text{C}$ )		2.00	4.70	17.07			3.00	4.27	2.20	3.30	
Width (m)	3	11	25	4	2	30	3	20	6	5	5
Depth (cm)	30	25				20		30	35	20	15
Current velocity (1)	4	2	2	3	3	3	4	3	4	3	3
Canopy cover (2)	4	3	3		3	2	3	3	3	2	3
Substratum type (dominance of)	rocks	rocks		silt	rocks	rocks	rocks	rocks	rocks	rocks	rocks
Water transparency (3)	3	3	1	1	1	2	3	2	3	2	3
Altitude a.s.l (m)	1143	391	161	273	124	35	504	149	527	183	419
Surface geology	calcareous	salts	calcareous	calcareous	calcareous	siliceous	calcareous	calcareous	calcareous	calcareous	salts

Code	J046	J051	J065	J074	J076	J077	J078	J080	J084	J093
River	Llobregat	Castellolí	Carme	Anoia	Rubi	Gavarresa	Llobregat	Llobregat	Llobregat	Calders
Site	El Prat de Llobregat	Vilanova del Camí	La Pobla de Claramunt	Martorell	El Papiol	Cabrianes	Guardiola de Berguedà	Balsareny	Abreira	Navarcles
Watershed	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
UTM X	426317	388402	388647	410460	416185	409978	406808	407106	409900	408615
UTM Y	4575155	4602550	4600213	4592171	4589265	4626882	4674500	4635046	4595207	4623275
pH	7.89	8.15	8.27	8.69	8.13	8.12	8.56	8.30	8.12	8.48
Conductivity ( $\mu\text{S cm}^{-1}$ )		1048	958	1829	2330	2070	319	410	1386	841
Water temperature ( $^{\circ}\text{C}$ )		18.00	19.00	27.00	24.00	24.00	15.00	17.00	16.00	20.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )										
Oxygen saturation (%)										
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	2.34		2.55	1.76	0.25	2.42		1.27	2.43	
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	2.30		0.18	6.03	21.33	0.44		0.09	0.40	
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	130.93		30.55	128.75	720.11	74.19		32.73	69.83	
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	189		383	528	195	419		98	145	
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	210.00		66.90	290.23	384.30	284.60		23.33	199.43	
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	284.10		378.40	427.20	415.30	357.95		232.77	263.57	
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	20.28		1.58	16.55	26.48	12.72		1.96	18.38	
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	129.20		212.80	216.53	128.30	182.10		110.30	116.47	
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	37.80		46.60	66.63	30.50	62.45		14.87	33.50	
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	132.40		14.62	233.07	288.20	224.75		18.65	114.03	
TOC ( $\text{mg L}^{-1} \text{ C}$ )	6.13		2.20	11.50	16.00	5.65		3.03	4.77	
Width (m)	30	1	3	10	15	3	8	20	3	25
Depth (cm)		15		25		10	20	0.5	20	
Current velocity (1)	3	3	3	2	2	3	4	3	2	3
Canopy cover (2)	3	4	4	2	3	3	3	3	3	3
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
Water transparency (3)	3	2	1	2	1	3	2	2	3	1
Altitude a.s.l (m)	1	274	276	47	39	247	696	300	54	227
Surface geology	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	siliceous	calcareous



Code	J095	J117	J118	J119	J120	J147	C014	J012	J030	J052
River	Anoia	Llobregat	Llobregat	Cardener	Avernó	Clarà	Figueres/Manol	Muga	Orlina	Muga
Site	Jorba	La Pobla de Lillet	Olvan	Súria	Sant Sadurní d'Anoia	Gironella	Vilanova	Boadella	Peralada	Castelló d'Empúries
Watershed	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Muga	Muga	Muga	Muga
UTM X	379090	414345	406484	397249	400787	407748	503528	488502	500672	506058
UTM Y	4606309	4676946	4658120	4629039	4586716	4650990	4680620	4687167	4685024	4678241
pH	7.83	8.50	8.50	8.73	8.34	8.81	7.63	8.14	7.03	7.68
Conductivity ( $\mu\text{S cm}^{-1}$ )	1868	205	395	1331	1510	595	939	367	277	674
Water temperature ( $^{\circ}\text{C}$ )	16.00	12.50	12.00	21.00	17.00	22.00	18.70	14.20	14.90	20.90
Dissolved oxygen ( $\text{mg L}^{-1}$ )					6.80		2.70	11.31	8.81	6.65
Oxygen saturation (%)					60.00		28.80	111.30	87.00	74.50
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	2.52		0.51		0.01	9.67		0.32		1.88
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.50		0.09		0.04	0.19		0.06		1.37
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	39.28		17.46		687.38	69.83		10.91		67.65
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	943		103		309	111		37		48
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	334.50		22.57		280.30	44.45		6.30		22.07
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	352.93		213.07		627.80	345.70		165.33		183.87
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	8.04		1.43		107.10	5.21		0.80		1.74
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	332.40		105.87		141.90	144.95		62.87		71.97
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	101.20		11.77		75.10	31.85		8.77		10.03
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	230.87		17.19		190.00	29.87		4.71		14.85
TOC ( $\text{mg L}^{-1} \text{ C}$ )	4.10		2.83		44.70	5.80		3.17		2.60
Width (m)	2	8	11	5	5	1.5	2	20	8	6
Depth (cm)	20	40		20	25		50	50	50	30
Current velocity (1)	3	3	2	3	3	3	3	3	3	3
Canopy cover (2)	4	3	3	3	3	3	2	3	3	2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
Water transparency (3)	2	3	1	2	2	3	2	3	3	3
Altitude a.s.l (m)	350	820	475	256	105	441	11	85	19	2
Surface geology	gypsum	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	calcareous	siliceous	calcareous

Code	J100	J101	J103	N29	N30	N31	J014	C033
River	Llobregat de la Muga	Muga	Àlguema	Muga	Muga	Orlina	Riudecanyes	Ges
Site	Peralada	Vilanova de la Muga	Sta. Llogaia d'Àlguema	Albanyà	St Llorenç de la Muga	Rabós	Duesaigües	St. Pere de Torelló
Watershed	Muga	Muga	Muga	Muga	Muga	Muga	Riudecanyes	Ter
UTM X	500898	503589	497410	476000	483000	503000	326856	443000
UTM Y	4683682	4680647	4676372	4686000	4685000	4693000	4556937	4659240
pH	7.55	7.82	7.67	8.29	8.22	8.78	8.47	8.62
Conductivity ( $\mu\text{S cm}^{-1}$ )	430	482	832	468	464	207	550	407
Water temperature ( $^{\circ}\text{C}$ )	17.10	20.30	15.30	18.00	18.00	19.10	19.00	15.60
Dissolved oxygen ( $\text{mg L}^{-1}$ )	8.53	7.83	5.27	9.89	9.60	10.72	7.00	10.16
Oxygen saturation (%)	88.50	86.40	52.80	106.40	102.80	116.50	87.00	109.51
$\text{NO}_3^-$ -N ( $\text{mg L}^{-1}$ )	1.73		6.05	0.09	0.18	0.01	1.48	2.96
$\text{NH}_4^+$ -N ( $\text{mg L}^{-1}$ )	0.08		5.35				0.06	0.04
$\text{PO}_4^{3-}$ -P ( $\mu\text{g L}^{-1}$ )	56.74		621.91	2.18	2.18	87.29	37.10	2.18
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	54	74	75	70	65	25	166	46
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	30.00	53.40	43.75	4.00	5.10	27.90	28.23	11.70
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	153.60	369.00	317.00	217.70	249.80	138.90	241.10	266.60
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	2.07	4.78	5.09	1.01	0.97	3.30	1.82	2.07
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	56.90	123.00	124.45	65.60	61.00	36.50	119.20	98.80
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	9.85	12.00	13.35	14.30	13.90	9.70	25.83	19.00
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	20.24	33.00	28.60	4.31	4.48	20.78	16.71	6.99
TOC ( $\text{mg L}^{-1}\text{C}$ )	2.75	6.25		0.05	0.05	4.50	1.83	2.00
Width (m)	10	2	5	25	20	3	1	30
Depth (cm)	60	35	25	30	15	30	20	5
Current velocity (1)	3	3	3	3	3	3	3	3
Canopy cover (2)	2	3	3	2	2	2	4	2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	slab
Water transparency (3)	3	3	3	3	3	3	3	3
Altitude a.s.l (m)	16	9	29	309	222	112	233	599
Surface geology	siliceous	calcareous	calcareous	calcareous	calcareous	siliceous	siliceous	calcareous

Code	C034	C304	C305	C306	J019	J020	J021	J028	J034	J053
River	Major	Brugent	Osor	Llémèna	Ter	Onyar	Freser	Terri	Ter	Ter
Site	St. Sadurni d'Osormort	Amer	Aigües amunt Anglès	St. Gregori	Roda de Ter	Quart	Ripoll	St. Julià de Ramis	Torelló	Torroella de Montgrí
Watershed	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter
UTM X	451251	468166	469445	480481	443016	486931	433288	488409	440624	512714
UTM Y	4643005	4648899	4645740	4648142	4647062	4646082	4672251	4654349	4648776	4652834
pH	8.20	8.05	7.90	8.52	8.26	7.87	8.40	7.99	8.39	8.22
Conductivity ( $\mu\text{S cm}^{-1}$ )	235	675	744	602	697	1235	205	1560	255	310
Water temperature ( $^{\circ}\text{C}$ )	13.10	17.60	16.10	19.80	16.00	20.60	12.30	19.50	13.90	20.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )	10.16	8.49	8.76	13.67	8.26	9.04	10.58	7.86	11.10	10.40
Oxygen saturation (%)	102.39	90.10	91.50	150.10	88.70	109.70	108.70	85.50	113.20	113.50
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )		1.55			1.94	7.01	0.32	7.03	1.08	2.92
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )		0.05			0.15	0.57	0.04	1.93	0.05	0.12
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )		34.91			15.28	272.77	17.46	130.93	15.28	43.64
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )		153			58	80	28	548	42	101
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )		22.15			35.83	135.65	4.47	85.80	9.23	53.53
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )		296.75			151.60	253.15	111.87	300.00	139.60	215.77
$\text{K}^+$ ( $\text{mg L}^{-1}$ )		1.94			2.63	8.01	0.42	5.18	0.88	4.39
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )		136.35			63.90	99.15	44.10	315.30	56.70	98.60
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )		23.80			10.77	17.05	6.23	33.15	8.50	14.17
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )		16.96			23.48	97.28	2.78	55.70	6.63	40.75
TOC ( $\text{mg L}^{-1} \text{ C}$ )		1.70			2.33	4.80	1.47	8.10	2.17	3.67
Width (m)	5	4	5	5	100	15	20	15	150	100
Depth (cm)	15	20	20	30	65	20	30	35	80	30
Current velocity (1)	3	3	3	2	2	2	4	3	2	3
Canopy cover (2)	4	2	3	2	1	2	2	3	2	2
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks	silt	sand
Water transparency (3)	3	3	3	3	2	3	3	2	2	2
Altitude a.s.l (m)	445	159	148	89	430	71	677	45	435	4
Surface geology	siliceous	calcareous	siliceous	calcareous	calcareous	siliceous	calcareous	calcareous	calcareous	calcareous

Code	J054	J060	J091	J110	J112	N32	N33	N34	N35	N36	Te0
River	Ter	Ter	Ges	Ter	Ter	Mèder	Freser	Solana	Merdàs	Ritort	Ter
Site	St. Julià de Ramis	El Pasteral	Torelló	Bescanó	Flaça	Sta. Eulàlia de Riuprimer	Planoles	St. Quirze de Besora	Gombrèn	Molló	Setcases
Watershed	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter
UTM X	488177	467193	438661	479399	498370	431000	426000	437000	425000	451000	438961
UTM Y	4652531	4648385	4655306	4646609	4659430	4637000	4685000	4664000	4678000	4692000	4697736
pH	7.88	8.06	8.58	7.63	8.01	8.43	8.66	8.51	8.60	7.99	7.60
Conductivity ( $\mu\text{S cm}^{-1}$ )	599	537	434	538	701	1186	179.5	468	583	96.5	57
Water temperature ( $^{\circ}\text{C}$ )	15.50	11.10	18.00	11.70	16.70	19.70	13.10	14.50	16.40	9.20	8.00
Dissolved oxygen ( $\text{mg L}^{-1}$ )	9.72	10.99	10.84	9.98	9.60	9.57	10.23	10.04	10.32	11.39	11.35
Oxygen saturation (%)	98.00	101.70	123.10	92.20	99.10	101.30	110.70	108.20	114.90	113.50	111.20
$\text{NO}_3^- \text{-N}$ ( $\text{mg L}^{-1}$ )	2.21	2.39	2.58	1.76	2.82	0.68		0.01		0.29	0.26
$\text{NH}_4^+ \text{-N}$ ( $\text{mg L}^{-1}$ )	0.33	0.07	0.04	0.04	0.30			0.01			0.04
$\text{PO}_4^{3-} \text{-P}$ ( $\mu\text{g L}^{-1}$ )	39.28	28.37	21.82	29.82	58.92	2.18		133.11		2.18	6.55
$\text{SO}_4^{2-}$ ( $\text{mg L}^{-1}$ )	70	60	49	60	152	376	9	30		6	4
$\text{Cl}^-$ ( $\text{mg L}^{-1}$ )	50.83	39.10	13.40	39.50	52.67	34.10	8.80	8.50		1.10	2.37
$\text{HCO}_3^-$ ( $\text{mg L}^{-1}$ )	195.13	166.10	247.65	185.03	213.53	262.90	91.60	177.30		50.80	35.03
$\text{K}^+$ ( $\text{mg L}^{-1}$ )	4.71	4.24	2.01	3.59	4.31	7.15	0.39	0.76		0.43	0.16
$\text{Ca}^{2+}$ ( $\text{mg L}^{-1}$ )	80.30	67.83	83.70	71.80	97.37	140.40	24.80	44.50		13.90	11.57
$\text{Mg}^{2+}$ ( $\text{mg L}^{-1}$ )	12.53	11.27	19.20	11.50	13.97	57.90	7.50	20.60		2.70	1.57
$\text{Na}^+$ ( $\text{mg L}^{-1}$ )	39.41	30.09	7.20	30.38	38.31	35.57	2.19	2.63		2.06	1.39
TOC ( $\text{mg L}^{-1} \text{ C}$ )	4.03	3.73	3.05	3.33	3.97	2.10		2.00		1.00	1.13
Width (m)	40	30	35	40	50	1	7	2	3	3	5
Depth (cm)	200	50	5	20	50	5	20	10	20	80	20
Current velocity (1)	2	4	3	3	3	2	4	3	2	4	4
Canopy cover (2)	2	2	2	2	2	4	2	3	2	2	2
Substratum type (dominance of)	silt	rocks	slab	rocks	rocks	slab	rocks	slab	rocks	rocks	rocks
Water transparency (3)	1	3	3	3	2	3	3	3	3	2	3
Altitude a.s.l (m)	44	180	502	96	22	643	1087	815	904	1309	1350
Surface geology	calcareous	calcareous	calcareous	calcareous	calcareous	gypsum	siliceous	calcareous	calcareous	siliceous	siliceous



## **APPENDIX 2**

Diatom data corresponding to summer (July-August) 2002 and spring (May-June) 2003 for the 152 stream and river sites in NE Iberian Peninsula.



## **SUMMER 2002**

Diatom data corresponding to summer (July-August) 2002  
for the 152 stream and river sites in NE Iberian Peninsula.





## CODE-RIVER-SITE-WATERSHED

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
				Avencó	Mogent	Congost	Besòs
				Aiguafreda	Montornès del Vallès	La Garriga	Reixac
				Besòs	Besòs	Besòs	Besòs
ABIA	ADBI	<i>Achnanthes biasoletiana</i> Grunow	<i>Achnanthidium biasoletianum</i> (Grunow in Cl. & Grun.) Round & Bukhtiyarova	0.95	0.00	0.00	0.00
ABSA	ADSU	<i>Achnanthes biasoletiana</i> Grunow var. <i>subatomus</i> Lange-Bertalot	<i>Achnanthidium subatomus</i> (Hustedt) Lange-Bertalot	0.00	0.00	0.00	0.00
ABIO	PBIO	<i>Achnanthes bioretii</i> Germain	<i>Psammothidium bioretii</i> (Germain) Bukhtiyarova	0.00	0.00	0.00	0.00
ABIN		<i>Achnanthes brevipes</i> Agardh var. <i>intermedia</i> (Kutz.) Cleve		0.00	0.00	0.00	0.00
ACLE	KCLE	<i>Achnanthes clevei</i> Grunow	<i>Karayevia clevei</i> (Grun. in Cl. & Grun.) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
ACBO		<i>Achnanthes clevei</i> Grunow var. <i>botnica</i> Cleve		0.00	0.00	0.00	0.00
ACOA		<i>Achnanthes coarctata</i> (Brébisson) Grunow in Cl. & Grun.		0.00	0.00	0.00	0.00
ACON	PTCO	<i>Achnanthes conspicua</i> Mayer	<i>Platessa conspicua</i> (A. Mayer) Lange-Bertalot	0.00	0.00	0.00	0.00
ADEL	PTDE	<i>Achnanthes delicatula</i> (Kutz.) Grun	<i>Planothidium delicatulum</i> (Kutz.) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
AEXG		<i>Achnanthes exigua</i> Grunow in Cl. & Grunow		0.00	0.00	0.00	0.00
AEEL		<i>Achnanthes exigua</i> Grunow var. <i>elliptica</i> Hustedt		0.00	0.00	0.00	0.00
AHEL	PHEL	<i>Achnanthes helvetica</i> (Hustedt) Lange-Bertalot	<i>Psammothidium helveticum</i> (Hustedt) Bukhtiyarova et Round	0.00	0.00	0.00	0.00
AHUN	LHUN	<i>Achnanthes hungarica</i> in Cleve et Grun.	<i>Lemnicola hungarica</i> (Grunow) Round & Basson)	0.00	0.00	0.00	0.00
AKOL	KKOL	<i>Achnanthes kolbei</i> Hustedt	<i>Kolbesia kolbei</i> (Hust.) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
ALVS	EULA	<i>Achnanthes laevis</i> Oestrup	<i>Eucoconeis laevis</i> (Oestrup) Lange-Bertalot	0.00	0.00	0.00	0.00
ALFR	PLFR	<i>Achnanthes lanceolata</i> (Breb.) Grun. ssp. <i>frequentissima</i> Lange-Bertalot	<i>Planothidium frequentissimum</i> (Lange-Bertalot) Round & Bukhtiyarova	0.00	0.96	0.00	0.25
ALAN	PTLA	<i>Achnanthes lanceolata</i> (Breb.) Grunow	<i>Planothidium lanceolatum</i> (Breb.) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
ALAE	PTEL	<i>Achnanthes lanceolata</i> (Breb.) Grunow var. <i>elliptica</i> Cleve	<i>Planotidium ellipticum</i> (Cl.) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
ALAR	PRST	<i>Achnanthes lanceolata</i> var. <i>rostrata</i> (Oestrup) Lange-Bertalot	<i>Planothidium rostratum</i> (Oestrup) Lange-Bertalot	0.00	0.00	0.00	0.49
ALAT	KALA	<i>Achnanthes laterostrata</i> Hustedt	<i>Karayevia laterostrata</i> (Hust.) Round & Bukht.	0.24	0.00	0.00	0.00
AMAR	PMRG	<i>Achnanthes marginulata</i> Grunow in Cleve & Grun.	<i>Psammothidium marginulatum</i> (Grun) Bukht. & Round	0.00	0.00	0.00	0.00
AMAF	ACAF	<i>Achnanthes minutissima</i> Kutz. var. <i>affinis</i> (Grunow) Lange-Bertalot	<i>Achnanthidium affine</i> (Grun.) Czamecki	0.00	0.00	0.00	0.00
AMIN	ADMI	<i>Achnanthes minutissima</i> Kützing	<i>Achnanthidium minutissimum</i> (Kütz.) Czamecki	8.33	0.24	0.00	0.00
AMIC		<i>Achnanthes minutissima</i> Kützing var. <i>microcephala</i> Kützing		0.00	0.00	0.00	0.00
AMSA	ADSA	<i>Achnanthes minutissima</i> Kützing var. <i>saprophila</i> Kobayabasi et Mayama	<i>Achnanthidium saprophilum</i> (Kobayabasi et Mayama) Round & Bukhtiyarova	0.00	0.00	0.00	0.00
AOBG		<i>Achnanthes oblongella</i> Oestrup		0.00	0.00	0.00	0.00
APLO	KPLO	<i>Achnanthes ploenensis</i> (Hust.) Kingston	<i>Kolbesia ploenensis</i> (Hust.) Kingston	0.00	0.00	0.00	0.00
ASAT	PSAT	<i>Achnanthes subatomoides</i> (Hustedt) Lange-Bertalot	<i>Psammothidium subatomoides</i> (Hust.) L. Bukhtiyarova et Round	0.00	0.00	0.00	0.00
ATRO	NUTP	<i>Achnanthes tropica</i> Hustedt	<i>Nupela tropica</i> (Hustedt) Lange-Bertalot	0.00	0.00	0.00	0.00
AMGR		<i>Achnanthidium altergracillimum</i> (Lange-Bertalot) Round & Bukh.		0.00	0.00	0.00	0.00
ACTT		<i>Achnanthidium catenatum</i> (Bily & Marvan) Lange-Bertalot		0.00	0.00	0.00	0.00
ADLA		<i>Achnanthidium latecephalum</i> Kobayasi		0.00	0.00	0.00	0.00
ASTB		<i>Achnanthidium straubianum</i> (Lange-Bertalot) Lange-Bertalot		0.00	0.00	0.00	0.00
APEL		<i>Amphipleura pellucida</i> Kützing		0.00	0.00	0.00	0.00
AALA		<i>Amphiprora alata</i> Kützing		0.00	0.00	0.00	0.00
AEXI		<i>Amphora eximia</i>		0.00	0.00	0.00	0.00
AHOL		<i>Amphora holsatica</i> Hustedt		0.00	0.00	0.00	0.00
AINA		<i>Amphora inariensis</i> Krammer		0.00	0.00	0.00	0.00
ALIB	ACOP	<i>Amphora libyca</i> Ehr.	<i>Amphora copulata</i> (Kützing) Schoeman & Archibald	0.00	0.00	0.00	0.00
AMMO		<i>Amphora montana</i> Krasske		0.00	0.00	0.00	0.00
AOVA		<i>Amphora ovalis</i> (Kützing) Kützing		0.00	0.00	0.00	0.00
APED		<i>Amphora pediculus</i> (Kützing) Grunow		0.48	0.48	0.24	0.00
AVEN		<i>Amphora veneta</i> Kützing		0.00	0.48	0.00	0.25
ANBR	BNEO	<i>Anomoeoneis brackysira</i> (Brébisson in Rabenhorst) Grunow in Cleve	<i>Brachysira neoexilis</i> Lange-Bertalot	0.00	0.00	0.00	0.00
AGAR	BGAR	<i>Anomoeoneis garrensis</i> Lange-Bertalot et Krammer	<i>Brachysira garrensis</i> (Lange-Bertalot & Krammer) Lange-Bertalot	0.00	0.00	0.00	0.00
AVIT	BVIT	<i>Anomoeoneis vitrea</i> (Grunow) Ross	<i>Brachysira vitrea</i> (Grunow) Ross in Hartley	0.00	0.00	0.00	0.00
AFOR		<i>Asterionella formosa</i> Hassall		0.00	0.00	0.00	0.00
ADIA		<i>Aulacoseira dianchiensis</i> Yang Stoermer & Kociolek		0.00	0.00	0.00	0.00
AUDI		<i>Aulacoseira distans</i> (Ehr.) Simonsen		0.00	0.00	0.00	0.00
AUGR		<i>Aulacoseira granulata</i> (Ehr.) Simonsen		0.00	0.00	0.00	0.25
BPAR	BPAX	<i>Bacillaria paradoxa</i> Gmelin	<i>Bacillaria paxillifera</i> (O.F. Müller) Hendey	0.00	0.00	0.00	0.00
CAPS		<i>Caloneis alpestris</i> (Grunow) Cleve		0.00	0.00	0.00	0.00
CAMP		<i>Caloneis amphisbaena</i> (Bory) Cleve		0.00	0.00	0.00	0.00
CBAC		<i>Caloneis bacillum</i> (Grunow) Cleve		0.00	0.00	0.00	0.00
CBRD		<i>Caloneis branderii</i> (Hustedt) Krammer		0.00	0.00	0.00	0.00
CMOL		<i>Caloneis molaris</i> (Grunow) Krammer		0.00	0.00	0.00	0.00
CSIL		<i>Caloneis silicula</i> (Ehr.) Cleve		0.00	0.00	0.00	0.00
CPED		<i>Cocconeis pediculus</i> Ehrenberg		0.00	0.48	0.00	0.00
CPLA		<i>Cocconeis placentula</i> Ehrenberg		0.00	0.00	0.00	0.00

## CODE-RIVER-SITE-WATERSHED

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
CPLE		<i>Cocconeis placentula</i> Ehrenberg var. <i>euglypta</i> (Ehr.) Grunow		0.48	0.00	0.00	0.00
CPLI		<i>Cocconeis placentula</i> Ehrenberg var. <i>lineata</i> (Ehr.) Van Heurck		0.24	0.00	0.24	0.00
CPPL	COPL	<i>Cocconeis placentula</i> Ehrenberg var. <i>pseudolineata</i> Geither	<i>Cocconeis pseudolineata</i> (Geitler) Lange-Bertalot	0.00	0.00	0.00	0.00
CDUB		<i>Cyclostephanos dubius</i> (Fricke) Round		0.00	0.00	0.00	0.00
CINV		<i>Cyclostephanos invisitatus</i> (Hohn&Hellerman) Theriot, Stoermer & Hakansson		0.00	0.00	0.00	0.00
CATO		<i>Cyclotella atomus</i> Hustedt		0.00	0.00	0.00	0.00
CCMS		<i>Cyclotella comensis</i> Grunow in Van Heurck		0.00	0.00	0.00	0.00
CCCP		<i>Cyclotella cyclopuncta</i> Hakansson & Carter		0.00	0.00	0.00	0.00
CDTG		<i>Cyclotella distinguenda</i> Hustedt		0.00	0.00	0.00	0.00
CKUT		<i>Cyclotella kuetzingiana</i> Thwaites		0.00	0.00	0.00	0.00
CMED		<i>Cyclotella meduanae</i> Germain		0.00	0.00	0.00	0.00
CMEN		<i>Cyclotella meneghiniana</i> Kützing		0.00	0.00	0.48	0.74
COCE		<i>Cyclotella ocellata</i> Pantocsek		0.00	0.00	0.00	0.00
CPOL		<i>Cyclotella polymorpha</i> Meyer & Hakansson		0.00	0.00	0.00	0.00
CPST	DPST	<i>Cyclotella pseudostelligera</i> Hustedt	<i>Discostella pseudostelligera</i> (Hustedt) Houk. et Klee	0.00	0.00	0.00	0.00
CRAD		<i>Cyclotella radiosa</i> (Grunow) Lemmermann		0.00	0.24	0.00	0.00
CWUE		<i>Cyclotella wuethrichiana</i> Druart & Straub		0.00	0.00	0.00	0.00
CSAP		<i>Cymatopleura solea</i> (Brébisson) W. Smith var. <i>apiculata</i> (W. Smith) Ralfs		0.00	0.00	0.00	0.00
CSOL		<i>Cymatopleura solea</i> (Brébisson) W. Smith		0.00	0.00	0.00	0.00
CAFF		<i>Cymbella affinis</i> Kützing	<i>Cymbella gr. excisa/parva</i>	0.00	0.00	0.00	0.49
CAPH	CBAM	<i>Cymbella amphicephala</i> Naegeli	<i>Cymbopleura amphicephala</i> (Naegeli) Krammer	0.00	0.00	0.00	0.00
CASP		<i>Cymbella aspera</i> (Ehr.) Cleve		0.00	0.00	0.00	0.00
CCAE	ECAE	<i>Cymbella caespitosa</i> (Kützing) Brun	<i>Encyonema caespitosum</i> Kützing	0.00	0.00	0.00	0.00
CCES	ECES	<i>Cymbella cesatii</i> (Rabenhorst) Krammer	<i>Encyonopsis cesatii</i> (Rabenhorst) Krammer	0.00	0.00	0.00	0.00
CDEL	DDEL	<i>Cymbella delicatula</i> Kützing	<i>Delicata delicatula</i> (Kützing) Krammer	0.00	0.00	0.00	0.00
CDES	EDES	<i>Cymbella descripta</i> (Hustedt) Krammer et Lange-Bertalot	<i>Encyonopsis descripta</i> (Hustedt) Krammer	0.00	0.00	0.00	0.00
CFAL	ECFA	<i>Cymbella falaisensis</i> (Grunow) Krammer et Lange-Bertalot	<i>Encyonopsis falaisensis</i> (Grunow) Krammer	0.00	0.00	0.00	0.00
CHEL		<i>Cymbella helvetica</i> Kützing	<i>Cymbella gr. helvetica</i>	0.00	0.00	0.00	0.00
CLAC	ELAC	<i>Cymbella lacustris</i> (Agardh) Cleve	<i>Encyonema lacustre</i> (C. Agardh) Mills	0.00	0.00	0.00	0.00
CLAE		<i>Cymbella laevis</i> Naegeli		0.00	0.00	0.00	0.00
CLAN		<i>Cymbella lanceolata</i> (Ehrenb.) Kirchner		0.00	0.00	0.00	0.00
CMIC	ENCM	<i>Cymbella microcephala</i> Grunow	<i>Encyonopsis microcephala</i> (Grunow) Krammer	0.24	0.00	0.00	0.00
CMIIN	ENMI	<i>Cymbella minuta</i> Hilse ex Rabenhorst	<i>Encyonema minutum</i> (Hilse in Rabh.) D. G. Mann	0.71	0.00	0.00	0.00
CNAV	CBNA	<i>Cymbella naviculiformis</i> Auerswald	<i>Cymbopleura naviculiformis</i> (Auerswald) Krammer	0.00	0.00	0.00	0.00
CGRA		<i>Cymbella neogracile</i> Krammer		0.00	0.00	0.00	0.00
COBS	EOBS	<i>Cymbella obscura</i> Krasske	<i>Encyonema obscurum</i> (Krasske) D. G. Mann	0.00	0.00	0.00	0.00
CPRO	EPRO	<i>Cymbella prostrata</i> (Berkeley) Grunow	<i>Encyonema prostratum</i> (Berkeley) Kützing	0.00	0.00	0.00	0.00
CSLE	ESLE	<i>Cymbella silesiaca</i> Bleisch	<i>Encyonema silesiacum</i> (Bleisch in Rabh.) D. G. Mann	1.67	0.00	0.00	0.00
CSIN	RSIN	<i>Cymbella sinuata</i> Gregory	<i>Reimeria sinuata</i> (Gregory) Kociolek & Stoermer	0.00	0.00	0.00	0.00
CSAE	CSAQ	<i>Cymbella subaequalis</i> Grunow	<i>Cymbopleura subaequalis</i> (Grunow) Krammer	0.00	0.00	0.00	0.00
CTUM		<i>Cymbella tumida</i> (Brébisson) Van Heurck		0.00	0.00	0.00	0.00
CTLA	CLTL	<i>Cymbella tumidula</i> Grunow var. <i>lancettula</i> Krammer	<i>Cymbella lancettula</i> (Krammer) Krammer	0.00	0.00	0.00	0.00
CTGL		<i>Cymbella turgidula</i> Grunow		0.00	0.00	0.00	0.00
DKUE		<i>Denticula kuetzingii</i> Grunow		0.00	0.00	0.00	0.00
DSUB		<i>Denticula subtilis</i> Grunow		0.00	0.00	0.00	0.00
DTEN		<i>Denticula tenuis</i> Kützing		0.00	0.00	0.00	0.00
DEHR		<i>Diatoma ehrenbergii</i> Kützing		0.00	0.00	0.00	0.00
DMES		<i>Diatoma mesodon</i> (Ehrenberg) Kützing		0.00	0.00	0.00	0.00
DMON		<i>Diatoma moniliformis</i> Kützing		0.00	0.00	0.00	0.00
DITE		<i>Diatoma tenuis</i> Agardh		0.00	0.00	0.00	0.00
DVUL		<i>Diatoma vulgare</i> Bory 1824		0.24	0.00	0.00	0.00
DVLI		<i>Diatoma vulgare</i> Bory Morphotyp linearis		0.00	0.00	0.00	0.00
DELL		<i>Diploneis elliptica</i> (Kützing) Cleve		0.00	0.00	0.00	0.00
DOBL		<i>Diploneis oblongella</i> (Naegeli) Cleve-Euler		0.00	0.00	0.00	0.00
DOVA		<i>Diploneis ovalis</i> (Hilse) Cleve		0.00	0.00	0.00	0.00
DPET		<i>Diploneis petersenii</i> Hustedt		0.00	0.00	0.00	0.00
EARE		<i>Ellerbeckia arenaria</i> (Moore) Crawford		0.00	0.00	0.00	0.00
EPAL		<i>Entomoneis paludosa</i> (Smith) Reimer		0.00	0.00	0.00	0.00
EADN		<i>Epithemia adnata</i> (Kützing) Brébisson		2.14	0.00	0.00	0.00
EGOE		<i>Epithemia goeppertiana</i> Hilse		0.00	0.00	0.00	0.00
EARC		<i>Eunotia arcus</i> Ehrenberg		0.00	0.00	0.00	0.00
EBIL		<i>Eunotia bilunaris</i> (Ehr.) Mills		0.00	0.00	0.00	0.00

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ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
EEXI		<i>Eunotia exigua</i> (Breb.) Rabenhorst		0.00	0.00	0.00	0.00
EPEC		<i>Eunotia pectinalis</i> (Dyllwyn) Rabenhorst		0.00	0.00	0.00	0.00
ESOL		<i>Eunotia soleirolii</i> (Kützing) Rabenhorst		0.00	0.00	0.00	0.00
FARC	HARC	<i>Fragilaria arcus</i> (Ehrenberg) Cleve	<i>Hannaea arcus</i> (Ehrbg.) Patrick	0.00	0.00	0.00	0.00
FBCP		<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot		0.00	0.00	0.00	0.00
FBID		<i>Fragilaria bidens</i> Heiberg		0.00	0.00	0.00	0.00
FBRE		<i>Fragilaria brevistriata</i> Grunow		0.00	0.00	0.00	0.00
FCPI		<i>Fragilaria capitata</i> (Ehrenberg) Compère		0.00	0.00	0.00	0.00
FCAP		<i>Fragilaria capucina</i> Desmazières		0.00	0.00	0.00	0.00
FCAU		<i>Fragilaria capucina</i> Desmazières var. <i>austriaca</i> (Grunow) Lange-Bertalot		0.00	0.00	0.00	0.00
FCGR	FGRA	<i>Fragilaria capucina</i> Desmazières var. <i>gracilis</i> (Oestrup) Hustedt	<i>Fragilaria gracilis</i> Ostrup	0.00	0.00	0.00	0.00
FCME		<i>Fragilaria capucina</i> Desmazières var. <i>mesolepta</i> (Rabenhorst) Rabenhorst		0.00	0.00	0.00	0.00
FCRA		<i>Fragilaria capucina</i> Desmazières var. <i>radians</i> (Kützing) Lange-Bertalot		0.00	0.00	0.00	0.00
FCRU		<i>Fragilaria capucina</i> Desmazières var. <i>rumpens</i> (Kütz.) Lange-Bert.		0.00	0.00	0.00	0.00
FCVA		<i>Fragilaria capucina</i> Desmazières var. <i>vaucheriae</i> (Kützing) Lange-Bertalot		2.14	0.00	0.00	0.00
FCAH		<i>Fragilaria capucina</i> Desmazières var. <i>amphicephala</i> (Kützing) Lange-Bertalot		5.48	0.00	0.00	0.00
FCPE		<i>Fragilaria capucina</i> var. <i>perminuta</i> (Grunow) Lange-Bertalot		0.00	0.00	0.00	0.00
FCBI	SCBI	<i>Fragilaria construens</i> (Ehr.) Grunow f. <i>binodis</i> (Ehr.) Hustedt	<i>Staurosira construens</i> (Ehr.) var. <i>binodis</i> (Ehr.) Hamilton	0.00	0.00	0.00	0.00
FCVE	SCVE	<i>Fragilaria construens</i> (Ehr.) Grunow f. <i>venter</i> (Ehr.) Hustedt	<i>Staurosira construens</i> Ehr. var. <i>venter</i> (Ehr.) Hamilton	0.00	0.00	0.00	0.00
FCON	SCON	<i>Fragilaria construens</i> (Ehrenberg) Grunow	<i>Staurosira construens</i> Ehrenberg	0.00	0.00	0.00	0.00
FDEL		<i>Fragilaria delicatissima</i> (W. Smith) Lange-Bertalot		0.00	0.00	0.00	0.00
FDIL		<i>Fragilaria dilatata</i> (Brébisson) Lange-Bertalot		0.00	0.00	0.00	0.00
FELL		<i>Fragilaria elliptica</i> (Schumann) Williams & Round	<i>Staurosira elliptica</i> (Schumann) Williams & Round	0.00	0.00	0.00	0.00
FFAS	TFAS	<i>Fragilaria fasciculata</i> (C. A. Agardh) Lange-Bertalot	<i>Tabularia fasciculata</i> (Agardh) Williams et Round	0.00	0.24	0.00	0.00
FNAN		<i>Fragilaria nanana</i> Lange-Bertalot		0.00	0.00	0.00	0.00
FPSC		<i>Fragilaria parasitica</i> (W. Sm.) var. <i>subconstricta</i> Grunow		0.00	0.00	0.00	0.00
FPAR		<i>Fragilaria parasitica</i> (W.Sm.) Grun.		0.00	0.00	0.00	0.00
FPIN	SPIN	<i>Fragilaria pinnata</i> Ehrenberg	<i>Staurosirella pinnata</i> (Ehr.) Williams & Round	0.00	0.00	0.00	0.00
FPUL	CTPU	<i>Fragilaria pulchella</i> (Ralfs ex Kütz.) Lange-bertalot	<i>Ctenophora pulchella</i> (Ralfs ex Kutz.) Williams et Round	0.00	0.00	0.00	0.00
FROB		<i>Fragilaria robusta</i> (Fusey) Manguin		0.00	0.00	0.00	0.00
FTEN		<i>Fragilaria tenera</i> (Smith) Lange-Bertalot		0.00	0.00	0.00	0.00
FUAC		<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot var. <i>acus</i> (Kütz.) Lange-Bertalot		0.00	0.00	0.00	0.00
FULN	UULN	<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot	<i>Ulnaria ulna</i> (Nitzsch.) Compère	30.24	0.00	0.00	0.00
FSPI		<i>Frustulia spicula</i> Amossé		0.00	0.00	0.00	0.00
FVUL		<i>Frustulia vulgaris</i> (Thwaites) De Toni		0.00	0.00	0.00	0.00
GMMI		<i>Gomphonema minuta</i> (Stone) Kociolek & Stoermer		0.00	0.00	0.00	0.00
GACU		<i>Gomphonema acuminatum</i> Ehrenberg		0.24	0.00	0.00	0.00
GAMO		<i>Gomphonema amoenum</i> Lange-Bertalot		0.00	0.00	0.00	0.00
GANG		<i>Gomphonema angustatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00	0.00
GANT		<i>Gomphonema angustum</i> Agardh		0.00	0.00	0.00	0.00
GAUG		<i>Gomphonema augur</i> Ehrenberg		0.00	0.00	0.00	0.00
GBAV		<i>Gomphonema bavaricum</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00	0.00
GBOH		<i>Gomphonema bohemicum</i> Reichelt & Fricke		0.00	0.00	0.00	0.00
GOMP		GOMPHONEMA C. G. Ehrenberg		0.00	0.00	0.00	0.00
GCLA		<i>Gomphonema clavatum</i> Ehr.		0.00	0.00	0.00	0.00
GCLE		<i>Gomphonema clevei</i> Fricke		0.00	0.00	0.00	0.00
GDIC		<i>Gomphonema dichotomum</i> Kutz.		0.00	0.00	0.00	0.00
GEMI		<i>Gomphonema exiguum</i> Kützing var. <i>minutissimum</i> Grunow		0.00	0.00	0.00	0.00
GGRA		<i>Gomphonema gracile</i> Ehrenberg		0.24	0.00	0.00	0.00
GLAT		<i>Gomphonema lateripunctatum</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00	0.00
GMIC		<i>Gomphonema micropus</i> Kützing		0.00	0.00	0.00	0.00
GMIN		<i>Gomphonema minutum</i> (Ag.) Agardh		0.00	0.00	0.00	0.00
GOCCU		<i>Gomphonema occultum</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00	0.00
GOLI		<i>Gomphonema olivaceum</i> (Hornemann) Brébisson		0.00	0.00	0.00	0.00
GPAR		<i>Gomphonema parvulum</i> Kützing		0.71	1.68	0.24	3.43
GPXS	GEXL	<i>Gomphonema parvulum</i> Kützing var. <i>exilissimum</i> Grunow	<i>Gomphonema exilissimum</i> (Grun.) Lange-Bertalot & Reichardt	0.00	0.00	0.00	0.00
GPLA		<i>Gomphonema parvulum</i> Kützing var. <i>lagenula</i> (Kütz.) Frenguelli		0.00	0.00	0.00	0.00
GPXA		<i>Gomphonema pseudoaugur</i> Lange-Bertalot		0.00	0.00	0.00	0.25
GPUM		<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	<i>Gomphonema gr. pumilum</i>	4.29	0.00	0.00	0.00
GTER		<i>Gomphonema tergestinum</i> Fricke		0.00	0.00	0.00	0.00
GTRU		<i>Gomphonema truncatum</i> Ehr.		1.43	0.00	0.00	0.00
GYAC		<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00	0.00

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ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
GYAT		<i>Gyrosigma attenuatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00	0.00
GNOD		<i>Gyrosigma nodiferum</i> (Grunow) Reimer		0.00	0.00	0.00	0.00
GYPA		<i>Gyrosigma parkerii</i> (Harrison) Elmore		0.00	0.00	0.00	0.00
HAMP		<i>Hantzschia amphioxys</i> (Ehr.) Grunow in Cleve et Grunow 1880		0.00	0.00	0.00	0.00
MSMI		<i>Mastogloia smithii</i> Thwaites		0.00	0.00	0.00	0.00
MLIN		<i>Melosira lineata</i> (Dillwyn) Agardh		0.00	0.00	0.00	0.00
MMON		<i>Melosira moniliformis</i> (O. F. Muller) Agardh		0.00	0.00	0.00	0.00
MVAR		<i>Melosira varians</i> Agardh		20.95	0.00	0.72	0.00
MCIR		<i>Meridion circulare</i> (Greville) C.A. Agardh		0.00	0.00	0.00	0.00
NACO	CRAC	<i>Navicula accommoda</i> (Hustedt) Mann	<i>Craticula accomoda</i> (Hustedt) Mann	0.00	0.00	0.24	0.00
NAMB		<i>Navicula ambigua</i> (Ehrenberg) Mann		0.00	0.00	0.00	0.00
NATO	MAAT	<i>Navicula atomus</i> (Kützing) Lange-Bertalot	<i>Mayamaea atomus</i> (Kützing) Lange-Bertalot	0.00	0.00	0.00	0.00
NAPE	MAPE	<i>Navicula atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	<i>Mayamaea atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	0.00	2.88	0.00	0.00
NBGR		<i>Navicula bacillum</i> (Ehrenberg) Mann var. <i>gregoryana</i> (Grunow) Bukhtiyarovah.		0.00	0.00	0.00	0.00
NBAC	SEBA	<i>Navicula bacillum</i> Ehrenberg	<i>Sellaphora bacillum</i> (Ehrenberg) D. G. Mann	0.00	0.00	0.00	0.00
NBRY	ABRY	<i>Navicula bryophila</i> Boye Petersen	<i>Adlafia bryophila</i> (Petersen) Moser Lange-Bertalot & Metzeltin	0.00	0.00	0.00	0.00
NCAP	HCAP	<i>Navicula capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	<i>Hippodonta capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	0.00	0.00	0.00	0.00
NCPR		<i>Navicula capitatoradiata</i> Germain		0.71	0.00	0.00	0.00
NCAR		<i>Navicula cari</i> Ehrenberg		0.00	0.00	0.00	0.00
NCTG		<i>Navicula catalanogermanica</i> Lange-Bertalot & Hofman		0.00	0.00	0.00	0.00
NCTV		<i>Navicula caterva</i> Hohn & Helleman		0.00	0.00	0.00	0.00
NCIN		<i>Navicula cincta</i> (Ehr.) Ralfs in Pritchard		0.00	0.00	0.00	0.00
NCOF	DCOF	<i>Navicula confervacea</i> (Kützing) Grunow	<i>Diademsis confervacea</i> Kützing	0.00	0.00	0.00	0.00
NCON	DCOT	<i>Navicula contenta</i> Grunow	<i>Diademsis contenta</i> (Grunow ex V. Heurck) Mann	0.00	0.00	0.00	0.00
NCRY		<i>Navicula cryptocephala</i> Kützing		0.00	0.00	0.00	0.00
NCFA		<i>Navicula cryptofallax</i> Lange-Bertalot & Hofmann		0.00	0.00	0.00	0.00
NCTE		<i>Navicula cryptotenella</i> Lange-Bertalot		2.86	0.00	0.00	0.00
NCUS	CRCU	<i>Navicula cuspidata</i> Kützing	<i>Craticula cuspidata</i> (Kützing) Mann	0.00	0.00	0.00	0.00
NDEC	GDEC	<i>Navicula decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	<i>Geissleria decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	0.00	0.00	0.00	0.00
NEDG		<i>Navicula eidrigiana</i> Carter		0.00	0.00	0.00	0.00
NERI		<i>Navicula erifuga</i> Lange-Bertalot		0.00	0.00	0.72	0.49
NFOR	FFOR	<i>Navicula forcipata</i> Greville	<i>Fallacia forcipata</i> (Greville) Stickle & Mann	0.00	0.00	0.00	0.00
NGOE	LGOE	<i>Navicula goeppertiana</i> (Bleisch) H. L. Smith	<i>Luticola goeppertiana</i> (Bleisch in Rabenhorst) D.G. Mann	0.00	0.00	0.00	0.00
NGOT		<i>Navicula gottlandica</i> Grunow		0.00	0.00	0.00	0.00
NGRE		<i>Navicula gregaria</i> Donkin		0.00	0.24	0.24	0.49
NHAL	CHAL	<i>Navicula halophila</i> (Grunow ex Van Heurck) Mann	<i>Craticula halophila</i> (Grunow ex Van Heurck) Mann	0.00	0.00	0.00	0.00
NHEL		<i>Navicula helensis</i> Schulz.		0.00	0.00	0.00	0.00
NHUN		<i>Navicula hungarica</i> (Grunow) Lange-Bertalot, Metzeltin & Witkowski		0.00	0.00	0.00	0.00
NINO	GINO	<i>Navicula ignota</i> Krasske 1932 emend Lund 1948	<i>Geissleria ignota</i> (Krasske) Lange-Bertalot & Metzeltin	0.00	0.00	0.00	0.00
NICT		<i>Navicula incertata</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NINS	FINS	<i>Navicula insociabilis</i> (Krasske) Mann	<i>Fallacia insociabilis</i> (Krasske) D.G. Mann	0.00	0.00	0.00	0.00
NKOT	LKOT	<i>Navicula kotschyi</i> Grunow	<i>Luticola kotschyi</i> (Grunow) D. G. Mann	0.00	0.00	0.00	0.00
NLLC		<i>Navicula lacunolaciniata</i> (Lange-Bertalot & Bonik) Lange-Bertalot		0.00	0.00	0.00	0.00
NLAN		<i>Navicula lanceolata</i> (Agardh) Ehrenberg		0.00	0.00	0.00	0.00
NLAP	CVLP	<i>Navicula lapidosa</i> Krasske	<i>Cavinula lapidosa</i> (Krass.) Lange-Bertalot	0.00	0.00	0.00	0.00
NLEN		<i>Navicula lenzii</i> Hustedt		0.00	0.00	0.00	0.00
NMGL		<i>Navicula margalithii</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NMEG	NANT	<i>Navicula menisculus</i> Schuman var. <i>grunowii</i> Lange-Bertalot	<i>Navicula antonii</i> Lange-Bertalot	0.00	0.00	0.00	0.00
NMUP	NUSA	<i>Navicula menisculus</i> Schuman var. <i>upsaliensis</i> Grunow	<i>Navicula upsaliensis</i> (Grunow) Peragallo	0.00	0.00	0.00	0.00
NMEN		<i>Navicula menisculus</i> Shumann		0.00	0.00	0.00	0.00
NMCA		<i>Navicula microcari</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NMDG		<i>Navicula microdigitoradiata</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NMIN	EOMI	<i>Navicula minima</i> Grunow	<i>Eolimna minima</i> (Grunow) Lange-Bertalot	0.00	0.96	0.00	0.00
NMIS		<i>Navicula minuscula</i> Grunow in Van Heurck 1880	<i>Adlafia minuscula</i> (Grunow) Lange-Bertalot	0.00	0.00	0.00	0.00
NMMU	ADMM	<i>Navicula minuscula</i> Grunow var. <i>muralis</i> (Grunow) Lange-Bertalot	<i>Adlafia minuscula</i> var. <i>muralis</i> (Grunow) Lange-Bertalot	0.00	0.00	0.00	0.00
NMLF	CMLF	<i>Navicula molestiformis</i> Hustedt	<i>Craticula molestiformis</i> (Hustedt) Lange-Bertalot	0.00	0.00	0.00	0.00
NMOC		<i>Navicula monoculata</i> (Hustedt) Mann		0.00	0.00	0.00	0.00
NMOM		<i>Navicula monoculata</i> Hustedt var. <i>omissa</i> (Hustedt) Lange-Bertalot		0.00	0.00	0.00	0.00
NMUT	LMUT	<i>Navicula mutica</i> (Kützing) D.G. Mann	<i>Luticola mutica</i> (Kützing) D.G. Mann	0.00	0.00	0.00	0.00
NNIV	LNIV	<i>Navicula nivalis</i> (Ehrenberg) D.G. Mann	<i>Luticola nivalis</i> (Ehrenberg) D.G. Mann	0.00	0.00	0.00	0.00
NOPU		<i>Navicula oppugnata</i> Hustedt		0.00	0.00	0.00	0.00
NPEL	FPEL	<i>Navicula pelliculosa</i> (Brébisson ex Kützing) Hilse	<i>Fistulifera pelliculosa</i> (Brébisson) Lange-Bertalot	0.00	0.00	0.00	0.00

## CODE-RIVER-SITE-WATERSHED

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
NPNU		<i>Navicula perminuta</i> Grunow in Van Heurck		0.00	0.00	0.00	0.00
NPHY		<i>Navicula phyllepta</i> Kützing		0.00	0.00	0.00	0.00
NPTU	ANSS	<i>Navicula pseudotuscula</i> Hustedt	<i>Aneumastus stroesei</i> (Ostrup) Mann	0.00	0.00	0.00	0.00
NPUP	SPUP	<i>Navicula pupula</i> (Kützing) Mereschkowksy	<i>Sellaphora pupula</i> (Kützing) Mereschkowksy	0.00	0.00	0.00	0.00
NPYG	FPYG	<i>Navicula pygmaea</i> Kützing	<i>Fallacia pygmaea</i> (Kützing) Stickle & Mann	0.00	0.00	0.00	0.00
NRAD		<i>Navicula radiosa</i> Kützing		0.00	0.00	0.00	0.00
NRCS		<i>Navicula recens</i> (Lange-Bertalot) Lange-Bertalot		0.00	0.00	0.24	0.00
NRCH		<i>Navicula reichardtiana</i> Lange-Bertalot		0.00	0.00	0.72	0.49
NRHY		<i>Navicula rhynchocephala</i> Kützing		0.00	0.00	0.00	0.00
NRTD		<i>Navicula rotunda</i> Hustedt 1945		0.00	0.00	0.00	0.00
NSAL		<i>Navicula salinarum</i> Grunow in Cleve et Grunow		0.00	0.00	0.00	0.00
NSAP	FSAP	<i>Navicula saprophila</i> Lange-Bertalot & Bonik	<i>Fistulifera saprophila</i> (Lange-Bertalot & Bonik) Lange-Bertalot	0.00	68.82	45.65	0.98
NSAX	LSAX	<i>Navicula saxophila</i> Bock	<i>Luticola saxophila</i> (Bock ex Hustedt) D. G. Mann	0.00	0.00	0.00	0.00
NSHR		<i>Navicula schroeteri</i> Meister		0.00	0.00	0.00	0.00
NSEM	SSEM	<i>Navicula seminulum</i> (Grunow) D.G. Mann	<i>Sellaphora seminulum</i> (Grunow) D.G. Mann	0.00	5.04	0.00	1.47
NSOR	CHSO	<i>Navicula soehrensensis</i> Krasske	<i>Chamaepinnularia soehrensensis</i> (Krasske) Lange-Bertalot et Krammer	0.00	0.00	0.00	0.00
NSPD		<i>Navicula splendidula</i> Van Landingham		0.00	0.00	0.00	0.00
NSTR		<i>Navicula stroemii</i> (Hustedt) Mann		0.00	0.00	0.00	0.00
NSBN		<i>Navicula subalpina</i> Reichardt		0.00	0.00	0.00	0.00
NSBH	FSBH	<i>Navicula subhamulata</i> (Grunow in V. Heurck) D.G. Mann	<i>Fallacia subhamulata</i> (Grunow in V. Heurck) D.G. Mann	0.00	0.00	0.00	0.00
NSBM	ESBM	<i>Navicula subminuscule</i> Manguin	<i>Eolimna subminuscule</i> (Manguin) Moser Lange-Bertalot & Metzeltin	0.00	8.39	0.97	7.11
NSMU		<i>Navicula submuralis</i> Hustedt		0.00	0.00	0.00	0.00
NSBR		<i>Navicula subrotundata</i> Hustedt		0.00	0.00	0.00	0.00
NSSY		<i>Navicula symmetrica</i> Patric		0.00	0.00	0.00	0.00
NTPT		<i>Navicula tripunctata</i> (O.F.Müller) Bory		0.00	0.00	0.00	0.00
NTRV		<i>Navicula trivialis</i> Lange-Bertalot		0.48	0.00	0.00	0.00
NVEN		<i>Navicula veneta</i> Kützing		0.00	1.20	0.72	7.35
NNEO		<i>Navicula ventricosa</i> (Kützing) Mann		0.00	0.00	0.00	0.00
NVIP		<i>Navicula vilaplani</i> (Lange-Bertalot & Sabater) Lange-Bertalot & Sabater		0.00	0.00	0.00	0.00
NVIR		<i>Navicula viridula</i> (Kützing) Ehrenberg		0.00	0.00	0.00	0.00
NVRO		<i>Navicula viridula</i> (Kützing) Ehrenberg var. <i>rostellata</i> (Kützing) Cleve		0.00	0.00	0.24	0.00
NVIL		<i>Navicula viridula</i> (Kützing) Ehrnberg var. <i>linearis</i> Hustedt		0.00	0.00	0.00	0.00
NVGE	NGER	<i>Navicula viridula</i> var. <i>germanii</i> (Wallace) Lange-Bertalot	<i>Navicula germanii</i> Wallace	0.00	0.00	0.00	0.00
NACI		<i>Nitzschia acicularis</i> (Kützing) W.M.Smith		0.71	0.00	0.00	0.00
NACU		<i>Nitzschia acula</i> Hantzsch		0.00	0.00	0.00	0.00
NAMP		<i>Nitzschia amphibia</i> Grunow		0.48	0.00	0.48	0.00
NIAN	TANG	<i>Nitzschia angustata</i> W. M. Smith	<i>Tryblionella angustata</i> Wm Smith	0.00	0.00	0.00	0.00
NZAG		<i>Nitzschia angustatula</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NAPI	TAPI	<i>Nitzschia apiculata</i> (Gregory) Grunow	<i>Tryblionella apiculata</i> (Gregory) Grunow	0.00	0.00	0.24	0.00
NIAR		<i>Nitzschia archibaldii</i> Lange-Bertalot		5.00	0.00	0.00	0.00
NAUR		<i>Nitzschia aurariae</i> Cholnoky		0.00	0.00	0.24	0.00
NBRG		<i>Nitzschia bergii</i> Cleve-Euler		0.00	0.00	0.00	0.00
NBNO		<i>Nitzschia brunoi</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NICA	TCAL	<i>Nitzschia calida</i> Grunow	<i>Tryblionella calida</i> (Grunow in Cl. & Grun) D. G. Mann	0.00	0.00	0.00	0.00
NCPL		<i>Nitzschia capitellata</i> Hustedt		0.00	1.20	21.50	0.25
NCOM		<i>Nitzschia communis</i> Rabenhorst		0.00	0.00	0.00	0.00
NCOT		<i>Nitzschia constricta</i> (Kützing) Ralfs		0.00	0.00	0.00	0.00
NCRP		<i>Nitzschia curvipunctata</i> Cholnoky		0.00	0.00	0.00	0.00
NDLO		<i>Nitzschia delognei</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NDEN		<i>Nitzschia denticula</i> Grunow		0.00	0.00	0.00	0.00
NDES		<i>Nitzschia desertorum</i> Hustedt		0.00	0.96	2.90	0.98
NDIS		<i>Nitzschia dissipata</i> (Kützing) Grunow		1.90	0.00	0.00	0.25
NDIV		<i>Nitzschia diversa</i> Hustedt		0.00	0.00	0.00	0.00
NDRA		<i>Nitzschia draveillensis</i> Coste & Ricard		0.00	0.00	0.00	0.00
NDUB		<i>Nitzschia dubia</i> Smith		0.00	0.00	0.00	0.00
NFIL		<i>Nitzschia filiformis</i> (W.M.Smith) Van Heurck		0.00	0.00	0.00	0.00
NFIC		<i>Nitzschia filiformis</i> var. <i>conferta</i> (Richter) Lange-Bertalot		0.00	0.00	0.00	0.00
NFON		<i>Nitzschia fonticola</i> Grunow		0.24	0.00	0.00	0.00
NIFS		<i>Nitzschia fossilis</i> Grunow		0.00	0.00	0.00	0.00
NIFR		<i>Nitzschia frustulum</i> (Kützing) Grunow		0.00	1.44	1.45	13.73
NGES		<i>Nitzschia gessneri</i> Hustedt		1.90	0.00	0.00	0.00
NIGR		<i>Nitzschia gracilis</i> Hantzsch		0.00	0.00	0.00	0.00

## CODE-RIVER-SITE-WATERSHED

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037	J043
NHAN		<i>Nitzschia hantzschiana</i> Rabenhorst		0.00	0.00	0.00	0.00
NHEU		<i>Nitzschia heufferiana</i> Grunow		0.00	0.00	0.00	0.00
NIHU	THUN	<i>Nitzschia hungarica</i> (Grunow) D.G. Mann	<i>Tryblionella hungarica</i> (Grunow) D.G. Mann	0.00	0.00	0.00	0.00
NINC		<i>Nitzschia inconspicua</i> Grunow		0.00	0.24	0.00	1.47
NINT		<i>Nitzschia intermedia</i> Hantzsch ex Cleve & Grunow		0.00	0.00	0.00	0.00
NILA		<i>Nitzschia lacuum</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NLAV		<i>Nitzschia laevis</i> Hustedt		0.00	0.00	0.00	0.00
NLEI		<i>Nitzschia leistikowii</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NLSA		<i>Nitzschia levidensis</i> (W. Smith) Grunow var. <i>salinarum</i> Grunow in Van Heurck		0.00	0.00	0.00	0.00
NLVI	TVIC	<i>Nitzschia levidensis</i> (W. Smith) Grunow var. <i>victoriae</i> (Grunow) Cholnoky	<i>Tryblionella victoriae</i> Grunow	0.00	0.00	0.00	0.00
NLEV	TLEV	<i>Nitzschia levidensis</i> Wm. Smith	<i>Tryblionella levidensis</i> Wm. Smith	0.00	0.00	0.00	0.00
NLBT		<i>Nitzschia liebetruthii</i> Rabenhorst		0.00	0.00	0.00	0.00
NLSU		<i>Nitzschia linearis</i> (Agardh) Smith var. <i>subtilis</i> (Grunow) Hustedt		0.95	0.00	0.00	0.00
NLIN		<i>Nitzschia linearis</i> (Agardh) W.M. Smith		0.00	0.00	0.00	0.00
NNMIC		<i>Nitzschia microcephala</i> Grunow in Cleve & Moller		0.00	0.00	0.24	0.00
NNAN		<i>Nitzschia nana</i> Grunow		0.00	0.00	0.00	0.00
NPAL		<i>Nitzschia palea</i> (Kützing) W. Smith		2.62	3.60	21.01	58.82
NPAD		<i>Nitzschia palea</i> (Kützing) W. Smith var. <i>debilis</i> (Kützing) Grunow in Cl. & Grun.		0.00	0.00	0.00	0.00
NPAAE		<i>Nitzschia paleacea</i> (Grunow) Grunow in van Heurck		0.48	0.00	0.00	0.00
NIPF		<i>Nitzschia paleaeformis</i> Hustedt		0.00	0.00	0.00	0.00
NIPM		<i>Nitzschia perminuta</i> (Grunow) M. Peragallo		0.00	0.00	0.00	0.00
NIPU		<i>Nitzschia pusilla</i> (Kützing) Grunow		0.00	0.00	0.00	0.00
NREC		<i>Nitzschia recta</i> Hantzsch in Rabenhorst		0.00	0.00	0.00	0.00
NREV		<i>Nitzschia reversa</i> Smith		0.00	0.00	0.00	0.00
NSIG		<i>Nitzschia sigma</i> (Kützing) Smith		0.00	0.00	0.00	0.00
NSIO		<i>Nitzschia sigmoidea</i> (Nitzsch) W. Smith		0.00	0.00	0.00	0.00
NSDE	NSOL	<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>delognei</i> (Grunow) Lange-Bertalot	<i>Nitzschia solgensis</i> Cleve-Euler	0.00	0.00	0.00	0.00
NSIT		<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>tabellaria</i> Grunow		0.24	0.00	0.00	0.00
NSOC		<i>Nitzschia sociabilis</i> Hustedt		0.00	0.00	0.00	0.00
NSOL		<i>Nitzschia solgensis</i> Cleve-Euler		0.00	0.00	0.00	0.00
NISO		<i>Nitzschia solita</i> Hustedt		0.00	0.00	0.00	0.00
NSUA		<i>Nitzschia subacicularis</i> Hustedt		0.00	0.00	0.00	0.00
NSBC		<i>Nitzschia subcapitellata</i> Hustedt		0.00	0.00	0.00	0.00
NZSU		<i>Nitzschia supralitorea</i> Lange-Bertalot		0.00	0.00	0.00	0.00
NTHE		<i>Nitzschia thermaloides</i> Hustedt		0.00	0.00	0.00	0.00
NTUB		<i>Nitzschia tubicola</i> Grunow		0.00	0.00	0.00	0.00
NUMB		<i>Nitzschia umbonata</i> (Ehrenberg) Lange-Bertalot		0.00	0.00	0.00	0.00
PITM		<i>Pinnularia intermedia</i> (Lagerstedt) Cleve		0.00	0.00	0.00	0.00
PINT		<i>Pinnularia interrupta</i> W. M. Smith		0.00	0.00	0.00	0.00
PMIC		<i>Pinnularia microstauron</i> (Ehr.) Cleve		0.00	0.00	0.00	0.00
PPDG		<i>Pinnularia pseudogibba</i> Krammer		0.00	0.00	0.00	0.00
PLEV		<i>Pleurosira laevis</i> (Ehrenberg) Compère		0.00	0.00	0.00	0.00
RABB		<i>Rhoicosphenia abbreviata</i> (C. Agardh) Lange-Bertalot		0.00	0.00	0.00	0.00
SKPO		<i>Skeletonema potamos</i> (Weber) Hasle		0.00	0.00	0.00	0.00
SALP		<i>Stephanodiscus alpinus</i> Hustedt		0.00	0.00	0.00	0.00
SHTE		<i>Stephanodiscus hantzschii</i> f. <i>tenuis</i> (Hustedt) Hakansson & Stoermer		0.00	0.00	0.00	0.00
SHAN		<i>Stephanodiscus hantzschii</i> Grunow in Cl. & Grun. 1880		0.00	0.00	0.00	0.00
STMI		<i>Stephanodiscus minutulus</i> (Kützing) Cleve & Moller		0.00	0.00	0.00	0.00
SNEO		<i>Stephanodiscus neoastraea</i> Hakansson & Hickel		0.00	0.00	0.00	0.00
SANG		<i>Surirella angusta</i> Kützing		0.00	0.00	0.00	0.00
SBRE		<i>Surirella brebissonii</i> Krammer & Lange-Bertalot		0.00	0.24	0.24	0.00
SBPU		<i>Surirella brebissonii</i> Krammer & Lange-Bertalot var. <i>punctata</i> Krammer		0.00	0.00	0.00	0.00
SBKU		<i>Surirella brebissonii</i> var. <i>kuetzingii</i> Krammer & Lange-Bertalot		0.00	0.00	0.00	0.00
SBRI		<i>Surirella brightwellii</i> W. Smith		0.00	0.00	0.00	0.00
SCRU		<i>Surirella crumena</i> Brébisson ex Kützing		0.00	0.00	0.00	0.00
SLIN		<i>Surirella linearis</i> W. M. Smith		0.00	0.00	0.00	0.00
SUMI		<i>Surirella minuta</i> Brébisson		0.00	0.00	0.00	0.00
SOVI		<i>Surirella ovalis</i> Brébisson		0.00	0.00	0.00	0.00
SSSA		<i>Surirella subsalsa</i> W. Smith		0.00	0.00	0.00	0.00
TPSN		<i>Thalassiosira pseudonana</i> Halse et Heimdal		0.00	0.00	0.00	0.00
TWEI		<i>Thalassiosira weissflogii</i> (Grunow) Fryxell & Hasle		0.00	0.00	0.00	0.00

ACRONYMS	J048	J069	J075	J082	J086	J088	N16	N19	N4	N23	C223	C229	C231	C232	E097
	Besòs	Besòs	Ripoll	Tenes	Caldes	Congost	Caldes	Vall d'Horta	Rossinyol	Daró	Ondara	Segre	Segre	Noguera Pallaresa	Noguera Ribagorçana
	Barcelona	Montmeló	Castellar del Vallès	Mollet del Vallès	Caldes de Montbui	Balenya	Gallifa	Can Brossa	Sant Miquel del Fai	Gualta	Vilagrassa	La Seu d'Urgell	Ponts	Esterrri d'Àneu	Pinyana (Alfarràs)
	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Daró	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
ABIA	0.00	0.00	0.00	0.00	1.69	0.00	0.00	1.19	0.00	0.00	0.00	24.08	0.00	4.88	7.51
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.24	0.00	0.21	0.00	0.00	4.30	1.97	0.00	0.46	0.00	0.00	0.00	0.00
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	0.00	0.00	0.24	0.00	41.53	21.98	11.96	19.09	0.49	4.00	0.23	0.74	0.23	26.48	40.44
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.66
ACTT	0.00	0.00	0.00	0.00	25.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	0.25	0.00	0.00	0.85	0.00	0.00	0.48	51.11	0.25	0.00	2.46	0.45	0.51	0.00
AVEN	0.25	0.00	0.24	0.00	0.21	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADJA	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	3.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.24	0.00	0.50	0.00	0.25	0.91	0.00	0.00
CPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.98	0.23	1.80	0.00













ACRONYMS	E121	E207	E219	J010	J032	J057	J164	L020	L021	N1	N11	N13	N14
	Ebre	Segre	Segre	Noguera Ribagorçana	Garona	Ebre	Noguera Pallaresa	Noguera Ribagorçana	Noguera de Tor	Segre	Matarranya	Matarranya	Matarranya
	Flix	Térmens	Torres del Segre	El Pont de Suert	Canejan	Campredò	Sort	Senet	Balneari de Boí	Aiguabarreig- Granja d'Escarp	Besseit	Parrissal	Parrissal (Gubies)
	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
ABIA	0.00	0.00	1.59	46.75	3.21	0.00	35.81	30.44	0.49	1.73	4.49	4.99	18.49
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
ALFR	0.00	0.00	1.36	0.00	0.25	0.26	0.00	0.00	0.49	0.50	0.00	0.00	0.00
ALAN	0.00	18.90	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	2.73	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	0.74	0.87	6.36	19.50	70.86	0.26	18.92	50.35	9.88	0.25	55.28	68.33	62.56
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	5.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
ALIB	1.72	0.00	0.23	0.00	0.00	2.56	0.00	0.00	0.00	0.00	0.22	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.25	0.87	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	45.45	20.93	7.95	0.00	0.00	11.51	0.34	0.00	3.70	2.97	0.00	0.00	0.23
AVEN	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	1.73	0.00	0.00	0.00	0.00	0.00	0.22	0.22	0.23
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.25	2.03	0.45	0.25	0.00	0.51	0.00	0.00	0.25	0.99	0.22	0.00	0.00
CPLA	0.00	1.74	0.00	0.50	0.49	0.00	2.36	0.00	0.00	0.00	0.00	0.00	0.00













ACRONYMS	N15	N2	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46
	Noguera Ribagorçana	Siurana	Llobregós	Cadi	Llobregós	Sió	Fontanet	Segre	Valira	Noguera de Cardós	Noguera de Vallferrera	Flamicell
	Pont de Montanyana	La Febró	Castellfollit de Riubregós	Cava	Ponts	La Sentiu de Sió	Organyà	Artesa de Segre	La Seu d'Urgell	Lladorre	Alins	Lluçà
	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
ABIA	4.68	0.00	0.00	70.18	0.90	0.00	2.81	0.00	4.12	5.99	13.33	79.37
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.87	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAN	0.00	0.00	0.24	0.00	0.00	0.00	1.53	1.48	0.00	0.50	0.53	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	20.14	70.00	76.32	0.00	0.60	1.00	15.82	0.59	13.74	28.93	30.93	1.21
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	5.01	0.60	1.99	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	5.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.24	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00
APED	0.00	0.50	1.67	0.00	2.70	2.66	4.08	15.68	6.59	0.25	0.00	0.00
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADJA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.47	0.75	0.00	0.25	0.00	0.66	4.34	0.30	0.00	0.00	0.00	0.24
CPLA	0.00	0.00	1.20	0.00	0.00	0.00	11.73	0.30	1.37	0.00	0.53	0.49

ACRONYMS	N15	N2	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46
CPLE	0.00	0.75	0.00	0.00	1.80	3.99	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	12.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CKUT	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.24	0.00	0.60	0.66	0.00	0.30	0.00	0.00	0.00	0.00
COCE	0.00	0.00	0.48	0.00	1.20	1.33	0.00	0.00	0.00	0.00	0.00	0.00
CPOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CWUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSOL	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00
CAFF	1.17	2.50	1.20	4.76	0.00	0.00	9.69	0.59	0.00	0.00	0.00	5.58
CAPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCAЕ	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00
CCES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDEL	0.00	0.00	0.00	6.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
CDES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CFAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHEL	0.23	0.00	0.00	0.00	0.00	0.00	1.79	0.00	0.00	0.00	0.00	0.00
CLAC	1.17	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIC	7.03	6.50	3.83	4.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73
CMIN	0.00	0.00	0.00	0.75	0.00	2.33	7.65	0.30	17.58	12.47	15.73	0.73
CNAV	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COBS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPRO	2.34	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00
CSIN	1.17	0.00	0.00	0.00	0.30	0.00	0.00	0.00	9.62	1.00	0.27	0.24
CSAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CTUM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CTLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CTGL	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DKUE	0.00	0.00	3.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DSUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DTEN	0.23	0.00	0.00	1.25	0.00	0.00	1.28	0.00	0.00	0.00	0.00	0.00
DEHR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DMES	0.00	0.00	0.00	0.00	0.00	0.00	1.28	0.00	0.00	0.50	2.40	0.00
DMON	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DITE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.27	0.00
DVLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
DELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	0.00	1.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOVA	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DPET	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EARE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EADN	0.00	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EARC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EBIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00

ACRONYMS	N15	N2	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46
EEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FARC	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	1.37	13.47	25.87	0.00
FBCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBID	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00
FCPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCAP	0.00	0.00	0.00	3.01	0.00	0.00	4.34	0.00	0.00	0.00	0.53	0.73
FCAU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCGR	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	20.95	1.87	0.00
FCVA	0.23	0.00	0.00	0.00	0.00	0.33	8.42	0.00	0.82	0.00	0.27	0.73
FCAH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCPE	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.00
FCVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00
FDEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FDIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FFAS	0.00	0.00	0.24	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FNAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPSC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPUL	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FROB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FUAC	0.00	0.00	0.24	0.00	0.00	0.00	2.04	0.30	0.00	0.00	0.00	0.00
FULN	0.00	1.25	0.00	0.00	0.00	0.00	1.28	2.66	0.00	0.00	0.00	0.73
FSPI	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
GACU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GAMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GANG	0.00	0.00	0.00	0.00	0.00	0.33	0.26	0.30	0.00	1.50	1.07	0.00
GANT	0.00	0.00	0.00	0.00	0.30	0.00	0.77	0.00	0.00	0.00	0.00	0.00
GAUG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00
GBAV	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GBOH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GDIC	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GEMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GLAT	0.00	0.00	1.44	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIN	0.00	0.00	0.00	0.75	0.30	0.00	0.00	0.00	0.00	1.00	0.53	0.00
GOUCU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOLI	0.70	0.00	0.00	0.00	0.30	0.00	0.00	0.30	0.27	1.50	0.00	0.24
GPAR	0.23	0.00	0.48	0.00	0.30	0.00	0.00	1.18	0.55	0.00	0.00	0.00
GPXS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.97	0.53	0.00
GPSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	0.47	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.49
GTER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GTRU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GYAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48	0.00	0.00	0.00	0.00

ACRONYMS	N15	N2	N37	N38	N39	N40	N41	N42	N43	N44	N45	N46
GYAT	0.23	0.00	0.00	0.00	0.00	2.66	0.00	0.00	0.00	0.00	0.00	0.00
GNOD	0.00	0.00	0.00	0.00	1.20	2.66	0.00	0.00	0.00	0.00	0.00	0.00
GYPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MSMI	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MLIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MMON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MVAR	0.00	0.00	0.00	0.00	0.90	0.66	0.00	1.48	0.00	0.00	0.00	0.00
MCIR	0.00	0.00	0.00	0.00	0.00	0.00	17.86	0.00	0.00	0.00	0.00	0.00
NACO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAMB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NATO	0.00	0.00	0.00	0.00	0.00	2.33	0.00	0.59	1.37	0.00	0.00	0.00
NAPE	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBAC	0.00	0.00	0.00	0.00	0.00	0.33	0.00	1.18	0.00	0.00	0.00	0.00
NBRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCPR	0.00	0.00	0.00	0.00	0.90	1.00	0.00	4.14	0.00	0.00	0.00	0.00
NCAR	0.00	0.00	0.00	0.00	10.21	3.65	0.00	0.00	1.10	0.00	0.00	0.00
NCTG	0.00	0.00	0.00	0.00	0.90	3.65	0.00	0.00	0.00	0.00	0.00	0.00
NCTV	10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCIN	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00
NCOF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCRY	0.00	0.00	0.00	0.00	0.30	0.33	0.00	0.00	0.00	0.00	0.00	0.00
NCFA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCTE	0.47	1.00	1.91	0.25	4.80	6.64	1.79	3.85	0.55	0.00	0.00	0.49
NCUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEDG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NERI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	0.47	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHAL	0.00	0.00	0.00	0.00	2.70	8.97	0.00	0.00	0.00	0.00	0.00	0.00
NHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NINO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NICT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NINS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NKOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLAN	0.00	0.00	0.00	0.00	0.30	0.66	0.00	0.00	0.00	0.00	0.00	0.00
NLAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMGL	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEG	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.27	0.00	0.00	0.00
NMUP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48	1.65	0.00	0.00	0.00
NMCA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMDG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIN	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMMU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMLF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMOM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNIV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOPU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPEL	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.82	0.00	0.00	0.00







ACRONYMS	N47	N48	F0	J011	J013	J016	J040	J070	J104	J105	N24	N25	N26	N27
	Noguera Pallaresa	Noguera Pallaresa	Fluvià	Fluvià	Fluvià	Fluvià	Ser	Bianya	Turonell	Ridaura	Gurn	Joanetes	Llierca	Ponç
	La Pobla de Segur	Alòs d'Isil	Hostalets d'en Bas	St. Pere Pescador	Olot	Esponellà	Serinyà	St. Joan les Fonts	Castellfollit de la Roca	Llocalou	St. Privat d'en Bas	Joanetes	Pont de Llierca	St. Salvador de Bianya
	Ebre/Segre	Ebre/Segre	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià
ABIA	60.40	10.85	9.95	0.00	0.24	0.00	0.00	0.00	0.00	0.00	4.15	4.90	1.00	0.50
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAN	0.00	0.00	1.24	0.24	2.14	1.24	0.00	0.49	8.50	1.45	0.00	0.98	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	3.58	55.29	38.06	8.03	7.38	30.52	53.66	9.09	1.00	1.20	46.83	73.77	5.00	5.50
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	2.74	0.00	3.81	0.50	0.00	0.98	0.00	0.00	15.61	0.49	0.00	0.00
ALIB	0.00	0.00	0.00	0.24	1.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.24	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.24	0.25	0.24	0.25	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.45	0.79	1.99	1.46	13.81	6.95	0.47	5.16	0.00	0.96	8.78	0.49	0.00	0.00
AVEN	0.00	0.00	0.00	3.89	0.00	1.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	1.95	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.50	0.00	0.71	0.00	0.47	0.25	0.00	0.00	0.98	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	1.99	0.49	1.43	0.74	1.42	7.37	0.00	0.00	0.98	2.45	0.00	0.00
CPLA	0.00	1.59	9.95	0.00	5.00	0.25	0.00	0.00	10.25	0.00	8.29	0.00	0.00	91.75

























ACRONYMS	J001	J002	J003	J004	J005	J006	J023	J025	J031	J045	J046	J051	J065	J074
	Cardener	Cardener	Anoia	Anoia	Llobregat	Merlès	Llobregat	Cardener	Llobregat	Aiguadora	Llobregat	Castelloi	Carme	Anoia
	Cardona	Manresa	Vilanova del Camí	Sant Sadurní d'Anoia	Martorell	Santa Maria	Castellbell	Olius	El Pont de Vilomara	Cardona	El Prat de Llobregat	Vilanova del Camí	La Pobla de Claramunt	Martorell
	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
ABIA	0.00	0.00	0.00	0.00	0.25	0.49	0.00	13.87	0.00	4.90	0.00	0.00	0.00	0.00
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.21	2.77	0.36	0.23	1.23	0.74	0.00	0.00	0.48	0.00	0.00	0.24	0.45	0.00
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.25	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	6.89	0.23	0.00	0.00	1.23	12.99	0.71	69.34	0.48	26.47	0.00	1.20	0.45	0.00
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.87	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.48	0.23	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24	0.45	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	5.43	0.00	0.00	0.00	0.49	2.45	1.67	1.46	2.17	1.72	0.00	0.48	3.85	0.00
AVEN	0.21	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.23	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.84	0.00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.21	0.00	0.00	0.00	0.00	0.25	0.71	0.24	0.00	0.00	0.00	0.00	0.00	0.00
CPLA	0.00	1.39	0.00	0.00	0.25	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00









ACRONYMS	J001	J002	J003	J004	J005	J006	J023	J025	J031	J045	J046	J051	J065	J074
NPNU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPHY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPTU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPUP	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPYG	0.00	0.23	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
NRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
NRCS	0.42	2.08	0.18	0.00	10.59	0.00	10.00	0.00	0.97	0.25	0.00	0.00	0.00	0.93
NRCH	0.84	0.00	0.18	0.23	0.00	1.23	0.71	0.00	0.72	0.00	0.48	0.00	0.45	0.00
NRHY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRTD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSAP	0.21	52.42	0.18	0.00	3.45	0.00	0.48	0.00	2.66	0.00	0.00	0.00	0.00	2.80
NSAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSHR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSEM	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSTR	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00
NSBH	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.24	0.00	0.00	0.00	0.00	0.00
NSBM	0.21	3.46	2.89	0.00	5.67	0.00	0.48	0.00	5.07	0.00	0.97	0.00	0.90	24.01
NSMU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
NSSY	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.48	0.00	0.00	14.63	1.36	0.00
NTPT	0.63	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.24	0.00	0.00	0.00	3.85	0.00
NTRV	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.23	0.00
NVEN	1.04	0.92	8.66	1.64	8.87	0.98	0.24	0.00	4.11	0.00	1.45	5.76	1.36	6.06
NNEO	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVIP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00
NVIR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVRO	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.48	2.49	0.00
NVIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVGE	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
NACI	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACU	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.23	0.00
NAMP	5.01	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.48	0.00	0.00	0.00	0.23	0.00
NIAN	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZAG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPI	0.00	0.00	0.72	0.23	0.25	0.00	0.24	0.00	0.00	0.00	1.93	0.24	2.71	0.00
NIAR	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAUR	0.00	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90	0.96	0.00	0.00
NBRG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBNO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NICA	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.48	0.23	0.00
NCPL	0.42	0.00	9.93	83.41	2.71	0.00	0.48	0.00	0.97	0.00	10.87	1.68	10.41	33.80
NCOM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCRP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDLO	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	2.45	0.00	0.00	0.00	0.00
NDES	0.00	0.00	6.32	0.23	0.49	0.00	0.24	0.00	1.21	0.00	3.62	1.20	12.90	0.47
NDIS	49.06	0.00	0.00	0.00	0.00	0.98	1.43	0.00	0.97	0.00	0.24	0.96	3.62	0.00
NDIV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.96	0.00	0.00
NFIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFON	2.92	0.00	0.00	0.00	0.00	2.70	0.48	0.00	0.00	0.49	0.00	0.00	0.90	0.00
NIFS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIFR	0.42	0.00	52.17	0.70	38.92	0.49	57.62	0.00	0.00	0.00	1.21	0.00	0.00	0.00
NGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.72	0.00	0.00	0.00	0.00
NIGR	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00	0.00

















ACRONYMS	J052	J100	J101	J103	N29	N30	N31	J014	N17	C033	C034	C304
	Muga	Llobregat de la Muga	Muga	Àiguema	Muga	Muga	Orlina	Riudecanyes	Riudecanyes	Ges	Major	Brugent
	Castelló d'Empúries	Peralada	Vilanova de la Muga	Sta. Llogaia d'Àiguema	Albanyà	St Llorenç de la Muga	Rabós	Duesaigües	Riudecanyes	St. Pere de Torelló	St. Sadurní d'Osormort	Amer
	Muga	Muga	Muga	Muga	Muga	Muga	Muga	Riudecanyes	Riudecanyes	Ter	Ter	Ter
ABIA	0.00	0.00	0.58	0.00	2.34	2.37	0.57	0.00	0.46	0.99	0.00	0.00
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	1.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	3.14	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.23	0.00	0.00	0.00
ALAN	0.00	3.59	4.83	4.02	0.00	0.00	0.00	0.00	0.00	0.00	1.26	1.23
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	0.39	8.01	6.37	5.48	8.38	41.81	2.86	2.45	21.94	53.35	4.52	0.49
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	10.88	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	0.00	2.51	3.11	0.00	0.39	0.00	30.88	0.69	0.25	14.32	5.93
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	5.85	0.00	0.00	0.00	0.00	0.25	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	2.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.23	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	3.86	15.90	0.00	0.00	0.00	0.74	0.23	0.00	0.25	0.00
CPLA	1.57	0.55	3.86	16.09	0.39	0.00	14.50	0.00	0.00	0.25	23.12	0.74









ACRONYMS	J052	J100	J101	J103	N29	N30	N31	J014	N17	C033	C034	C304
NHAN	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIHU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NINC	0.00	1.10	0.39	0.00	0.58	0.00	8.97	0.00	0.69	0.00	3.52	0.74
NINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.25	0.00
NILA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.46	0.50	0.00	0.00
NLAV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLBT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLIN	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIC	0.00	1.93	0.39	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
NNAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAL	5.11	0.00	2.12	0.00	0.58	0.00	1.53	0.49	4.16	0.25	0.50	0.00
NPAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAE	0.00	0.00	0.97	0.00	0.00	0.00	0.38	0.00	0.00	0.25	0.00	0.00
NIPF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPU	0.00	0.00	0.39	0.00	0.00	0.00	0.38	0.00	0.46	0.00	0.00	0.00
NREC	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NREV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
NSOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NISO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSUA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUMB	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PITM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PPDG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RABB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	30.40	0.25
SKPO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SALP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SNEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SANG	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.00	0.00	0.00
SBPU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBKU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCRU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SLIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SSSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TPSN	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TWEI	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00

ACRONYMS	C305	C306	J019	J020	J021	J028	J034	J053	J054	J060	J072	J091	J110	J112	N32	N33
	Osor	Llémena	Ter	Onyar	Freser	Terri	Ter	Ter	Ter	Ter	Ter	Ges	Ter	Ter	Mèder	Freser
	Aigües amunt Anglès	St. Gregori	Roda de Ter	Quart	Ripoll	St. Julià de Ramis	Torelló	Torroella de Montgrí	St. Julià de Ramis	El Pasteral	Abans Ripoll	Torelló	Bescanó	Façà	Sta. Eulàlia de Riuprimer	Planoles
	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter
ABIA	0.00	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABSA	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.25	0.25	0.00	0.00	0.25	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.74	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.72	1.98	0.00	0.00	0.00	0.25	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAN	14.22	0.74	0.00	1.00	0.00	8.75	0.00	0.24	6.42	0.98	1.04	0.50	4.71	0.98	6.95	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	80.64	19.06	10.95	0.00	51.39	0.00	7.41	0.48	3.95	2.21	12.99	18.41	2.73	0.00	2.98	11.38
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.74	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.50	0.25	0.00	0.00	0.00	3.46	0.24	0.49	0.00	3.38	0.25	0.00	0.00	0.00	0.24
ALIB	0.00	0.00	0.25	0.00	0.00	0.50	0.00	0.00	0.25	0.74	0.00	0.00	1.49	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	4.95	7.46	0.00	0.69	16.50	9.14	2.63	2.22	7.11	1.56	2.49	9.68	0.73	0.50	0.24
AVEN	0.00	0.50	0.00	0.00	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.25	0.00	0.00	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
CPED	0.00	1.73	5.97	0.00	0.69	1.00	0.00	0.24	0.74	0.25	0.78	7.71	0.25	0.73	0.00	0.00
CPLA	0.25	0.00	0.00	0.25	0.23	5.00	1.23	0.24	0.25	0.74	0.00	0.00	5.71	1.96	2.48	0.00













ACRONYMS	N34	N35	N36	Te0	J026	J062	J066	J083	J115	J124	N20	N21	N22	T0
	Solana	Merdàs	Ritort	Ter	Tordera	Tordera	Arbúcies	Tordera	Breda	Vallgorguina	Santa Coloma	Santa Coloma	Fuïrosos	Tordera
	St. Quirze de Besora	Gombrèn	Molló	Setcases	Piscines Montseny	Fogars de Tordera	Hostalric	St. Celoni	Aigües avall Breda	St. Celoni	Pont de les Fosses	Parc St. Salvador	Gualba	Les Illes
	Ter	Ter	Ter	Ter	Tordera	Tordera	Tordera	Tordera	Tordera	Tordera	Tordera	Tordera	Tordera	Tordera
ABIA	0.00	0.00	0.24	0.00	0.57	0.00	0.00	0.00	0.00	0.40	2.14	0.55	16.08	0.00
ABSA	0.00	0.00	0.00	0.00	2.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.11
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.39	0.37	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.59	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.24	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.57	2.12	3.66	1.88	3.04	33.40	0.58	3.11	0.00	0.00
ALAN	0.49	0.24	0.73	0.75	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	12.02
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	1.16	0.00	0.00	5.34	0.39	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	16.63	16.34	9.20	25.88	16.79	0.00	0.58	0.00	0.00	0.40	1.56	4.95	0.00	9.09
AMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASAT	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACTT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASTB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AALA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	1.22	0.24	0.00	0.00	0.00	0.39	0.00	0.40	0.00	1.95	0.92	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.40	0.00	0.00	0.37	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00
AOVA	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	1.01	0.00
APED	2.44	11.71	0.48	0.75	0.38	0.00	2.50	0.00	0.00	0.59	3.90	4.03	0.00	1.47
AVEN	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AGAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	3.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUDI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00
CBRD	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.38	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.24	0.73	0.00	0.25	0.00	0.00	3.66	0.00	12.96	0.00	0.58	2.38	0.00	0.59
CPLA	0.00	0.24	0.00	0.50	6.42	0.58	15.99	0.94	18.42	0.00	17.54	27.66	10.30	25.22













## **SPRING 2003**

Diatom data corresponding to spring (May-June) 2003 for  
the 152 stream and river sites in NE Iberian Peninsula.



## CODE-RIVER-SITE-WATERSHED

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
				Avencó	Mogent	Congost
				Aiguafreda	Montornès del Vallès	La Garriga
				Besòs	Besòs	Besòs
ABIA	ADBI	<i>Achnanthes biasoletiana</i> Grunow	<i>Achnantheidium biasoletianum</i> (Grunow in Cl. & Grun.) Round & Bukhtiyarova	0.00	0.00	0.00
ABSA	ADSU	<i>Achnanthes biasoletiana</i> Grunow var. <i>subatomus</i> Lange-Bertalot	<i>Achnantheidium subatomus</i> (Hustedt) Lange-Bertalot	0.00	0.00	0.00
ABIO	PBIO	<i>Achnanthes bioretii</i> Germain	<i>Psammothidium bioretii</i> (Germain) Bukhtiyarova	0.00	0.00	0.00
ACLE	KCLE	<i>Achnanthes clevei</i> Grunow	<i>Karayevia clevei</i> (Grun. in Cl. & Grun.) Round & Bukhtiyarova	0.00	0.00	0.00
ACBO		<i>Achnanthes clevei</i> Grunow var. <i>bottnica</i> Cleve		0.00	0.00	0.00
ADAO		<i>Achnanthes daonensis</i> Lange-Bertalot		0.00	0.00	0.00
ADEL	PTDE	<i>Achnanthes delicatula</i> (Kütz.) Grun	<i>Planothidium delicatulum</i> (Kütz.) Round & Bukhtiyarova	0.00	0.00	0.00
AEXG		<i>Achnanthes exigua</i> Grunow in Cl. & Grunow		0.00	0.00	0.00
AEEL		<i>Achnanthes exigua</i> Grunow var. <i>elliptica</i> Husted		0.00	0.00	0.00
AFLE		<i>Achnanthes flexella</i> (Kützing) Brun		0.00	0.00	0.00
AHEL	PHEL	<i>Achnanthes helvetica</i> (Hustedt) Lange-Bertalot	<i>Psammothidium helveticum</i> (Husted) Bukhtiyarova et Round	0.00	0.00	0.00
AHUN	LHUN	<i>Achnanthes hungarica</i> in Cleve et Grun.	<i>Lemnicola hungarica</i> (Grunow) Round & Basson	0.00	0.00	0.00
AKOL	KKOL	<i>Achnanthes kolbei</i> Hustedt	<i>Kolbesia kolbei</i> (Hust.) Round & Bukhtiyanova	0.00	0.00	0.00
ALVS	EULA	<i>Achnanthes laevis</i> Oestrup	<i>Eucocconeis laevis</i> (Oestrup) Lange-Bertalot	0.00	0.00	0.00
ALFR	PLFR	<i>Achnanthes lanceolata</i> (Breb.) Grun. ssp. <i>frequentissima</i> Lange-Bertalot	<i>Planothidium frequentissimum</i> (Lange-Bertalot) Round & Bukhtiyarova	0.00	0.00	0.20
ALAN	PTLA	<i>Achnanthes lanceolata</i> (Breb.) Grunow	<i>Planothidium lanceolatum</i> (Breb.) Round & Bukhtiyanova	0.00	0.00	0.00
ALAE	PTEL	<i>Achnanthes lanceolata</i> (Breb.) Grunow var. <i>elliptica</i> Cleve	<i>Planothidium ellipticum</i> (Cl.) Round & Bukhtiyanova	0.00	0.00	0.00
ALAR	PRST	<i>Achnanthes lanceolata</i> var. <i>rostrata</i> (Oestrup) Lange-Bertalot	<i>Planothidium rostratum</i> (Oestrup) Lange-Bertalot	0.00	0.00	0.00
ALAT	KALA	<i>Achnanthes laterostrata</i> Husted	<i>Karayevia laterostrata</i> (Hust.) Round & Bukht.	0.00	0.00	0.00
AMAR	PMRG	<i>Achnanthes marginulata</i> Grunow in Cleve & Grun.	<i>Psammothidium marginulatum</i> (Grun) Bukht. & Round	0.00	0.00	0.00
AMIN	ADMI	<i>Achnanthes minutissima</i> Kützing	<i>Achnantheidium minutissimum</i> (Kütz.) Czarnecki	37.76	0.00	0.00
AOBG		<i>Achnanthes oblongella</i> Oestrup		0.00	0.00	0.00
APLO	KPLO	<i>Achnanthes ploenensis</i> (Hust.) Kingston	<i>Kolbesia ploenensis</i> (Hust.) Kingston	0.00	0.00	0.00
ATRI		<i>Achnanthes trinodis</i> (W. Sm.) Grunow		0.00	0.00	0.00
ADCT		<i>Achnantheidium catenatum</i> (Bily & Marvan) Lange-Bertalot		0.00	0.00	0.00
APEL		<i>Amphipleura pellucida</i> Kützing		0.23	0.00	0.00
AINA		<i>Amphora inariensis</i> Krammer		0.00	0.00	0.00
ALIB	ACOP	<i>Amphora libyca</i> Ehr.	<i>Amphora copulata</i> (Kützing) Schoeman & Archibald	0.00	0.00	0.00
AMMO		<i>Amphora montana</i> Krasske		0.00	0.00	0.00
AOVA		<i>Amphora ovalis</i> (Kützing) Kützing		0.00	0.00	0.00
APED		<i>Amphora pediculus</i> (Kützing) Grunow		0.00	0.00	0.00
AVEN		<i>Amphora veneta</i> Kützing		0.23	0.00	0.39
ANBR	BNEO	<i>Anomoeoneis brackysira</i> (Brébisson in Rabenhorst) Grunow in Cleve	<i>Brachysira neoexilis</i> Lange-Bertalot	0.00	0.00	0.00
ASPH		<i>Anomoeoneis sphaerophora</i> (Ehr.) Pfitzer		0.00	0.00	0.00
AVIT	BVIT	<i>Anomoeoneis vitrea</i> (Grunow) Ross	<i>Brachysira vitrea</i> (Grunow) Ross in Hartley	0.00	0.00	0.00
AUGR		<i>Aulacoseira granulata</i> (Ehr.) Simonsen		0.00	0.00	0.00
BPAR	BPAX	<i>Bacillaria paradoxa</i> Gmelin	<i>Bacillaria paxillifera</i> (O.F. Müller) Henedy	0.00	0.00	0.00
CAPS		<i>Caloneis alpestris</i> (Grunow) Cleve		0.00	0.00	0.00
CBAC		<i>Caloneis bacillum</i> (Grunow) Cleve		0.00	0.00	0.00
CATE		<i>Caloneis tenuis</i> (Gregory) Krammer		0.00	0.00	0.00
CPED		<i>Cocconeis pediculus</i> Ehrenberg		0.23	0.00	0.20
CPLA		<i>Cocconeis placentula</i> Ehrenberg		0.00	0.00	0.00
CPLE		<i>Cocconeis placentula</i> Ehrenberg var. <i>euglypta</i> (Ehr.) Grunow		0.00	0.00	0.00
CPLI		<i>Cocconeis placentula</i> Ehrenberg var. <i>lineata</i> (Ehr.) Van Heurck		0.47	0.00	0.20
CPPL	COPL	<i>Cocconeis placentula</i> Ehrenberg var. <i>pseudolineata</i> Geitler	<i>Cocconeis pseudolineata</i> (Geitler) Lange-Bertalot	0.00	0.00	0.00
CDUB		<i>Cyclostephanos dubius</i> (Fricke) Round		0.00	0.00	0.00
CINV		<i>Cyclostephanos invisitatus</i> (Hohn & Helleman) Theriot Stoermer & Hakansson		0.00	0.00	0.00
CATO		<i>Cyclotella atomus</i> Hustedt		0.00	0.00	0.00
CBOL		<i>Cyclotella bodanica</i> Grunow var. aff. <i>lemanica</i> (O. Muller ex Schroter) Bachman		0.00	0.00	0.00
CCMS		<i>Cyclotella comensis</i> Grunow in Van Heurck		0.00	0.00	0.00
CCCP		<i>Cyclotella cyclopuncta</i> Hakansson & Carter		0.00	0.00	0.00
CDTG		<i>Cyclotella distinguenda</i> Hustedt		0.00	0.00	0.00
CMEN		<i>Cyclotella meneghiniana</i> Kützing		0.00	0.00	0.00

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
COCE		<i>Cyclotella ocellata</i> Pantocsek		0.00	0.00	0.00
CPST	DPST	<i>Cyclotella pseudostelligera</i> Hustedt	<i>Discostella pseudostelligera</i> (Hustedt) Houk. et Klee	0.00	0.00	0.00
CRAD		<i>Cyclotella radiosa</i> (Grunow) Lemmermann		0.00	0.00	0.00
CTRI		<i>Cyclotella tripartita</i> Hakansson		0.00	0.00	0.00
CWUE		<i>Cyclotella wuethrichiana</i> Druart & Straub		0.00	0.00	0.00
CELL		<i>Cymatopleura elliptica</i> (Brébisson) W.Smith		0.00	0.00	0.00
CSAP		<i>Cymatopleura solea</i> (Brébisson) W. Smith var. <i>apiculata</i> (W. Smith) Raifs		0.00	0.00	0.00
CSOL		<i>Cymatopleura solea</i> (Brébisson) W.Smith		0.00	0.00	0.00
CAFF		<i>Cymbella affinis</i> Kützing	<i>Cymbella</i> gr. <i>excisa/parva</i>	0.00	0.00	0.00
CAPH	CBAM	<i>Cymbella amphicephala</i> Naegeli	<i>Cymbopleura amphicephala</i> (Naegeli) Krammer	0.00	0.00	0.00
CASP		<i>Cymbella aspera</i> (Ehr.) Cleve		0.00	0.00	0.00
CAUE		<i>Cymbella austriaca</i> Grunow var. <i>erdoebenyiana</i> (Pantocsek) Krammer		0.00	0.00	0.00
CCAE	ECAE	<i>Cymbella caespitosa</i> (Kützing) Brun	<i>Encyonema caespitosum</i> Kützing	0.00	0.00	0.00
CCES	ECES	<i>Cymbella cesatii</i> (Rabenhorst) Krammer	<i>Encyonopsis cesatii</i> (Rabenhorst) Krammer	0.00	0.00	0.00
CCIS		<i>Cymbella cistula</i> (Ehrenberg) Kirchner		0.00	0.00	0.00
CDEL	DDEL	<i>Cymbella delicatula</i> Kützing	<i>Delicata delicatula</i> (Kützing) Krammer	0.00	0.00	0.00
CELG	EELG	<i>Cymbella elginensis</i> Krammer	<i>Encyonema elginense</i> (Krammer) D. G. Mann	0.00	0.00	0.00
CHEL		<i>Cymbella helvetica</i> Kützing	<i>Cymbella</i> gr. <i>helvetica</i>	0.00	0.00	0.00
CINC		<i>Cymbella incerta</i> (Grunow) Cleve		0.00	0.00	0.00
CLAC	ELAC	<i>Cymbella lacustris</i> (Agardh) F.W.Mills	<i>Encyonema lacustre</i> (Agardh) F.W.Mills	0.00	0.00	0.00
CLAE		<i>Cymbella laevis</i> Naegeli in Kützing 1849		0.00	0.00	0.00
CLAN		<i>Cymbella lanceolata</i> (Ehrenb.) Kirchner		0.00	0.00	0.00
CMIC	ENCM	<i>Cymbella microcephala</i> Grunow	<i>Encyonopsis microcephala</i> (Grunow) Krammer	0.23	0.00	0.00
CMIN	ENMI	<i>Cymbella minuta</i> Hilse ex Rabenhorst	<i>Encyonema minutum</i> (Hilse in Rabh.) D.G. Mann	1.63	0.00	0.00
CMUE	ENMU	<i>Cymbella muellerii</i> Hustedt	<i>Encyonema muelleri</i> (Husted) D. G. Mann	0.00	0.00	0.00
CNAV	CBNA	<i>Cymbella naviculiformis</i> Auerswald	<i>Cymbopleura naviculiformis</i> (Auerswald) Krammer	0.00	0.00	0.00
CPRO	EPRO	<i>Cymbella prostrata</i> (Berkeley) Grunow	<i>Encyonema prostratum</i> (Berkeley) Kützing	0.00	0.00	0.00
CPRX		<i>Cymbella proxima</i> Reimer		0.00	0.00	0.00
CSLE	ESLE	<i>Cymbella silesiaca</i> Bleisch	<i>Encyonema silesiacum</i> (Bleisch in Rabh.) D.G. Mann	7.23	0.00	0.00
CSIN	RSIN	<i>Cymbella sinuata</i> Gregory	<i>Reimeria sinuata</i> (Gregory) Kociolek & Stoermer	1.40	0.00	0.00
CSAE	CSAQ	<i>Cymbella subaequalis</i> Grunow	<i>Cymbopleura subaequalis</i> (Grunow) Krammer	0.00	0.00	0.00
DKUE		<i>Denticula kuetzingii</i> Grunow		0.00	0.00	0.00
DTEN		<i>Denticula tenuis</i> Kützing		0.23	0.00	0.00
DEHR		<i>Diatoma ehrenbergii</i> Kützing		0.47	0.00	0.00
DMES		<i>Diatoma mesodon</i> (Ehrenberg) Kützing		0.00	0.00	0.00
DMON		<i>Diatoma moniliformis</i> Kützing		2.10	0.00	0.00
DVUL		<i>Diatoma vulgare</i> Bory 1824		2.10	0.00	0.00
DVLI		<i>Diatoma vulgare</i> Bory Morphotyp linearis		0.00	0.00	0.00
DELL		<i>Diploneis elliptica</i> (Kützing) Cleve		0.00	0.00	0.00
DMAR		<i>Diploneis marginestriata</i> Husted		0.00	0.00	0.00
DOBL		<i>Diploneis oblongella</i> (Naegeli) Cleve-Euler		0.00	0.00	0.00
DOVA		<i>Diploneis ovalis</i> (Hilse) Cleve		0.00	0.00	0.00
DPAR		<i>Diploneis parva</i> Cleve		0.00	0.00	0.00
DPET		<i>Diploneis peterseni</i> Husted		0.00	0.00	0.00
EPAL		<i>Entomoneis paludosa</i> (W.Smith) Reimer		0.00	0.00	0.00
EADN		<i>Epithemia adnata</i> (Kützing) Brébisson		0.00	0.00	0.00
EGOE		<i>Epithemia goeppertiana</i> Hilse		0.00	0.00	0.00
EARC		<i>Eunotia arcus</i> Ehrenberg		0.00	0.00	0.00
EBIL		<i>Eunotia bilunaris</i> (Ehr.) Mills		0.00	0.00	0.00
EEXI		<i>Eunotia exigua</i> (Breb.) Rabenhorst		0.00	0.00	0.00
EPEC		<i>Eunotia pectinalis</i> (Dyallwyn) Rabenhorst		0.00	0.00	0.00
ESOL		<i>Eunotia soleirolii</i> (Kützing) Rabenhorst		0.00	0.00	0.00
FARC	HARC	<i>Fragilaria arcus</i> (Ehrenberg) Cleve	<i>Hannaea arcus</i> (Ehrbg.) Patrick	0.00	0.00	0.00
FBCP		<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot		0.00	0.00	0.00
FBRE	PSBR	<i>Fragilaria brevistriata</i> (Grun.in Van Heurck) Williams & Round	<i>Pseudostaurosira brevistriata</i> (Grun.in Van Heurck) Williams & Round	0.00	0.00	0.00
FCAP		<i>Fragilaria capucina</i> Desmazières		0.23	0.00	0.00
FAH		<i>Fragilaria capucina</i> Desmazières var. <i>amphicephala</i> (Kützing) Lange-Bertalot		0.00	0.00	0.00

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
FCAU		<i>Fragilaria capucina</i> Desmazières var. <i>austriaca</i> (Grunow) Lange-Bertalot		0.00	0.00	0.00
FCCP		<i>Fragilaria capucina</i> Desmazières var. <i>capitellata</i> (Grunow) Lange-Bertalot		0.00	0.00	0.00
FCGR	FGRA	<i>Fragilaria capucina</i> Desmazières var. <i>gracilis</i> (Oestrup) Hustedt	<i>Fragilaria gracilis</i> Ostrup	0.93	0.00	0.00
FCME		<i>Fragilaria capucina</i> Desmazières var. <i>mesolepta</i> (Rabenhorst) Rabenhorst		0.00	0.00	0.00
FCRA		<i>Fragilaria capucina</i> Desmazières var. <i>radians</i> (Kützing) Lange-Bertalot		0.00	0.00	0.00
FCRU		<i>Fragilaria capucina</i> Desmazières var. <i>rumpens</i> (Kütz.) Lange-Bert.		4.20	0.19	0.00
FCVA		<i>Fragilaria capucina</i> Desmazières var. <i>vaucheriae</i> (Kützing) Lange-Bertalot		8.39	0.19	0.00
FCBI	SCBI	<i>Fragilaria construens</i> (Ehr.) Grunow f. <i>binodis</i> (Ehr.) Hustedt	<i>Staurosira construens</i> (Ehr.) var. <i>binodis</i> (Ehr.) Hamilton	0.00	0.00	0.00
FCSS		<i>Fragilaria construens</i> (Ehr.) Grunow f. <i>subsalina</i> (Hustedt) Hustedt		0.00	0.00	0.00
FCVE	SCVE	<i>Fragilaria construens</i> (Ehr.) Grunow f. <i>venter</i> (Ehr.) Hustedt	<i>Staurosira construens</i> Ehr. var. <i>venter</i> (Ehr.) Hamilton	0.00	0.00	0.00
FCON	SCON	<i>Fragilaria construens</i> (Ehrenberg) Grunow	<i>Staurosira construens</i> Ehrenberg	0.00	0.00	0.00
FDEL		<i>Fragilaria delicatissima</i> (W. Smith) Lange-Bertalot		0.00	0.00	0.00
FDIL		<i>Fragilaria dilatata</i> (Brébisson) Lange-Bertalot		0.00	0.00	0.00
FELI	SELI	<i>Fragilaria elliptica</i> (Schumann) Williams & Round	<i>Staurosira elliptica</i> (Schumann) Williams & Round	0.00	0.00	0.00
FFAS	TFAS	<i>Fragilaria fasciculata</i> (C. A. Agardh) Lange-Bertalot	<i>Tabularia fasciculata</i> (Agardh) Williams et Round	0.00	0.00	0.00
FPSC		<i>Fragilaria parasitica</i> (W. Sm.) var. <i>subconstricta</i> Grunow		0.00	0.00	0.00
FPAR		<i>Fragilaria parasitica</i> (W.Sm.) Grun.		0.00	0.00	0.00
FPIN	SPIN	<i>Fragilaria pinnata</i> Ehrenberg	<i>Staurosirella pinnata</i> (Ehr.) Williams & Round	0.00	0.00	0.00
FPUL	CTPU	<i>Fragilaria pulchella</i> (Ralfs ex Kütz.) Lange-Bertalot	<i>Ctenophora pulchella</i> (Ralfs ex Kutz.) Williams et Round	0.00	0.00	0.00
FTEN		<i>Fragilaria tenera</i> (W.Smith) Lange-Bertalot		0.00	0.00	0.00
FUAC		<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot var. <i>acus</i> (Kütz.) Lange-Bertalot		0.00	0.00	0.00
FULN	UULN	<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot	<i>Ulnaria ulna</i> (Nitzsch.) Compère	0.70	0.00	0.00
FUDA	FDAN	<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot var. <i>danica</i> (Kütz.) Compere	<i>Fragilaria danica</i> (Kutz.) Lange-Bertalot	0.00	0.00	0.00
FSPI		<i>Frustulia spicula</i> Amosse		0.00	0.00	0.00
FVUL		<i>Frustulia vulgaris</i> (Thwaites) De Toni		0.00	0.00	0.00
GMMI		<i>Gomphonema minuta</i> (Stone) Kociolek & Stoermer		0.00	0.00	0.00
GAFF		<i>Gomphonema affine</i> Kützing		0.00	0.00	0.00
GANG		<i>Gomphonema angustatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00
GANT		<i>Gomphonema angustum</i> Agardh		0.00	0.00	0.00
GAUG		<i>Gomphonema augur</i> Ehrenberg		0.00	0.00	0.00
GCLA		<i>Gomphonema clavatum</i> Ehr.		0.00	0.00	0.00
GCBC		<i>Gomphonema cymbeliclinum</i> Reichardt & Lange-Bertalot		3.26	0.00	0.00
GLAT		<i>Gomphonema lateripunctatum</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00
GLIP		<i>Gomphonema lippertii</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00
GMIC		<i>Gomphonema micropus</i> Kützing		2.10	0.00	0.00
GMIN		<i>Gomphonema minutum</i> (Ag.) Agardh		0.00	0.00	0.00
GOCU		<i>Gomphonema occultum</i> Reichardt & Lange-Bertalot		0.00	0.00	0.00
GOLI		<i>Gomphonema olivaceum</i> (Hornemann) Brébisson		11.19	0.00	0.00
GOOL		<i>Gomphonema olivaceum</i> var. <i>olivaceoides</i> (Husted) Lange-Bertalot		0.00	0.00	0.00
GPAR		<i>Gomphonema parvulum</i> Kützing		0.00	0.19	0.00
GPXS	GEXL	<i>Gomphonema parvulum</i> Kützing var. <i>exilissimum</i> Grunow	<i>Gomphonema exilissimum</i> (Grun.) Lange-Bertalot & Reichardt	0.00	0.00	0.00
GPLA		<i>Gomphonema parvulum</i> Kützing var. <i>lagenula</i> (Kütz.) Frenguelli		0.00	0.00	0.00
GPRO		<i>Gomphonema productum</i> (Grunow) Lange-Bertalot & Reichardt		0.00	0.00	0.00
GPUM		<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	<i>Gomphonema gr. pumilum</i>	2.56	0.00	0.00
GRHO		<i>Gomphonema rhombicum</i> Fricke		0.00	0.00	0.00
GTER		<i>Gomphonema tergestinum</i> Fricke		6.53	0.00	0.00
GTRU		<i>Gomphonema truncatum</i> Ehr.		0.00	0.00	0.00
GYAC		<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00
GYAT		<i>Gyrosigma attenuatum</i> (Kützing) Rabenhorst		0.00	0.00	0.00
GNOD		<i>Gyrosigma nodiferum</i> (Grunow) Reimer		0.00	0.00	0.00
GYPA		<i>Gyrosigma parkerii</i> (Harrison) Elmore		0.00	0.00	0.00
HABU		<i>Hantzschia abundans</i> Lange-Bertalot		0.00	0.00	0.00
HAMP		<i>Hantzschia amphioxys</i> (Ehr.) Grunow in Cleve et Grunow 1880		0.00	0.00	0.00
hHSUT		<i>Hippodonta cf. subtilissima</i> Lange-Bertalot Metzeltin & Witkowski		0.00	0.00	0.00
MELL		<i>Mastogloia elliptica</i> (Agardh) Cleve		0.00	0.00	0.00
MVAR		<i>Melosira varians</i> Agardh		0.00	0.00	0.00
MCCO	MCON	<i>Meridion circulare</i> (Greville) Agardh var. <i>constrictum</i> (Ralfs) Van Heurck	<i>Meridion constrictum</i> Ralfs	0.00	0.00	0.00



ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
MCIR		<i>Meridion circulare</i> (Greville) C.A.Agardh		0.93	0.00	0.00
NACO	CRAC	<i>Navicula accomoda</i> (Hustedt) Mann	<i>Craticula accomoda</i> (Hustedt) Mann	0.00	0.00	0.00
NAAN		<i>Navicula angusta</i> Grunow		0.00	0.00	0.00
NAPL		<i>Navicula applicita</i> Hustedt		0.00	0.19	0.00
NAEX	MAEX	<i>Navicula atomus</i> (Kütz.) Grunow var. <i>excelsa</i> (Krasske) Lange-Bertalot	<i>Mayamaea excelsa</i> (Krasske) Lange-Bertalot	0.00	0.00	0.00
NATO	MAAT	<i>Navicula atomus</i> (Kützing) Lange-Bertalot	<i>Mayamaea atomus</i> (Kützing) Lange-Bertalot	0.00	0.00	0.00
NAPE	MAPE	<i>Navicula atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	<i>Mayamaea atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	0.00	0.19	4.70
NBAC	SEBA	<i>Navicula bacillum</i> Ehrenberg	<i>Sellaphora bacillum</i> (Ehrenberg) D. G. Mann	0.00	0.00	0.00
NBRY	ABRY	<i>Navicula bryophila</i> Boye Petersen	<i>Adlafia bryophila</i> (Petersen) Moser Lange-Bertalot & Metzeltin	0.00	0.00	0.00
NCAP	HCAP	<i>Navicula capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	<i>Hippodonta capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	0.00	0.00	0.00
NCHU	HHUN	<i>Navicula capitata</i> Ehrenberg var. <i>hungarica</i> (Grunow) Ross	<i>Hippodonta hungarica</i> (Grunow) Lange-Bertalot Metzeltin & Witkowski	0.00	0.00	0.00
NCLU	HLUE	<i>Navicula capitata</i> Ehrenberg var. <i>lueneburgensis</i> (Grun.) Patrick	<i>Hippodonta lueneburgensis</i> (Grunow) Lange-Bertalot Metzeltin & Witkowski	0.00	0.00	0.00
NCPR		<i>Navicula capitatoradiata</i> Germain		0.00	0.00	0.00
NCAR		<i>Navicula cari</i> Ehrenberg		0.00	0.00	0.00
NCTG		<i>Navicula catalanogermanica</i> Lange-Bertalot & Hofman		0.00	0.00	0.00
NCTV		<i>Navicula caterva</i> Hohn & Helleman		0.00	0.00	0.00
NCIN		<i>Navicula cincta</i> (Ehr.) Ralfs in Pritchard		0.00	0.00	0.00
NCOH	LCOH	<i>Navicula cohnii</i> (Hilse) D.G. Mann	<i>Luticola cohnii</i> (Hilse) D.G. Mann	0.00	0.00	0.00
NCON	DCOT	<i>Navicula contenta</i> Grunow	<i>Diadesmis contenta</i> (Grunow ex V. Heurck) Mann	0.00	0.00	0.00
NADU	NDCM	<i>Navicula cosmopolitana</i> Lange-Bertalot	<i>Naviculadicta cosmopolitana</i> Lange-Bertalot	0.00	0.00	0.00
NCRY		<i>Navicula cryptocephala</i> Kützing		0.00	0.00	0.00
NCLY	FCRY	<i>Navicula cryptolyra</i> Brockman	<i>Fallacia cryptolyra</i> (Brockman) Stickle & D. G. Mann	0.00	0.00	0.00
NCTE		<i>Navicula cryptotenella</i> Lange-Bertalot		0.47	0.00	0.00
NCUS	CRCU	<i>Navicula cuspidata</i> Kützing	<i>Craticula cuspidata</i> (Kützing) Mann	0.00	0.00	0.00
NDEC	GDEC	<i>Navicula decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	<i>Geissleria decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	0.23	0.00	0.00
NDIG		<i>Navicula digitatoradiata</i> (Gregory) Ralfs		0.00	0.00	0.00
NERI		<i>Navicula erifuga</i> Lange-Bertalot		0.00	0.00	0.00
NEXI		<i>Navicula exilis</i> Kützing		0.00	0.00	0.00
NFOS	MAFO	<i>Navicula fossalis</i> Krasske	<i>Mayamea fossalis</i> (Krasske) Lange-Bertalot	0.00	0.00	0.00
NGOE	LGOE	<i>Navicula goeppertiana</i> (Bleisch) H. L. Smith	<i>Luticola goeppertiana</i> (Bleisch in Rabenhorst) D.G. Mann	0.00	0.00	0.00
NGOT		<i>Navicula gottlandica</i> Grunow		0.00	0.00	0.00
NGRE		<i>Navicula gregaria</i> Donkin		0.00	2.71	1.57
NHAL	CHAL	<i>Navicula halophila</i> (Grunow ex Van Heurck) Mann	<i>Craticula halophila</i> (Grunow ex Van Heurck) Mann	0.00	0.00	0.00
NHUS		<i>Navicula hustedtii</i> Krasske		0.00	0.00	0.00
NIAC	GACC	<i>Navicula ignota</i> Krasske var. <i>acceptata</i> (Hustedt) Lange-Bertalot	<i>Geissleria acceptata</i> (Hust.) Lange-Bertalot & Metzeltin	0.00	0.00	0.00
NLAN		<i>Navicula lanceolata</i> (Agardh) Ehrenberg		0.00	0.00	0.20
NLAT	NVDL	<i>Navicula laterostrata</i> Hustedt	<i>Naviculadicta laterostrata</i> Hustedt	0.00	0.00	0.00
NLEN		<i>Navicula lenzii</i> Hustedt		0.00	0.00	0.00
NMEG	NANT	<i>Navicula menisculus</i> Schuman var. <i>grunowii</i> Lange-Bertalot	<i>Navicula antonii</i> Lange-Bertalot	0.00	0.00	0.00
NMUP	NUSA	<i>Navicula menisculus</i> Schuman var. <i>upsaliensis</i> Grunow	<i>Navicula upsaliensis</i> (Grunow) Peragallo	0.00	0.00	0.00
NMEN		<i>Navicula menisculus</i> Shumann		0.00	0.00	0.00
NMNS		<i>Navicula meniscus</i> Shumann		0.00	0.00	0.00
NMIN	EOMI	<i>Navicula minima</i> Grunow	<i>Eolimna minima</i> (Grunow) Lange-Bertalot	0.00	0.77	0.00
NMIS		<i>Navicula minuscula</i> Grunow in Van Heurck 1880	<i>Adlafia minuscula</i> (Grunow) Lange-Bertalot	0.00	0.00	0.00
NMMU	ADMM	<i>Navicula minuscula</i> Grunow var. <i>muralis</i> (Grunow) Lange-Bertalot	<i>Adlafia minuscula</i> var. <i>muralis</i> (Grunow) Lange-Bertalot	0.00	0.00	0.00
NMLF	CMLF	<i>Navicula molestiformis</i> Hustedt	<i>Craticula molestiformis</i> (Hustedt) Lange-Bertalot	0.23	0.00	0.00
NMOC	FMOC	<i>Navicula monoculata</i> (Hustedt) D.G. Mann	<i>Fallacia monoculata</i> (Hustedt) D.G. Mann	0.00	0.00	0.00
NMOM		<i>Navicula monoculata</i> Hustedt var. <i>omissa</i> (Hustedt) Lange-Bertalot		0.00	0.00	0.00
NMUT	LMUT	<i>Navicula mutica</i> (Kützing) D.G. Mann	<i>Luticola mutica</i> (Kützing) D.G. Mann	0.00	0.00	0.00
NMVE		<i>Navicula mutica</i> Kützing var. <i>ventricosa</i> (Kütz.) Cleve et Grun.		0.00	0.00	0.00
NNIV	LNIV	<i>Navicula nivalis</i> (Ehrenberg) D.G. Mann	<i>Luticola nivalis</i> (Ehrenberg) D.G. Mann	0.00	0.00	0.00
NNOV		<i>Navicula novaesiberica</i> Lange-Bertalot		0.00	0.00	0.00
NOBL		<i>Navicula oblonga</i> Kützing		0.00	0.00	0.00
NOLI		<i>Navicula oligotrappenta</i> Lange-Bertalot & Hofmann		0.00	0.00	0.00
NOPU		<i>Navicula oppugnata</i> Hustedt		0.00	0.00	0.00
NPNU		<i>Navicula perminuta</i> Grunow in Van Heurck		0.00	0.00	0.00
NPHY		<i>Navicula phyllepta</i> Kützing		0.00	0.00	0.00

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
NPRO		<i>Navicula protracta</i> (Grunow) Cleve		0.00	0.00	0.00
NPTU	ANSS	<i>Navicula pseudotuscula</i> Husted	<i>Aneumastus stroesei</i> (Ostrup) Mann	0.00	0.00	0.00
NPUP	SPUP	<i>Navicula pupula</i> (Kützing) Mereschkowksy	<i>Sellaphora pupula</i> (Kützing) Mereschkowksy	0.00	0.00	0.00
NPYG	FPYG	<i>Navicula pygmaea</i> (Kützing) Stickle & Mann	<i>Fallacia pygmaea</i> (Kützing) Stickle & Mann	0.00	0.00	0.00
NRAD		<i>Navicula radiosa</i> Kützing		0.23	0.00	0.00
NRCS		<i>Navicula recens</i> (Lange-Bertalot) Lange-Bertalot		0.00	0.00	0.00
NRCH		<i>Navicula reichardtiana</i> Lange-Bertalot		0.00	0.00	0.00
NRHY		<i>Navicula rhynchocephala</i> Kützing		0.00	0.00	0.00
NSAP	FSAP	<i>Navicula saprophila</i> Lange-Bertalot & Bonik	<i>Fistulifera saprophila</i> (Lange-Bertalot & Bonik) Lange-Bertalot	0.93	93.81	59.49
NSHR		<i>Navicula schroeterii</i> Meister		0.00	0.00	0.00
NSEM	SSEM	<i>Navicula seminulum</i> (Grunow) D.G. Mann	<i>Sellaphora seminulum</i> (Grunow) D.G. Mann	0.00	0.19	0.00
NSOR	CHSO	<i>Navicula soehrensii</i> Krasske	<i>Chamaepinnularia soehrensii</i> (Krasske) Lange-Bertalot et Krammer	0.00	0.00	0.00
NSPD		<i>Navicula splendicula</i> Van Landingham		0.00	0.00	0.00
NSTR	SSTM	<i>Navicula stroemii</i> (Hustedt) Mann	<i>Sellaphora stroemii</i> (Hustedt) Mann	0.00	0.00	0.00
NSBN		<i>Navicula subalpina</i> Reichardt		0.00	0.00	0.00
NSBH	FSBH	<i>Navicula subhamulata</i> (Grunow in V. Heurck) D.G. Mann	<i>Fallacia subhamulata</i> (Grunow in V. Heurck) D.G. Mann	0.00	0.00	0.00
NSBM	ESBM	<i>Navicula subminuscula</i> Manguin	<i>Eolimna subminuscula</i> (Manguin) Moser Lange-Bertalot & Metzeltin	0.00	1.35	16.05
NSMU		<i>Navicula submuralis</i> Husted		0.00	0.00	0.00
NSSY		<i>Navicula symmetrica</i> Patrick		0.00	0.00	0.00
NTPT		<i>Navicula tripunctata</i> (O.F.Müller) Bory		0.00	0.00	0.00
NTRV		<i>Navicula trivialis</i> Lange-Bertalot		0.00	0.00	0.00
NVEN		<i>Navicula veneta</i> Kützing		0.00	0.19	0.00
NVTL	PVEN	<i>Navicula ventralis</i> Krasske	<i>Psammothidium ventralis</i> (Krasske) Bukht et Round	0.00	0.00	0.00
NNEO	LVEN	<i>Navicula ventricosa</i> (Kützing) D.G. Mann	<i>Luticola ventricosa</i> (Kützing) D.G. Mann	0.00	0.00	0.00
NVRO		<i>Navicula viridula</i> (Kütz.) Ehr. var. <i>rostellata</i> (Kütz.) Cleve		0.00	0.00	0.00
NVIL		<i>Navicula viridula</i> (Kützing) Ehrnberg var. <i>linearis</i> Husted		0.00	0.00	0.00
NVGE	NGER	<i>Navicula viridula</i> var. <i>germanii</i> (Wallace) Lange-Bertalot	<i>Navicula germanii</i> Wallace	0.00	0.00	0.00
NVUL		<i>Navicula vulpina</i> Kützing		0.00	0.00	0.00
NEDU		<i>Neidium dubium</i> (Ehrenberg) Cleve		0.00	0.00	0.00
NACI		<i>Nitzschia acicularis</i> (Kützing) W.M.Smith		0.00	0.00	0.00
NACU		<i>Nitzschia acula</i> Hantzsch		0.00	0.00	0.00
NAMP		<i>Nitzschia amphibia</i> Grunow		0.00	0.00	0.00
NIAN	TANG	<i>Nitzschia angustata</i> W. M. Smith	<i>Tryblionella angustata</i> Wm Smith	0.00	0.00	0.00
NZAG		<i>Nitzschia angustatula</i> Lange-Bertalot		0.00	0.00	0.00
NAPI	TAPI	<i>Nitzschia apiculata</i> Gregory	<i>Tryblionella apiculata</i> Gregory	0.00	0.00	0.00
NIAR		<i>Nitzschia archibaldii</i> Lange-Bertalot		0.93	0.00	0.00
NAUR		<i>Nitzschia aurariae</i> Cholnoky		0.00	0.00	0.00
NICA	TCAL	<i>Nitzschia calida</i> Grunow	<i>Tryblionella calida</i> (Grunow in Cl. & Grun) D. G. Mann	0.00	0.00	0.00
NCPL		<i>Nitzschia capitellata</i> Husted		0.00	0.00	0.00
NCLA		<i>Nitzschia clausii</i> Hantzsch		0.00	0.00	0.00
NCOT		<i>Nitzschia constricta</i> (Kützing) Raifs		0.00	0.00	0.00
NDEB		<i>Nitzschia debilis</i> (Arnott) Grunow		0.00	0.00	0.00
NDLO	SIDE	<i>Nitzschia delognei</i> Lange-Bertalot	<i>Simonsenia delognei</i> Lange-Bertalot	0.00	0.00	0.00
NDES		<i>Nitzschia desertorum</i> Husted		0.00	0.00	0.20
NDIS		<i>Nitzschia dissipata</i> (Kützing) Grunow		1.17	0.00	0.00
NDIV		<i>Nitzschia diversa</i> Husted		0.00	0.00	0.00
NDRA		<i>Nitzschia draveillensis</i> Coste & Ricard		0.00	0.00	0.00
NDUB		<i>Nitzschia dubia</i> W.M.Smith		0.00	0.00	0.00
NFIL		<i>Nitzschia filiformis</i> (W.M.Smith) Van Heurck		0.00	0.00	0.00
NFIC		<i>Nitzschia filiformis</i> var. <i>conferta</i> (Richter) Lange-Bertalot		0.00	0.00	0.00
NFON		<i>Nitzschia fonticola</i> Grunow		0.00	0.00	0.20
NIFR		<i>Nitzschia frustulum</i> (Kützing) Grunow		0.00	0.00	14.87
NGES		<i>Nitzschia gessneri</i> Husted		0.00	0.00	0.00
NIGR		<i>Nitzschia gracilis</i> Hantzsch		0.00	0.00	0.00
NHAN		<i>Nitzschia hantzschiana</i> Rabenhorst		0.00	0.00	0.00
NHEU		<i>Nitzschia heufferiana</i> Grunow		0.00	0.00	0.00
NIHU	THUN	<i>Nitzschia hungarica</i> (Grunow) D.G. Mann	<i>Tryblionella hungarica</i> (Grunow) D.G. Mann	0.00	0.00	0.00

ACRONYMS	SYNONYMS	TAXA	SYNONYMS	J017	J035	J037
NINC		<i>Nitzschia inconspicua</i> Grunow		0.00	0.00	0.00
NINT		<i>Nitzschia intermedia</i> Hantzsch ex Cleve & Grunow		0.00	0.00	0.00
NILA		<i>Nitzschia lacuum</i> Lange-Bertalot		0.00	0.00	0.00
NLEV	TLEV	<i>Nitzschia levidensis</i> Wm. Smith	<i>Tryblionella levidensis</i> Wm. Smith	0.00	0.00	0.00
NLIN		<i>Nitzschia linearis</i> (Agardh) W.M.Smith		0.00	0.00	0.00
NLSU	NISU	<i>Nitzschia linearis</i> (Agardh) W.M.Smith var. <i>subtilis</i> (Grunow) Hustedt	<i>Nitzschia subtilis</i> Grunow in Cleve et Grunow	0.00	0.00	0.00
NZLT		<i>Nitzschia linearis</i> (Agardh) W.M.Smith var. <i>tenuis</i> (W.Smith) Grunow		0.00	0.00	0.00
NMIC		<i>Nitzschia microcephala</i> Grunow in Cleve & Moller		0.00	0.00	0.20
NNAN		<i>Nitzschia nana</i> Grunow in Van Heurck		0.00	0.00	0.00
NPAL		<i>Nitzschia palea</i> (Kützing) W. Smith		0.00	0.00	0.78
NPAE		<i>Nitzschia paleacea</i> (Grunow) Grunow in van Heurck		0.00	0.00	0.78
NIPF		<i>Nitzschia paleaeformis</i> Hustedt		0.00	0.00	0.00
NIPE		<i>Nitzschia pellucida</i> Grunow		0.00	0.00	0.00
NIPM		<i>Nitzschia perminuta</i> (Grunow) M. Peragallo		0.00	0.00	0.00
NIPR		<i>Nitzschia pura</i> Hustedt		0.00	0.00	0.00
NIPU		<i>Nitzschia pusilla</i> (Kützing) Grunow		0.00	0.00	0.00
NREC		<i>Nitzschia recta</i> Hantzsch in Rabenhorst		0.00	0.00	0.00
NSIO		<i>Nitzschia sigmoidea</i> (Nitzsch) W. Smith		0.00	0.00	0.00
NSDE	NSOL	<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>delognei</i> (Grunow) Lange-Bertalot	<i>Nitzschia solgensis</i> Cleve-Euler	0.00	0.00	0.00
NSIT		<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>tabellaria</i> Grunow		0.00	0.00	0.00
NSOC		<i>Nitzschia sociabilis</i> Hustedt		0.00	0.00	0.00
NSBC		<i>Nitzschia subcapitellata</i> Hustedt		0.00	0.00	0.00
NZSU		<i>Nitzschia supralitorea</i> Lange-Bertalot		0.00	0.00	0.00
NTHE		<i>Nitzschia thermaloides</i> Hustedt		0.00	0.00	0.00
NTUB		<i>Nitzschia tubicola</i> Grunow		0.00	0.00	0.00
NUMB		<i>Nitzschia umbonata</i> (Ehrenberg) Lange-Bertalot		0.00	0.00	0.00
NVER		<i>Nitzschia vermicularis</i> (Kützing) Hantzsch		0.00	0.00	0.00
NIVI		<i>Nitzschia vitrea</i> Norman		0.00	0.00	0.00
PBOR		<i>Pinnularia borealis</i> Ehrenberg		0.00	0.00	0.00
PLUN		<i>Pinnularia lundii</i> Hustedt		0.00	0.00	0.00
PMBR		<i>Pinnularia microstauron</i> (Ehr.) Cleve var. <i>Brébissonii</i> (Kützing) Mayer		0.00	0.00	0.00
PMIC		<i>Pinnularia microstauron</i> (Ehr.) Cleve		0.00	0.00	0.00
PSCA		<i>Pinnularia subcapitata</i> Gregory		0.00	0.00	0.00
RUNI		<i>Reimeria uniseriata</i> Sala Guerrero & Ferrario		0.00	0.00	0.00
RABB		<i>Rhoicosphenia abbreviata</i> (C.Agardh) Lange-Bertalot		0.47	0.00	0.00
RGIB		<i>Rhopalodia gibba</i> (Ehr.) O. Muller		0.00	0.00	0.00
SSMI		<i>Stauroneis smithii</i> Grunow		0.00	0.00	0.00
SHTE		<i>Stephanodiscus hantzschii</i> f. <i>tenuis</i> (Hustedt) Hakansson et Stoermer		0.00	0.00	0.00
SHAN		<i>Stephanodiscus hantzschii</i> Grunow in Cl. & Grun. 1880		0.00	0.00	0.00
STMI		<i>Stephanodiscus minutulus</i> (Kützing) Cleve & Moller		0.00	0.00	0.00
SANG		<i>Surirella angusta</i> Kützing		0.00	0.00	0.00
SBRE		<i>Surirella brebissonii</i> Krammer & Lange-Bertalot		0.00	0.00	0.00
SBKU		<i>Surirella brebissonii</i> var. <i>kuetzingii</i> Krammer et Lange-Bertalot		0.00	0.00	0.00
SUMI		<i>Surirella minuta</i> Brébisson		0.00	0.00	0.00
SOVI		<i>Surirella ovalis</i> Brébisson		0.00	0.00	0.00
SGAI		<i>Synedra gaillonii</i> (Bory) Ehrenberg		0.00	0.00	0.00
TVEN		<i>Tabellaria ventricosa</i> Kützing		0.00	0.00	0.00
TPSN		<i>Thalassiosira pseudonana</i> Halse et Heimdal		0.00	0.00	0.00
TWEI		<i>Thalassiosira weissflogii</i> (Grunow) Fryxell & Hasle		0.00	0.00	0.00

ACRONYMS	J043	J048	J069	J075	J086	J088	N16	N4	N7	N23	C121	C223	C229	C231	C232
	Besòs	Besòs	Besòs	Ripoll	Caldes	Congost	Caldes	Rossinyol	Tenes	Daró	Siurana	Ondara	Segre	Segre	Noguera Pallaresa
	Reixac	Barcelona	Montmeló	Castellar del Vallès	Caldes de Montbui	Balenyà	Gallifa	St. Miquel del Fai	St. Miquel del Fai	Gualta	El Masroig (Garcia)	Vilagrassa	La Seu d'Urgell	Ponts	Esterrí d'Aneu
	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Besòs	Daró	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
ABIA	0.00	0.00	0.00	0.00	0.00	0.00	2.94	0.00	5.14	0.00	0.00	0.00	24.25	0.74	15.93
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.46	13.44	7.44	0.00	0.00	0.00	2.57	8.13	0.47	0.99	0.00	0.00	0.00
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	0.00	0.00	0.23	0.00	24.51	67.15	29.66	62.70	30.37	2.71	48.36	0.25	0.75	2.48	56.62
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	11.27	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	2.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.25
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	0.00	0.00	0.47	0.44	9.73	1.23	0.00	7.94	1.48	0.70	0.99	0.00	1.73	0.98
AVEN	0.21	0.20	0.23	0.24	0.22	0.00	0.00	0.00	0.23	0.00	0.00	0.74	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.93	0.00	0.00	0.00	0.00	0.25	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.00	0.00	0.44	0.49	0.00	0.00	0.47	0.00	0.23	0.00	0.00	0.99	0.00
CPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	0.00	0.00	0.50	3.50	3.19
CPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	0.00	0.00	0.23	10.38	1.75	0.24	0.49	0.00	0.23	0.00	5.87	0.00	0.00	0.00	0.00
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.97	0.00
CINV	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
CATO	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.21	0.81	0.92	0.00	0.00	0.00	0.00	0.00	0.47	45.57	0.00	0.74	0.00	0.00	0.00











ACRONYMS	J043	J048	J069	J075	J086	J088	N16	N4	N7	N23	C121	C223	C229	C231	C232
NINC	0.00	0.00	0.00	0.00	9.85	3.41	0.00	0.00	1.17	7.39	3.05	0.00	0.25	0.50	0.25
NINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NILA	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00
NLEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZLT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAL	0.42	6.45	4.15	0.24	0.44	0.00	0.00	0.00	1.87	0.49	0.23	20.69	0.00	0.25	0.25
NPAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.75	0.25	0.00
NIPF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.00
NREC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.50	0.00
NSIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSDE	0.00	0.00	0.00	0.00	0.00	0.24	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSOC	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	3.47	0.00
NSBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUMB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PBOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLUN	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSCA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RUNI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RABB	0.00	0.00	0.00	0.00	0.22	0.73	0.00	0.00	0.00	0.49	0.00	0.00	0.00	1.49	0.00
RGIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SSMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
SHAN	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	3.71	0.00
STMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
SANG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00
SBRE	0.00	0.00	0.23	0.00	0.22	0.00	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.50	0.00
SBKU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
SOVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SGAI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TPSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	1.49	0.00
TWEI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00

ACRONYMS	C234	E121	E207	E219	J010	J032	J041	J057	J164	L020	L021	N15
	Noguera Ribagorçana	Ebre	Segre	Segre	Noguera Ribagorçana	Garona	Corb	Ebre	Noguera Pallaresa	Noguera Ribagorçana	Noguera de Tor	Noguera Ribagorçana
	Corbins	Flix	Tèrmens	Torres del Segre	El Pont de Suert	Canejan	Vilanova	Campredò	Sort	Senet	Balneari de Boí	Pont de Montanyana
	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre	Ebre/Segre
ABIA	0.00	0.00	11.27	0.00	1.69	1.93	0.00	0.00	39.12	0.48	1.18	0.00
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	2.38	0.00	0.00	0.85	0.00	0.00	0.47	0.00	0.00	0.24	0.00	1.23
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.48	0.23	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	7.84	3.37	34.51	4.06	33.09	24.82	0.23	4.89	12.22	60.29	83.06	28.50
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.46	0.00	4.67
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	22.09	3.61	1.64	3.42	0.24	0.00	5.83	25.92	0.00	0.00	0.00	6.14
AVEN	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.24	0.24	1.41	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.74
CPLA	0.00	0.00	2.58	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
CPLE	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	2.85	0.72	0.00	0.21	0.00	0.00	0.47	8.56	0.00	0.24	0.00	1.72
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.21	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00

























ACRONYMS	N48	F0	J011	J013	J016	J040	J070	J104	J105	N24	N25	N26	N27
	Noguera Pallaresa	Fluvià	Fluvià	Fluvià	Fluvià	Ser	Bianya	Turonell	Ridaura	Gurn	Joanetes	Llierca	Ponç
	Alòs d'Isil	Hostalets d'en Bas	St. Pere Pescador	Olot	Esponellà	Serinyà	St. Joan les Fonts	Castellfollit de la Roca	Llocalou	St. Privat d'en Bas	Joanetes	Pont de Llierca	St. Salvador de Bianya
	Ebre/Segre	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià	Fluvià
ABIA	38.57	19.90	0.00	0.25	0.00	0.00	16.59	0.00	0.00	15.71	22.72	0.98	20.79
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00
ALFR	0.00	0.00	0.00	0.74	0.25	0.00	0.00	1.74	17.70	0.00	0.00	0.00	0.00
ALAN	0.00	0.00	0.00	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	38.08	37.59	28.22	21.67	3.72	52.99	60.58	18.86	12.20	62.59	58.52	25.43	43.56
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	2.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
AINA	0.00	1.23	5.11	4.19	1.49	0.75	0.96	5.46	0.24	0.25	0.49	0.00	0.00
ALIB	0.00	0.00	0.49	0.25	0.25	0.00	0.24	0.00	0.24	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	1.72	4.14	10.84	0.74	2.49	0.96	21.59	2.87	0.00	0.99	0.00	3.96
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.24	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.99	0.00	1.74	0.00	0.00	0.00	0.50	0.00	0.00	0.00
CATE	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.49	0.25	1.74	1.49	3.61	2.23	0.48	1.75	3.95	0.00	2.97
CPLA	0.00	0.25	0.00	0.25	0.00	0.00	1.44	1.99	2.63	1.50	0.49	0.00	2.97
CPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.49	0.00	0.00	0.25	0.00	0.00	0.00	0.75	0.00	0.98	0.00
CMEN	0.00	0.00	0.00	0.00	1.24	0.50	0.00	0.00	0.00	0.50	0.00	0.00	0.00

ACRONYMS	N48	F0	J011	J013	J016	J040	J070	J104	J105	N24	N25	N26	N27
COCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CTRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CWUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	0.49	10.07	0.24	0.99	0.00	24.88	0.96	0.00	0.00	1.50	3.21	8.56	0.00
CAPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
CAUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCAЕ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00
CCIS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.96	0.00
CELG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96	0.00
CINC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIC	0.00	0.25	1.95	0.00	0.00	0.00	0.24	0.00	0.00	1.75	1.48	22.25	2.97
CMIN	1.23	13.51	0.00	1.48	0.25	0.50	0.48	0.25	0.24	0.50	1.73	4.40	1.98
CMUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CNAV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
CPRX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24	0.00
CSIN	1.72	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00
CSAE	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
DKUE	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	5.02	0.00	0.00	0.49	0.00
DTEN	0.00	8.11	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	0.25	4.40	0.00
DEHR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DMES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DMON	0.00	0.25	0.24	0.00	0.00	0.25	0.00	0.00	0.00	4.49	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVLI	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
DMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.74	0.25	0.75	0.00	0.00	0.00	1.25	0.25	0.98	0.00
DOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DPAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DPET	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EADN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
EGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
EARC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
EBIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FARC	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
FBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCAH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.24	0.00

ACRONYMS	N48	F0	J011	J013	J016	J040	J070	J104	J105	N24	N25	N26	N27
FCAU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16	0.00
FCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	0.00	0.00	0.24	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVA	0.00	0.25	0.00	0.25	0.00	0.50	0.00	0.00	0.00	0.00	0.99	0.00	0.00
FCBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVE	0.00	0.00	11.44	0.00	3.47	0.00	0.00	0.25	0.00	0.50	0.00	0.00	0.00
FCON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FDEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FDIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FFAS	0.00	0.00	2.19	0.00	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
FPSC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPAR	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPUL	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FUAC	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
FULN	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	1.25	0.00	0.24	0.00
FUDA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FSPI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GAFF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GANG	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.49	0.00	0.00
GANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GAUG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
GCLA	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GLAT	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
GLIP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIN	0.00	0.00	0.49	0.25	0.50	0.50	0.00	0.50	0.00	0.25	0.74	0.73	9.90
GOCU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
GOLI	0.00	0.49	0.24	0.00	0.00	3.48	3.37	0.25	0.24	0.00	0.99	0.00	0.00
GOOL	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPAR	0.74	0.00	0.24	0.00	0.50	0.00	0.00	0.99	2.39	0.00	0.00	0.49	0.00
GPXS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	7.62	0.98	0.00	0.00	0.50	0.00	2.40	0.00	0.00	0.25	0.99	0.00	1.98
GRHO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GTER	7.13	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00
GTRU	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GYAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GYAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GNOD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GYPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HABU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
CHSUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MVAR	0.00	0.00	0.49	0.99	0.00	0.25	0.00	1.49	0.00	0.00	0.00	0.00	0.00
MCCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00









ACRONYMS	N28	J008	J125	J059	J079	J085	J122	J123	N3	J007	C072	C708	C716	J001	J002
	Ferró	Foix	Foix	Francolí	Francolí	Francolí	Anguera	Francolí	Brugent	Gaià	Clarà	Negre	Cardener	Cardener	Cardener
	St. Salvador de Bianya	Castellet	Sant Martí Sarroca	La Masó	Tarragona	La Ribà	Montblanc	L'Espluga de Francolí	Capafons	Montferri	Casserres	Clariana de Cardener	La Coma	Cardona	Manresa
	Fluvià	Foix	Foix	Francolí	Francolí	Francolí	Francolí	Francolí	Francolí	Gaià	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
ABIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.99	0.00	0.96	0.00	15.38	0.00	0.00
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	2.43	0.21	0.00	11.98	0.36	2.84	0.00	20.51	0.00	5.34	0.48	0.00	0.23	0.46	0.47
ALAN	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.24	0.00	0.00	0.00	0.00	0.00	15.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	23.54	0.00	69.16	1.53	0.00	0.24	0.44	14.75	32.45	5.83	34.22	43.95	38.69	10.02	1.17
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
AINA	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.23	1.17
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	2.67	4.04	1.69	0.65	0.00	15.17	0.44	0.00	0.00	5.34	3.13	0.99	1.40	5.01	4.20
AVEN	0.00	0.00	0.00	0.00	0.18	0.47	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.23
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.23	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	2.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70	0.96	0.25	0.00	0.23	0.00
CPLA	14.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	0.00	0.21	7.23	2.61	0.18	0.24	0.00	2.07	0.00	41.99	6.02	0.00	0.00	0.23	0.23
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.70
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	5.02	0.00	0.00	0.24	0.96	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.48	0.00	0.00	0.23	1.86













ACRONYMS	J003	J004	J005	J006	J023	J025	J031	J045	J046	J051	J065	J076	J077
	Anoia	Anoia	Llobregat	Merlès	Llobregat	Cardener	Llobregat	Aiguadora	Llobregat	Castelloí	Carme	Rubí	Gavarresa
	Vilanova del Camí	Sant Sadurní d'Anoia	Martorell	Santa Maria	Castellbell	Olius	El Pont de Vilomara	Cardona	El Prat de Llobregat	Vilanova del Camí	La Pobla de Claramunt	El Papiol	Cabrianes
	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat
ABIA	0.00	0.00	0.00	7.94	0.00	4.14	0.00	5.31	0.00	0.00	0.00	0.00	0.00
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.70	0.00	0.24	0.00	2.93	0.72	0.47	0.00	3.88
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	1.97	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	0.25	0.21	0.23	48.60	2.35	32.36	0.96	50.97	0.00	63.37	0.47	0.00	0.00
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.23	0.23	0.47	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
AMMO	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	1.41	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.49	0.00	0.23	0.70	0.47	0.49	1.20	0.00	0.73	5.54	55.27	0.00	5.34
AVEN	0.00	0.00	0.23	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.23	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.24
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.00	0.23	0.23	0.24	1.20	0.97	0.49	1.45	0.23	0.00	0.24
CPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	0.00	0.00	3.42	0.00	1.88	0.00	3.13	0.00	0.73	4.82	1.41	0.00	3.16
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.49
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.74	0.43	0.23	0.00	0.00	0.24	0.00	0.72	0.00	0.00	0.00	0.00	0.24
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	10.81	0.21	0.23	0.70	0.94	0.00	7.21	0.00	16.10	0.00	0.23	0.19	3.64







ACRONYMS	J003	J004	J005	J006	J023	J025	J031	J045	J046	J051	J065	J076	J077
NPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPTU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPUP	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00
NPYG	0.49	0.00	0.00	0.23	0.23	0.00	0.24	0.00	0.24	0.00	0.00	0.00	0.24
NRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRCS	0.00	0.00	0.23	0.00	0.23	0.00	0.24	0.00	0.73	0.00	0.00	0.00	0.00
NRCH	0.00	0.00	0.00	0.23	5.40	0.00	2.40	0.00	0.00	0.48	0.23	0.00	0.24
NRHY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSAP	0.00	0.00	62.56	0.00	12.91	0.00	6.25	0.00	4.88	0.48	0.00	97.01	33.25
NSHR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSEM	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
NSOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSPD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSTR	0.00	0.00	0.00	0.00	0.00	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBH	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	2.11	0.00	0.00
NSBM	4.91	0.21	12.33	0.00	9.15	0.00	3.37	0.00	2.20	0.00	0.00	0.00	1.70
NSMU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSSY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00
NTPT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.48	8.20	0.00	0.00
NTRV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVEN	0.00	0.00	0.23	0.00	0.70	0.00	0.00	0.00	5.12	0.48	0.70	0.19	0.24
NVTL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNEO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
NVRO	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
NVIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00
NVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACI	0.00	0.00	0.00	0.00	0.94	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00
NACU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIAN	0.00	0.00	0.00	0.23	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZAG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPI	0.00	0.00	0.00	0.00	0.23	0.00	0.72	0.00	0.73	0.24	1.87	0.00	0.00
NIAR	0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00	0.24	0.00	0.00	0.00
NAUR	0.00	0.00	0.00	0.00	1.41	0.00	0.48	0.00	0.00	0.00	0.23	0.00	0.49
NICA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCPL	0.00	0.00	1.60	0.00	4.46	0.00	6.97	0.00	0.49	0.00	0.00	1.31	0.24
NCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDEB	4.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00
NDLO	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	1.41	0.00	0.00
NDES	0.00	0.00	0.23	0.00	1.17	0.00	0.48	0.00	0.24	0.00	0.00	0.00	0.00
NDIS	0.00	0.00	0.23	0.00	1.41	0.00	0.72	0.72	0.00	0.24	2.11	0.00	0.00
NDIV	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
NFIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFON	11.55	3.62	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00
NIFR	0.00	1.28	10.50	0.23	8.69	0.00	0.00	0.00	2.20	0.00	0.00	0.00	6.31
NGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00
NIGR	2.46	17.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHEU	0.00	0.21	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.23	0.00	0.00
NIHU	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00

ACRONYMS	J003	J004	J005	J006	J023	J025	J031	J045	J046	J051	J065	J076	J077
NINC	2.70	1.71	0.23	0.00	0.00	0.00	3.61	0.00	0.00	7.47	1.64	0.00	0.00
NINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NILA	0.00	0.00	0.00	0.93	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEV	2.70	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
NLIN	14.74	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSU	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZLT	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00
NMIC	0.00	0.00	0.00	0.00	2.82	0.00	2.16	0.00	0.00	0.00	0.00	0.00	0.00
NNAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAL	0.00	0.00	0.00	0.00	16.43	0.00	4.57	0.00	1.95	0.00	0.70	0.37	0.24
NPAE	0.00	0.00	0.00	0.00	0.70	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
NIPF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPU	0.00	0.00	0.68	0.00	0.23	0.00	1.20	0.00	0.00	0.00	0.70	0.00	0.00
NREC	0.25	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.85	0.00	0.00
NSIO	3.44	2.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSDE	0.25	52.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIT	0.00	0.00	0.00	0.23	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSOC	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.24	0.00	0.00	1.87	0.00	0.00
NSBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUMB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.83	0.00	0.00	0.56	0.00
NVER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PBOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLUN	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSCA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RUNI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RABB	0.00	0.00	0.23	0.00	2.35	0.00	3.85	0.48	7.80	0.00	0.47	0.00	0.00
RGIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SSMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00
SHTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00
SHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SANG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBRE	0.00	0.00	0.23	0.00	0.23	0.00	1.44	0.00	0.49	0.00	2.34	0.00	0.00
SBKU	0.25	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SGAI	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TVEN	1.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TPSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TWEI	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00

ACRONYMS	J078	J080	J084	J093	J095	J117	J118	J119	J120	J147	C014	J012	J030	J052
	Llobregat	Llobregat	Llobregat	Calders	Anoia	Llobregat	Llobregat	Cardener	Avernó	Clarà	Figueres/Manol	Muga	Orlina	Muga
	Guardiola de Berguedà	Balsareny	Abreira	Navarcles	Jorba	La Pobla de Lillet	Olvan	Súria	Sant Sadurn d'Anoia	Gironella	Vilanova	Boadella	Peralada	Castelló d'Empúries
	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Llobregat	Muga	Muga	Muga	Muga
ABIA	1.60	0.00	0.00	0.00	0.00	72.10	13.64	0.00	0.00	0.00	0.00	17.49	0.49	0.49
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	5.83	0.95	0.73	6.88	0.00	0.00	2.63	3.44	1.46	10.86	0.00	0.00	1.95
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	44.85	2.18	0.00	0.73	2.46	12.10	64.77	1.43	0.00	2.68	1.73	52.22	21.92	5.12
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.49	0.49
ALIB	0.00	1.21	0.00	0.73	0.00	0.00	0.00	1.43	0.25	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	0.00	20.63	0.00	3.63	1.23	0.00	1.59	14.08	0.00	0.73	0.49	1.97	0.49	1.22
AVEN	0.00	0.00	0.00	0.48	1.23	0.00	0.00	0.24	0.25	0.00	0.00	0.00	1.48	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.49	0.00	0.00
BPAR	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.23	7.28	0.00	0.48	2.95	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00
CPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.47	1.23	0.25	9.76
CPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPLI	0.46	10.68	0.00	1.45	4.67	0.00	1.14	0.72	0.00	4.39	0.00	0.00	0.00	0.00
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.24	0.00	0.73	1.47	0.00	0.00	0.95	17.94	0.98	0.00	0.00	0.00	0.49











ACRONYMS	J078	J080	J084	J093	J095	J117	J118	J119	J120	J147	C014	J012	J030	J052
NINC	0.00	0.00	0.00	0.00	4.42	0.00	0.68	0.95	0.00	0.00	0.25	0.00	32.76	1.22
NINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NILA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEV	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZLT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIC	0.00	0.00	0.00	0.48	0.98	0.00	0.00	4.30	0.25	0.00	0.00	0.00	0.00	0.00
NNAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAL	0.00	0.00	6.41	0.24	1.72	0.00	0.00	0.00	5.65	2.93	1.23	0.00	0.00	0.73
NPAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.24
NIPF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPU	0.00	0.00	0.00	0.48	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NREC	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.25	0.00	0.00
NSIO	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIT	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSOC	0.23	0.00	0.00	0.24	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.95	0.00	0.00	0.00	0.00
NTHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUMB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
NVER	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIVI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PBOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSCA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RUNI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
RABB	0.69	21.36	0.00	1.69	1.97	0.00	0.00	7.88	0.00	0.00	0.00	0.00	0.00	0.00
RGIB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SSMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
STMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SANG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBRE	0.00	0.97	0.00	0.97	16.46	0.00	0.00	0.72	0.74	2.20	0.00	0.00	0.00	0.00
SBKU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SOVI	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SGAI	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TPSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.46
TWEI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00















ACRONYMS	J019	J020	J021	J028	J034	J053	J054	J060	J091	J110	J112	N32	N33	N34	N35	N36
	Ter	Onyar	Freser	Terri	Ter	Ter	Ter	Ter	Ges	Ter	Ter	Mèder	Freser	Solana	Merdàs	Ritort
	Roda de Ter	Quart	Ripoll	St. Julià de Ramis	Torelló	Torroella de Montgrí	St. Julià de Ramis	El Pasteral	Torelló	Bescanó	Flaçà	Sta. Eulàlia de Riuprimer	Planoles	St. Quirze de Besora	Gombràs	Molló
	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter	Ter
ABIA	0.25	0.49	76.92	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	64.50	0.25	0.00	3.94
ABSA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.45
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.50	0.00	0.25	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00
ACBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AKOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	1.96	0.00	1.49	0.00	0.49	0.00	1.75	0.00	0.00	7.35	8.19	0.00	0.00	0.00	0.00
ALAN	0.74	0.25	0.00	3.22	0.50	0.00	2.24	0.00	0.25	0.50	0.98	0.00	0.00	0.00	0.00	3.45
ALAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ALAT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	5.46	2.70	10.17	2.72	13.22	10.51	1.49	8.98	45.89	1.99	2.21	17.87	0.00	6.65	71.96	30.79
AOBG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APLO	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
ADCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	1.99	0.25	0.25	0.50	3.99	0.49	0.00	4.49	0.75	0.00	0.25	0.50	0.00	0.00	0.00	0.49
ALIB	0.00	0.00	0.00	1.24	0.00	0.24	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	4.47	0.25	0.74	11.14	15.46	1.47	1.49	17.96	4.49	1.49	0.98	4.22	0.00	0.00	4.22	0.25
AVEN	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
ANBR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00
AUGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BPAR	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.25	0.00	0.50	0.25	0.24	0.00	0.25	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	0.25	0.99	1.00	0.00	0.25	0.25	1.25	0.00	0.00	0.00	0.25	0.00	0.50	0.00
CPLA	0.99	0.00	0.50	13.86	0.75	1.71	0.25	4.99	0.00	0.50	1.72	0.99	0.25	0.00	0.50	0.00
CPLI	0.00	12.01	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CINV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCMS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00
CMEN	0.00	59.31	0.00	0.74	0.00	0.24	1.00	0.00	0.50	0.00	0.74	0.00	0.00	0.00	0.00	0.00



















ACRONYMS	Te0	J026	J062	J066	J083	J115	J124	N20	N21	N22	T0
MCIR	0.00	0.99	0.00	0.00	0.49	0.74	0.98	0.00	0.00	0.00	6.72
NACO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
NATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPE	0.99	0.49	28.54	21.59	11.33	27.21	9.76	0.99	3.73	0.00	0.25
NBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
NBRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCHU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
NCPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
NCAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCTV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCOH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25
NADU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCLY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCTE	0.25	0.25	0.00	0.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00
NCUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.23	0.00	0.00
NDIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NERI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	0.74	0.00	6.06	4.47	22.91	21.57	22.44	0.99	8.46	0.74	0.00
NHAL	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
NHUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIAC	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLAN	0.99	0.00	0.00	0.00	0.00	4.17	0.00	0.00	0.00	0.25	0.00
NLAT	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEG	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.75	0.00	0.00
NMUP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMNS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMIN	0.00	0.00	1.52	0.50	0.74	0.74	0.00	0.00	0.25	0.00	0.00
NMIS	0.50	1.23	0.00	0.00	0.25	0.00	0.00	0.50	1.00	0.00	0.00
NMMU	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
NMLF	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
NMOC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMOM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNIV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNOV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.72	0.00	0.00	0.00
NOBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NOPU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPNU	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPHY	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00





## **APPENDIX 3**

Environmental and spatial data corresponding to winter  
(December) 2005 and spring (May) 2006 in Fuirosos.





## **WINTER 2005**

Environmental and spatial data corresponding to winter (December) 2005 in Fuirosos.



UNSHADED REACH  
TRANSECT 1

	US1_0	US1_10	US1_20	US1_30	US1_40	US1_50	US1_60	US1_70	US1_80	US1_90	US1_100	US1_110	US1_120	US1_130	US1_140	US1_150	US1_160
<b>Environmental data</b>																	
Depth (cm)	18.00	22.50	22.50	22.00	18.00	28.50	16.00	25.00	28.00	29.00	26.50	25.50	22.00	20.50	20.00	22.00	20.50
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.03	0.01	0.01	0.01	0.06	0.07	0.01	0.01	0.02
Reynolds number	1792.83	2241.04	2241.04	2191.24	1792.83	2838.65	4780.88	2490.04	8366.53	2888.45	2639.44	2539.84	13147.41	14292.83	1992.03	2191.24	4083.67
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.04	0.05	0.01	0.01	0.01
pH	7.56									7.49							
Conductivity (µS cm <sup>-1</sup> )	186.00	186.80	186.90	187.40	187.40	187.40	187.40	187.30	187.40	187.40	187.40	187.40	187.30	187.40	187.40	187.30	187.40
Water temperature (°C)	5.60	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Oxygen saturation (%)	95.30	96.20	95.70	99.30	102.60	108.60	106.00	107.70	109.10	109.20	108.30	108.00	107.20	106.60	106.80	107.50	107.30
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )			238.00	211.95										114.28	275.44		
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )			10.45	10.45										7.02	6.17		
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )			447.32	418.19										430.84	425.87		
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	23.00	21.00	28.00	25.00	25.00	26.00	24.00	25.00	26.00	32.00	36.00	28.00	26.00	42.00	30.00	40.00	45.00
F0 (Gain 7, Meas-Int 9)	98.67	987.67	835.00	728.00	1051.33	128.00	1402.00	684.33	76.00	1002.00	401.67	695.00	610.33	580.33	266.67	869.67	0.00
Substratum type (dominance of)	rocks	sand	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>																	
x	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
y	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
x <sup>2</sup>	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
y <sup>2</sup>	1	4	9	16	25	36	49	64	81	100	121	144	169	196	225	256	289
x*y	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700
x <sup>2</sup> y	10000	20000	30000	40000	50000	60000	70000	80000	90000	100000	110000	120000	130000	140000	150000	160000	170000
x y <sup>2</sup>	100	400	900	1600	2500	3600	4900	6400	8100	10000	12100	14400	16900	19600	22500	25600	28900
x <sup>3</sup>	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
y <sup>3</sup>	1	8	27	64	125	216	343	512	729	1000	1331	1728	2197	2744	3375	4096	4913

**UNSHADED REACH  
TRANSECT 2**

	US1_170	US1_180	US1_190	US1_200	US1_210	US1_220	US1_230	US1_240	US1_250	US1_260	US1_270	US1_280	US1_290	US1_300	US2_0	US2_10	
<b>Environmental data</b>																	
Depth (cm)	21.00	19.50	19.00	16.50	16.50	16.00	16.00	12.50	14.00	12.00	12.50	15.50	13.50	13.50	41.00	38.00	
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.07	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Reynolds number	2091.63	1942.23	1892.43	11503.98	6573.71	1593.63	1593.63	1245.02	1394.42	1195.22	1245.02	1543.82	1344.62	1344.62	4083.67	3784.86	
Froude number	0.01	0.01	0.01	0.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	
pH			7.48										7.49		7.44		
Conductivity (µS cm <sup>-1</sup> )	187.40	187.40	187.40	187.40	187.40	187.30	187.30	187.30	187.40	187.40	187.30	187.30	187.30	187.30	187.20	187.20	
Water temperature (°C)	5.50	5.50	5.50	5.50	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	5.60	6.00	6.00	
Oxygen saturation (%)	107.20	106.20	105.90	106.00	105.60	105.40	105.00	105.50	105.30	104.80	104.00	103.40	103.70	103.70	97.20	97.30	
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )					236.37	235.56									254.28		
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )					7.02	6.17									7.02		
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )					410.97	184.94									414.58		
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	60.00	62.00	75.00	60.00	50.00	60.00	65.00	70.00	75.00	78.00	65.00	65.00	65.00	65.00	20.00	18.00	
F0 (Gain 7, Meas-Int 9)	292.33	442.67	170.00	955.33	255.33	77.67	105.00	199.00	137.33	241.00	338.00	1807.67	1035.67	1035.67	0.00	0.00	
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	sand	sand	sand	sand	sand	sand	sand	rocks	rocks	sand	sand
<b>Spatial data</b>																	
x	100	100	100	100	100	100	100	100	100	100	100	100	100	100	700	700	
y	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	
x <sup>2</sup>	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	490000	490000	
y <sup>2</sup>	324	361	400	441	484	529	576	625	676	729	784	841	900	961	1	4	
x*y	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	700	1400	
x <sup>2</sup> y	180000	190000	200000	210000	220000	230000	240000	250000	260000	270000	280000	290000	300000	310000	490000	980000	
x y <sup>2</sup>	32400	36100	40000	44100	48400	52900	57600	62500	67600	72900	78400	84100	90000	96100	700	2800	
x <sup>3</sup>	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	343000000	343000000	
y <sup>3</sup>	5832	6859	8000	9261	10648	12167	13824	15625	17576	19683	21952	24389	27000	29791	1	8	

	US2_20	US2_30	US2_40	US2_50	US2_60	US2_70	US2_80	US2_90	US2_100	US2_110	US2_120	US2_130	US2_140	US2_150
<b>Environmental data</b>														
Depth (cm)	38.50	39.00	34.00	32.00	28.00	25.00	26.00	25.00	22.00	23.50	25.00	22.50	20.00	21.50
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	3834.66	3884.46	3386.45	3187.25	2788.84	2490.04	2589.64	2490.04	2191.24	2340.64	2490.04	2241.04	1992.03	2141.43
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH									7.44					
Conductivity (µS cm <sup>-1</sup> )	187.20	187.20	187.20	187.20	187.20	187.20	187.20	187.20	187.20	187.20	187.30	187.20	187.40	187.40
Water temperature (°C)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Oxygen saturation (%)	97.30	97.30	97.30	97.30	97.30	97.30	97.30	97.60	97.30	97.60	98.00	98.00	98.10	98.50
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	213.58	207.07											246.14	203.81
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	7.02	5.31											7.88	7.02
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	412.55	224.90											154.23	430.61
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	24.00	28.00	70.00	67.00	62.00	29.00	33.00	45.00	75.00	80.00	75.00	112.00	90.00	26.00
F0 (Gain 7, Meas-Int 9)	188.33	0.00	0.00	1259.67	0.00	0.00	114.67	0.00	240.00	0.00	617.67	0.00	0.00	0.00
Substratum type (dominance of)	sand	sand	rocks	rocks	sand	sand	sand	sand	sand	sand	rocks	sand	sand	sand
<b>Spatial data</b>														
x	700	700	700	700	700	700	700	700	700	700	700	700	700	700
y	3	4	5	6	7	8	9	10	11	12	13	14	15	16
x <sup>2</sup>	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000
y <sup>2</sup>	9	16	25	36	49	64	81	100	121	144	169	196	225	256
x*y	2100	2800	3500	4200	4900	5600	6300	7000	7700	8400	9100	9800	10500	11200
x <sup>2</sup> y	1470000	1960000	2450000	2940000	3430000	3920000	4410000	4900000	5390000	5880000	6370000	6860000	7350000	7840000
x y <sup>2</sup>	6300	11200	17500	25200	34300	44800	56700	70000	84700	100800	118300	137200	157500	179200
x <sup>3</sup>	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000
y <sup>3</sup>	27	64	125	216	343	512	729	1000	1331	1728	2197	2744	3375	4096

	US2_160	US2_170	US2_180	US2_240	US2_250	US2_260	US2_270	US2_280	US2_290	US2_300	US2_310	US2_320	US2_330	US2_340
<b>Environmental data</b>														
Depth (cm)	15.00	15.50	14.50	13.50	14.50	15.50	16.00	16.00	24.00	23.00	22.50	25.00	27.50	32.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.03	0.01	0.01	0.03	0.01
Reynolds number	1494.02	1543.82	2888.45	1344.62	1444.22	3087.65	1593.63	3187.25	2390.44	6872.51	2241.04	2490.04	8217.13	3187.25
Froude number	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.01
pH			7.44	7.42						7.42				
Conductivity (µS cm <sup>-1</sup> )	187.40	187.40	187.70	186.70	186.30	187.50	187.50	187.50	187.50	187.50	187.50	187.50	187.50	187.50
Water temperature (°C)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Oxygen saturation (%)	98.40	98.40	98.40	97.60	98.30	98.60	99.10	99.50	100.20	101.90	103.40	104.80	106.60	106.70
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )														
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )														
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )														
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	32.00	80.00	85.00	88.00	64.00	59.00	63.00	77.00	70.00	54.00	62.00	63.00	60.00	55.00
F0 (Gain 7, Meas-Int 9)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	466.67	920.00
Substratum type (dominance of)	sand	sand	sand	sand	sand	sand	sand	sand	sand	sand	sand	sand	rocks	rocks
<b>Spatial data</b>														
x	700	700	700	700	700	700	700	700	700	700	700	700	700	700
y	17	18	19	25	26	27	28	29	30	31	32	33	34	35
x <sup>2</sup>	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000
y <sup>2</sup>	289	324	361	625	676	729	784	841	900	961	1024	1089	1156	1225
x*y	11900	12600	13300	17500	18200	18900	19600	20300	21000	21700	22400	23100	23800	24500
x <sup>2</sup> y	8330000	8820000	9310000	12250000	12740000	13230000	13720000	14210000	14700000	15190000	15680000	16170000	16660000	17150000
x y <sup>2</sup>	202300	226800	252700	437500	473200	510300	548800	588700	630000	672700	716800	762300	809200	857500
x <sup>3</sup>	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000
y <sup>3</sup>	4913	5832	6859	15625	17576	19683	21952	24389	27000	29791	32768	35937	39304	42875

	US2_350	US2_360	US2_370	US2_380	US2_390	US2_400	US2_410	US2_420	US2_430	US2_440	US2_450	US2_460	US2_470	US2_480
<b>Environmental data</b>														
Depth (cm)	31.50	32.00	36.00	34.00	27.00	23.50	19.50	35.00	35.00	38.00	12.00	10.00	9.50	19.00
Current velocity (m s <sup>-1</sup> )	0.02	0.01	0.03	0.04	0.08	0.07	0.01	0.08	0.02	0.01	0.02	0.02	0.01	0.01
Reynolds number	6274.90	3187.25	10756.97	13545.82	21513.94	16384.46	1942.23	27888.45	6972.11	3784.86	2390.44	1992.03	946.22	1892.43
Froude number	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.04	0.01	0.01	0.02	0.02	0.01	0.01
pH						7.42								
Conductivity (µS cm <sup>-1</sup> )	187.60	187.60	187.60	187.60	187.60	187.50	187.50	187.50	187.40	187.40	187.50	187.50	187.20	187.20
Water temperature (°C)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.10	6.10	6.10	6.10	6.20	6.20	6.20
Oxygen saturation (%)	106.50	107.20	107.20	107.20	107.20	110.70	109.30	109.40	108.80	108.50	106.10	105.50	106.50	107.20
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )					222.53			211.95						
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )					10.45			8.73						
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )					122.84			310.94						
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	62.00	65.00	71.00	38.00	30.00	35.00	34.00	37.00	39.00	41.00	28.00	22.00	22.00	30.00
F0 (Gain 7, Meas-Int 9)	239.00	115.67	214.00	395.00	33.67	1576.67	961.67	390.00	706.67	1053.33	690.00	786.67	0.00	623.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>														
x	700	700	700	700	700	700	700	700	700	700	700	700	700	700
y	36	37	38	39	40	41	42	43	44	45	46	47	48	49
x <sup>2</sup>	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000	490000
y <sup>2</sup>	1296	1369	1444	1521	1600	1681	1764	1849	1936	2025	2116	2209	2304	2401
x*y	25200	25900	26600	27300	28000	28700	29400	30100	30800	31500	32200	32900	33600	34300
x <sup>2</sup> y	17640000	18130000	18620000	19110000	19600000	20090000	20580000	21070000	21560000	22050000	22540000	23030000	23520000	24010000
xy <sup>2</sup>	907200	958300	1010800	1064700	1120000	1176700	1234800	1294300	1355200	1417500	1481200	1546300	1612800	1680700
x <sup>3</sup>	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000
y <sup>3</sup>	46656	50653	54872	59319	64000	68921	74088	79507	85184	91125	97336	103823	110592	117649



**UNSHADED REACH  
TRANSECT 3**

	US2_490	US2_500	US3_0	US3_10	US3_20	US3_30	US3_40	US3_50	US3_60	US3_70	US3_80	US3_90
<b>Environmental data</b>												
Depth (cm)	15.50	17.50	21.00	25.00	19.50	23.50	25.50	19.00	14.00	19.50	20.50	20.00
Current velocity (m s <sup>-1</sup> )	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	4631.47	1743.03	2091.63	2490.04	1942.23	2340.64	2539.84	1892.43	1394.42	1942.23	2041.83	1992.03
Froude number	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH		7.41	7.37									
Conductivity (µS cm <sup>-1</sup> )	186.60	186.00	188.70	188.00	188.00	187.90	188.30	188.30	188.20	188.20	188.10	188.10
Water temperature (°C)	6.30	6.70	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Oxygen saturation (%)	108.20	110.20	134.40	135.30	136.60	136.80	136.20	135.40	133.60	133.60	133.60	133.60
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )		281.95	163.12		205.44							
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )		8.73	7.02		6.17							
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )		65.48	240.48		389.06							
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	18.00	17.00	12.00	13.00	13.00	10.00	16.00	21.00	19.00	21.00	26.00	31.00
F0 (Gain 7, Meas-Int 9)	80.00	249.00	131.67	0.00	110.67	0.00	953.67	0.00	0.00	0.00	0.00	0.00
Substratum type (dominance of)	rocks	rocks	rocks	sand	sand	sand	sand	sand	sand	rocks	sand	sand
<b>Spatial data</b>												
x	700	700	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
y	50	51	1	2	3	4	5	6	7	8	9	10
x <sup>2</sup>	490000	490000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000
y <sup>2</sup>	2500	2601	1	4	9	16	25	36	49	64	81	100
x*y	35000	35700	1300	2600	3900	5200	6500	7800	9100	10400	11700	13000
x <sup>2</sup> y	24500000	24990000	1690000	3380000	5070000	6760000	8450000	10140000	11830000	13520000	15210000	16900000
x y <sup>2</sup>	1750000	1820700	1300	5200	11700	20800	32500	46800	63700	83200	105300	130000
x <sup>3</sup>	343000000	343000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000
y <sup>3</sup>	125000	132651	1	8	27	64	125	216	343	512	729	1000

	US3_100	US3_110	US3_120	US3_130	US3_140	US3_150	US3_160	US3_170	US3_180	US3_190	US3_200	US3_210
<b>Environmental data</b>												
Depth (cm)	19.00	19.50	18.00	23.50	19.50	14.50	19.00	20.00	22.00	19.50	20.50	23.50
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	1892.43	1942.23	1792.83	2340.64	1942.23	1444.22	1892.43	1992.03	2191.24	1942.23	2041.83	2340.64
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH	7.36										7.36	
Conductivity (µS cm <sup>-1</sup> )	188.10	188.10	188.10	188.00	188.00	188.00	188.00	188.00	188.00	188.00	188.00	188.00
Water temperature (°C)	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.30	3.30	3.30	3.30
Oxygen saturation (%)	133.60	133.60	134.20	133.80	133.80	132.80	132.60	132.60	132.60	132.60	132.60	132.60
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	286.84	312.88										246.95
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	7.02	7.88										7.88
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	146.77	46.97										394.03
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	35.00	38.00	43.00	48.00	36.00	41.00	38.00	40.00	41.00	39.00	40.00	45.00
F0 (Gain 7, Meas-Int 9)	205.00	32.33	36.00	0.00	18.33	0.00	64.00	225.67	27.00	546.00	9.33	1151.33
Substratum type (dominance of)	sand	sand	sand	sand	sand	sand	sand	sand	sand	sand	rocks	rocks
<b>Spatial data</b>												
x	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
y	11	12	13	14	15	16	17	18	19	20	21	22
x <sup>2</sup>	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000
y <sup>2</sup>	121	144	169	196	225	256	289	324	361	400	441	484
x*y	14300	15600	16900	18200	19500	20800	22100	23400	24700	26000	27300	28600
x <sup>2</sup> y	18590000	20280000	21970000	23660000	25350000	27040000	28730000	30420000	32110000	33800000	35490000	37180000
x y <sup>2</sup>	157300	187200	219700	254800	292500	332800	375700	421200	469300	520000	573300	629200
x <sup>3</sup>	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000
y <sup>3</sup>	1331	1728	2197	2744	3375	4096	4913	5832	6859	8000	9261	10648

**SHADED REACH  
TRANSECT 1**

	US3_220	US3_230	US3_240	US3_250	US3_260	US3_270	US3_280	US3_290	US3_300	US3_310	S1_0	S1_10
<b>Environmental data</b>												
Depth (cm)	24.00	25.00	21.00	27.00	31.00	30.00	29.00	29.00	24.50	10.00	7.00	20.50
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.01	0.01
Reynolds number	2390.44	2490.04	2091.63	2689.24	3087.65	2988.05	2888.45	2888.45	2440.24	14940.24	697.21	2041.83
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.01	0.01
pH									7.36		6.08	
Conductivity (µS cm <sup>-1</sup> )	188.00	188.00	188.00	188.00	188.00	188.00	188.00	188.00	187.90	187.90	190.70	190.60
Water temperature (°C)	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	2.60	2.60
Oxygen saturation (%)	132.30	132.30	132.30	132.10	132.10	132.10	131.80	131.80	131.90	131.40	120.50	120.50
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	119.98									232.30	89.05	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	8.73									7.88	21.58	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	101.84									436.03	200.74	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	44.00	46.00	51.00	48.00	52.00	57.00	44.00	61.00	57.00	61.00	29.00	29.00
F0 (Gain 7, Meas-Int 9)	696.67	1281.67	1557.33	1524.00	1151.67	616.67	360.33	0.00	78.00	381.67	1115.00	0.00
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	sand	rocks	rocks	rocks
<b>Spatial data</b>												
x	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1900	1900
y	23	24	25	26	27	28	29	30	31	32	1	2
x <sup>2</sup>	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	3610000	3610000
y <sup>2</sup>	529	576	625	676	729	784	841	900	961	1024	1	4
x*y	29900	31200	32500	33800	35100	36400	37700	39000	40300	41600	1900	3800
x <sup>2</sup> y	38870000	40560000	42250000	43940000	45630000	47320000	49010000	50700000	52390000	54080000	3610000	7220000
x y <sup>2</sup>	687700	748800	812500	878800	947700	1019200	1093300	1170000	1249300	1331200	1900	7600
x <sup>3</sup>	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	6859000000	6859000000
y <sup>3</sup>	12167	13824	15625	17576	19683	21952	24389	27000	29791	32768	1	8

	S1_20	S1_30	S1_40	S1_50	S1_60	S1_70	S1_80	S1_90	S1_100	S1_110	S1_120	S1_130
<b>Environmental data</b>												
Depth (cm)	20.00	18.50	20.50	22.00	11.00	23.50	16.00	13.00	19.00	15.00	17.50	19.00
Current velocity (m s <sup>-1</sup> )	0.01	0.06	0.01	0.13	0.15	0.17	0.03	0.01	0.01	0.03	0.01	0.01
Reynolds number	1992.03	11055.78	2041.83	28486.06	16434.26	39790.84	4780.88	1294.82	1892.43	4482.07	1743.03	1892.43
Froude number	0.01	0.04	0.01	0.09	0.14	0.11	0.02	0.01	0.01	0.02	0.01	0.01
pH									6.09			
Conductivity (µS cm <sup>-1</sup> )	190.60	190.60	190.60	190.60	190.50	190.50	190.50	190.50	190.50	190.50	190.50	190.50
Water temperature (°C)	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
Oxygen saturation (%)	120.60	120.60	120.60	120.70	120.50	120.30	120.60	120.70	120.60	120.30	119.90	119.90
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	279.51				102.07			128.12			33.70	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	13.87				13.02			13.02			17.30	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	39.52				396.06			136.16			382.29	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	31.00	29.00	29.00	26.00	26.00	25.00	26.00	26.00	26.00	27.00	27.00	28.00
F0 (Gain 7, Meas-Int 9)	556.67	1051.33	279.00	412.67	341.67	434.00	0.00	698.67	815.00	881.00	47.67	188.67
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks	rocks	rocks	sand
<b>Spatial data</b>												
x	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
y	3	4	5	6	7	8	9	10	11	12	13	14
x <sup>2</sup>	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000
y <sup>2</sup>	9	16	25	36	49	64	81	100	121	144	169	196
x*y	5700	7600	9500	11400	13300	15200	17100	19000	20900	22800	24700	26600
x <sup>2</sup> y	10830000	14440000	18050000	21660000	25270000	28880000	32490000	36100000	39710000	43320000	46930000	50540000
x y <sup>2</sup>	17100	30400	47500	68400	93100	121600	153900	190000	229900	273600	321100	372400
x <sup>3</sup>	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000
y <sup>3</sup>	27	64	125	216	343	512	729	1000	1331	1728	2197	2744

**SHADED REACH  
TRANSECT 2**

	S1_140	S1_150	S1_160	S1_170	S1_180	S1_190	S1_200	S2_0	S2_10	S2_20	S2_30	S2_40
<b>Environmental data</b>												
Depth (cm)	19.50	21.50	20.50	15.00	11.00	7.50	8.50	14.00	9.00	17.00	12.00	13.50
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.20	0.24	0.01	0.06	0.01	0.17	0.15
Reynolds number	1942.23	2141.43	2041.83	1494.02	1095.62	14940.24	20318.73	1394.42	5378.49	1693.23	20318.73	20169.32
Froude number	0.01	0.01	0.01	0.01	0.01	0.23	0.26	0.01	0.06	0.01	0.16	0.13
pH							6.11	6.76				
Conductivity (µS cm <sup>-1</sup> )	190.50	190.50	190.50	190.50	190.50	190.50	190.50	196.40	196.40	196.50	196.50	196.50
Water temperature (°C)	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.70	2.70	2.80	2.80	2.80
Oxygen saturation (%)	119.90	119.90	119.90	119.80	120.10	120.10	120.10	104.30	103.00	103.00	103.60	103.90
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )			67.88				60.56	121.60		300.67		80.09
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )			11.30				12.16	12.16		9.59		8.73
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )			457.71				403.52	406.23		404.19		411.65
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	29.00	29.00	27.00	28.00	28.00	26.00	23.00	30.00	26.00	26.00	25.00	27.00
F0 (Gain 7, Meas-Int 9)	0.00	0.00	0.00	0.00	0.00	629.00	616.33	0.00	1397.33	1119.00	1649.33	137.33
Substratum type (dominance of)	sand	sand	sand	sand	sand	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>												
x	1900	1900	1900	1900	1900	1900	1900	2500	2500	2500	2500	2500
y	15	16	17	18	19	20	21	1	2	3	4	5
x <sup>2</sup>	3610000	3610000	3610000	3610000	3610000	3610000	3610000	6250000	6250000	6250000	6250000	6250000
y <sup>2</sup>	225	256	289	324	361	400	441	1	4	9	16	25
x*y	28500	30400	32300	34200	36100	38000	39900	2500	5000	7500	10000	12500
x <sup>2</sup> y	54150000	57760000	61370000	64980000	68590000	72200000	75810000	6250000	12500000	18750000	25000000	31250000
x y <sup>2</sup>	427500	486400	549100	615600	685900	760000	837900	2500	10000	22500	40000	62500
x <sup>3</sup>	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	15625000000	15625000000	15625000000	15625000000	15625000000
y <sup>3</sup>	3375	4096	4913	5832	6859	8000	9261	1	8	27	64	125

	S2_50	S2_60	S2_70	S2_80	S2_90	S2_100	S2_110	S2_120	S2_130	S2_140	S2_150
<b>Environmental data</b>											
Depth (cm)	12.50	12.50	22.00	11.50	17.00	7.00	7.00	15.00	27.00	10.00	10.00
Current velocity (m s <sup>-1</sup> )	0.07	0.01	0.02	0.04	0.44	0.42	0.06	0.38	0.18	0.71	0.11
Reynolds number	8715.14	1245.02	4382.47	4581.67	74501.99	29282.87	4183.27	56772.91	48406.37	70717.13	10956.18
Froude number	0.06	0.01	0.01	0.04	0.34	0.51	0.07	0.31	0.11	0.72	0.11
pH						6.75					
Conductivity (µS cm <sup>-1</sup> )	196.60	196.60	196.60	196.70	196.70	196.80	196.80	196.80	196.90	197.00	197.00
Water temperature (°C)	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Oxygen saturation (%)	104.20	104.20	103.40	103.30	103.40	103.80	104.00	103.90	104.30	104.40	103.80
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )				319.40	42.65					36.95	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )				7.88	12.16					8.73	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )				400.81	405.32					403.74	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	26.00	26.00	19.00	9.00	22.00	23.00	27.00	24.00	31.00	29.00	30.00
F0 (Gain 7, Meas-Int 9)	274.00	1111.67	769.33	453.67	1696.00	375.67	250.00	639.33	614.33	952.67	543.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>											
x	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
y	6	7	8	9	10	11	12	13	14	15	16
x <sup>2</sup>	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000
y <sup>2</sup>	36	49	64	81	100	121	144	169	196	225	256
x*y	15000	17500	20000	22500	25000	27500	30000	32500	35000	37500	40000
x <sup>2</sup> y	37500000	43750000	50000000	56250000	62500000	68750000	75000000	81250000	87500000	93750000	100000000
x y <sup>2</sup>	90000	122500	160000	202500	250000	302500	360000	422500	490000	562500	640000
x <sup>3</sup>	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000
y <sup>3</sup>	216	343	512	729	1000	1331	1728	2197	2744	3375	4096

**SHADED REACH  
TRANSECT 3**

	S2_160	S2_170	S3_0	S3_10	S3_20	S3_30	S3_40	S3_50	S3_60	S3_70	S3_80
<b>Environmental data</b>											
Depth (cm)	11.00	10.00	24.00	29.00	30.00	26.50	30.00	25.00	25.50	25.50	25.50
Current velocity (m s <sup>-1</sup> )	0.11	0.06	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	12051.79	5976.10	2390.44	2888.45	5976.10	2639.44	2988.05	2490.04	2539.84	2539.84	2539.84
Froude number	0.11	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH		6.77	7.15								
Conductivity (µS cm <sup>-1</sup> )	197.00	197.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00
Water temperature (°C)	2.80	2.80	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Oxygen saturation (%)	103.50	103.50	99.60	99.60	99.80	99.80	100.10	100.50	100.50	100.50	100.50
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )		31.26			283.58		213.58				
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )		8.73			10.45		11.30				
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )		404.65			396.29		399.00				
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	31.00	31.00	29.00	22.00	24.00	26.00	25.00	26.00	26.00	29.00	30.00
F0 (Gain 7, Meas-Int 9)	679.00	1394.00	2.00	172.33	422.67	123.00	483.00	742.33	0.00	0.00	33.00
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>											
x	2500	2500	2500	2500	3100	3100	3100	3100	3100	3100	3100
y	17	18	1	2	3	4	5	6	7	8	9
x <sup>2</sup>	6250000	6250000	6250000	6250000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	289	324	1	4	9	16	25	36	49	64	81
x*y	42500	45000	2500	5000	9300	12400	15500	18600	21700	24800	27900
x <sup>2</sup> y	106250000	112500000	6250000	12500000	28830000	38440000	48050000	57660000	67270000	76880000	86490000
x y <sup>2</sup>	722500	810000	2500	10000	27900	49600	77500	111600	151900	198400	251100
x <sup>3</sup>	15625000000	15625000000	15625000000	15625000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	4913	5832	1	8	27	64	125	216	343	512	729

	S3_90	S3_100	S3_170	S3_180	S3_190	S3_200	S3_210	S3_220	S3_230	S3_240	S3_250
<b>Environmental data</b>											
Depth (cm)	27.50	21.00	19.00	22.00	21.00	20.50	21.00	32.00	29.00	24.00	30.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.05
Reynolds number	2739.04	2091.63	1892.43	2191.24	2091.63	2041.83	2091.63	3187.25	2888.45	7171.31	14940.24
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03
pH		7.15	7.15								
Conductivity (µS cm <sup>-1</sup> )	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00	205.00
Water temperature (°C)	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Oxygen saturation (%)	100.60	100.50	101.00	101.00	101.00	101.10	101.50	101.10	101.10	101.20	101.50
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	201.37		233.93								
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	12.16		9.59								
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	413.00		401.48								
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	21.00	22.00	32.00	31.00	25.00	32.00	31.00	33.00	33.00	32.00	33.00
F0 (Gain 7, Meas-Int 9)	997.33	0.00	0.00	0.00	0.00	0.00	0.00	926.67	714.00	0.00	372.67
Substratum type (dominance of)	rocks	rocks	sand	sand	sand	sand	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>											
x	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100
y	10	11	18	19	20	21	22	23	24	25	26
x <sup>2</sup>	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	100	121	324	361	400	441	484	529	576	625	676
x*y	31000	34100	55800	58900	62000	65100	68200	71300	74400	77500	80600
x <sup>2</sup> y	96100000	105710000	172980000	182590000	192200000	201810000	211420000	221030000	230640000	240250000	249860000
x y <sup>2</sup>	310000	375100	1004400	1119100	1240000	1367100	1500400	1639900	1785600	1937500	2095600
x <sup>3</sup>	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	1000	1331	5832	6859	8000	9261	10648	12167	13824	15625	17576



	S3_260	S3_270	S3_280	S3_290	S3_300	S3_310	S3_320	S3_330	S3_340	S3_350
<b>Environmental data</b>										
Depth (cm)	30.50	11.00	25.00	19.00	21.00	17.00	18.00	17.50	18.00	12.00
Current velocity (m s <sup>-1</sup> )	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	3037.85	3286.85	2490.04	1892.43	2091.63	1693.23	1792.83	1743.03	1792.83	1195.22
Froude number	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH					7.14					7.15
Conductivity (μS cm <sup>-1</sup> )	205.00	205.00	205.00	205.00	205.00	205.00	205.00	204.00	204.00	204.00
Water temperature (°C)	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Oxygen saturation (%)	101.60	101.60	101.60	101.20	101.00	100.90	100.80	100.50	100.50	100.40
NH <sub>4</sub> <sup>+</sup> -N (μg L <sup>-1</sup> )	250.21					134.63				223.35
PO <sub>4</sub> <sup>3-</sup> -P (μg L <sup>-1</sup> )	10.45					11.30				14.73
NO <sub>3</sub> <sup>-</sup> -N (μg L <sup>-1</sup> )	399.00					395.16				393.81
Light (μmol photons m <sup>-2</sup> s <sup>-1</sup> )	31.00	33.00	30.00	30.00	31.00	31.00	18.00	25.00	29.00	28.00
F0 (Gain 7, Meas-Int 9)	693.67	1012.00	779.67	667.67	584.67	685.33	0.00	397.00	406.00	281.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>										
x	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100
y	27	28	29	30	31	32	33	34	35	36
x <sup>2</sup>	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	729	784	841	900	961	1024	1089	1156	1225	1296
x*y	83700	86800	89900	93000	96100	99200	102300	105400	108500	111600
x <sup>2</sup> y	259470000	269080000	278690000	288300000	297910000	307520000	317130000	326740000	336350000	345960000
x y <sup>2</sup>	2259900	2430400	2607100	2790000	2979100	3174400	3375900	3583600	3797500	4017600
x <sup>3</sup>	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	19683	21952	24389	27000	29791	32768	35937	39304	42875	46656

## **SPRING 2006**

Environmental and spatial data corresponding to spring (May) 2006 in Fuirosos.



UNSHADED REACH  
TRANSECT 1

	US1_0	US1_10	US1_20	US1_30	US1_40	US1_50	US1_60	US1_70	US1_80	US1_90	US1_100	US1_110	US1_120	US1_130	US1_140	US1_150	US1_160
<b>Environmental data</b>																	
Depth (cm)	5.50	10.00	11.00	12.00	13.00	12.50	14.00	12.00	11.50	11.00	9.50	14.00	14.00	9.00	10.00	12.00	6.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	547.81	996.02	1095.62	1195.22	1294.82	1245.02	1394.42	1195.22	1145.42	1095.62	946.22	1394.42	1394.42	896.41	996.02	1195.22	597.61
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH	7.63										7.64						
Conductivity (µS cm <sup>-1</sup> )	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00
Water temperature (°C)	14.50	14.50	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40
Oxygen saturation (%)	92.00	92.10	92.20	92.50	92.80	92.90	92.40	92.80	92.40	92.20	92.40	91.90	92.00	92.10	92.20	91.80	92.20
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	10.55			11.34				9.76					3.18				16.08
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	5.25			5.54				4.08					4.08				4.08
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	32.06			28.00				27.32					60.06				34.32
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	35.65	197.60	350.00	1054.40	979.80	1119.90	1209.30	1269.70	1286.30	1226.60	1249.90	1303.30	1338.20	1343.90	1343.30	1359.90	1384.40
F0 (Gain 7, Meas-Int 9)	707.33	573.67	217.00	326.33	45.00	799.33	362.00	545.67	221.67	788.33	442.33	106.00	229.00	244.67	237.67	141.67	217.00
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>																	
x	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
y	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
x <sup>2</sup>	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
y <sup>2</sup>	1	4	9	16	25	36	49	64	81	100	121	144	169	196	225	256	289
x*y	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700
x <sup>2</sup> y	10000	20000	30000	40000	50000	60000	70000	80000	90000	100000	110000	120000	130000	140000	150000	160000	170000
x y <sup>2</sup>	100	400	900	1600	2500	3600	4900	6400	8100	10000	12100	14400	16900	19600	22500	25600	28900
x <sup>3</sup>	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
y <sup>3</sup>	1	8	27	64	125	216	343	512	729	1000	1331	1728	2197	2744	3375	4096	4913

**UNSHADED REACH  
TRANSECT 2**

	US1_170	US1_180	US1_190	US1_200	US1_210	US1_220	US1_230	US1_240	US2_0	US2_10	US2_20	US2_30	US2_40	US2_50	US2_60
<b>Environmental data</b>															
Depth (cm)	6.00	8.00	7.50	9.00	8.00	7.00	7.00	7.00	2.00	3.00	4.50	3.50	6.50	2.00	4.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.05	0.04	0.01	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	597.61	796.81	3735.06	3585.66	796.81	2788.84	2788.84	697.21	199.20	298.80	448.21	348.61	647.41	199.20	398.41
Froude number	0.01	0.01	0.06	0.04	0.01	0.05	0.05	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.02
pH				7.60				7.58	7.58						
Conductivity (µS cm <sup>-1</sup> )	232.00	232.00	232.00	232.00	232.00	232.00	232.00	232.00	231.00	231.00	231.00	231.00	231.00	231.00	231.00
Water temperature (°C)	14.40	14.40	14.40	14.40	14.40	14.40	14.40	14.40	15.90	15.90	15.90	15.90	15.90	15.90	15.90
Oxygen saturation (%)	92.30	92.40	92.40	92.50	92.50	92.50	93.50	93.80	99.40	99.40	99.40	99.40	99.50	99.90	100.00
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )			13.71					12.13	1.08					3.97	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )			5.25					5.25	4.96					4.66	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )			28.90					37.03	32.97					27.10	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	1386.00	1379.80	1424.80	1420.60	1434.30	1449.00	1411.60	1371.70	153.10	158.10	310.40	129.83	147.50	249.20	630.70
F0 (Gain 7, Meas-Int 9)	337.33	114.67	210.67	350.67	136.67	215.33	213.67	219.67	13.00	23.33	328.33	28.00	286.67	1145.00	1885.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	sand	sand	rocks	rocks	rocks	rocks
<b>Spatial data</b>															
x	100	100	100	100	100	100	100	100	700	700	700	700	700	700	700
y	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7
x <sup>2</sup>	10000	10000	10000	10000	10000	10000	10000	10000	490000	490000	490000	490000	490000	490000	490000
y <sup>2</sup>	324	361	400	441	484	529	576	625	1	4	9	16	25	36	49
x*y	1800	1900	2000	2100	2200	2300	2400	2500	700	1400	2100	2800	3500	4200	4900
x <sup>2</sup> y	180000	190000	200000	210000	220000	230000	240000	250000	490000	980000	1470000	1960000	2450000	2940000	3430000
x y <sup>2</sup>	32400	36100	40000	44100	48400	52900	57600	62500	700	2800	6300	11200	17500	25200	34300
x <sup>3</sup>	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000
y <sup>3</sup>	5832	6859	8000	9261	10648	12167	13824	15625	1	8	27	64	125	216	343

**UNSHADED REACH  
TRANSECT 3**

	US2_70	US2_90	US2_100	US2_110	US2_120	US2_130	US2_140	US2_150	US2_190	US3_0	US3_10	US3_20	US3_40
<b>Environmental data</b>													
Depth (cm)	7.00	6.00	5.50	3.00	4.50	1.00	4.00	4.00	1.00	1.00	3.00	1.00	2.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.05	0.01	0.01	0.01	0.05	0.05	0.01	0.01	0.01	0.01	0.01
Reynolds number	697.21	597.61	2739.04	298.80	448.21	99.60	1992.03	1992.03	99.60	99.60	298.80	99.60	199.20
Froude number	0.01	0.01	0.07	0.02	0.02	0.03	0.08	0.08	0.03	0.03	0.02	0.03	0.02
pH			7.62						7.56	7.56			
Conductivity (µS cm <sup>-1</sup> )	231.00	231.00	231.00	231.00	231.00	231.00	231.00	231.00	231.00	229.00	229.00	229.00	230.00
Water temperature (°C)	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	18.10	18.10	18.10	17.70
Oxygen saturation (%)	99.70	99.80	98.30	99.50	99.50	98.00	98.00	98.00	98.00	97.90	97.90	97.90	97.90
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )	9.50		18.71			4.24		53.18	5.03		3.45		13.97
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )	6.13		5.25			5.54		5.25	6.13		7.30		5.25
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )	38.39		29.35			35.23		30.94	36.81		36.35		27.55
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	851.60	910.90	750.80	1011.10	1156.60	1071.90	898.80	1177.60	1261.40	892.90	279.30	127.70	172.20
F0 (Gain 7, Meas-Int 9)	1804.67	294.67	207.00	294.33	119.67	295.67	302.67	198.00	638.33	434.00	171.00	767.00	136.67
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	sand	rocks	rocks
<b>Spatial data</b>													
x	700	700	700	700	700	700	700	700	700	1300	1300	1300	1300
y	8	10	11	12	13	14	15	16	20	1	2	3	5
x <sup>2</sup>	490000	490000	490000	490000	490000	490000	490000	490000	490000	1690000	1690000	1690000	1690000
y <sup>2</sup>	64	100	121	144	169	196	225	256	400	1	4	9	25
x*y	5600	7000	7700	8400	9100	9800	10500	11200	14000	1300	2600	3900	6500
x <sup>2</sup> y	3920000	4900000	5390000	5880000	6370000	6860000	7350000	7840000	9800000	1690000	3380000	5070000	8450000
x y <sup>2</sup>	44800	70000	84700	100800	118300	137200	157500	179200	280000	1300	5200	11700	32500
x <sup>3</sup>	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	343000000	2197000000	2197000000	2197000000	2197000000
y <sup>3</sup>	512	1000	1331	1728	2197	2744	3375	4096	8000	1	8	27	125

	US3_60	US3_80	US3_90	US3_100	US3_110	US3_120	US3_130	US3_140	US3_160	US3_170	US3_180	US3_190	US3_200
<b>Environmental data</b>													
Depth (cm)	1.00	3.00	5.00	5.50	8.00	9.00	7.00	2.00	5.00	6.00	4.50	4.00	1.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	99.60	298.80	498.01	547.81	796.81	896.41	697.21	199.20	498.01	597.61	448.21	398.41	99.60
Froude number	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.03
pH				7.56									7.55
Conductivity (µS cm <sup>-1</sup> )	230.00	231.00	231.00	231.00	231.00	231.00	230.00	230.00	231.00	231.00	231.00	231.00	231.00
Water temperature (°C)	17.50	17.40	17.40	17.40	17.40	17.40	17.30	17.30	17.20	17.20	17.30	17.30	17.30
Oxygen saturation (%)	99.00	99.80	99.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )				8.45				6.08					5.82
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )				4.96				5.54					5.54
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )				26.19				28.45					25.97
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	1027.30	707.60	1076.90	1082.30	1091.90	1300.70	1339.80	1342.00	1400.20	1435.80	1413.90	1430.80	1370.00
F0 (Gain 7, Meas-Int 9)	360.67	354.67	266.00	1321.00	133.67	698.67	744.33	293.00	493.00	72.00	180.33	169.33	631.00
Substratum type (dominance of)	sand	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks
<b>Spatial data</b>													
x	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300
y	7	9	10	11	12	13	14	15	17	18	19	20	21
x <sup>2</sup>	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000
y <sup>2</sup>	49	81	100	121	144	169	196	225	289	324	361	400	441
x*y	9100	11700	13000	14300	15600	16900	18200	19500	22100	23400	24700	26000	27300
x <sup>2</sup> y	11830000	15210000	16900000	18590000	20280000	21970000	23660000	25350000	28730000	30420000	32110000	33800000	35490000
x y <sup>2</sup>	63700	105300	130000	157300	187200	219700	254800	292500	375700	421200	469300	520000	573300
x <sup>3</sup>	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000
y <sup>3</sup>	343	729	1000	1331	1728	2197	2744	3375	4913	5832	6859	8000	9261

**SHADED REACH  
TRANSECT 1**

	US3_210	US3_220	US3_230	US3_240	US3_250	US3_260	US3_270	US3_280	S1_0	S1_10	S1_20	S1_40	S1_50
<b>Environmental data</b>													
Depth (cm)	3.00	2.00	2.00	2.00	2.00	3.00	2.00	1.00	2.00	8.00	10.00	5.00	9.00
Current velocity (m s <sup>-1</sup> )	0.01	0.08	0.05	0.05	0.01	0.01	0.14	0.05	0.01	0.01	0.01	0.01	0.01
Reynolds number	298.80	1593.63	996.02	996.02	199.20	298.80	2788.84	498.01	199.20	796.81	996.02	498.01	896.41
Froude number	0.02	0.18	0.11	0.11	0.02	0.02	0.32	0.16	0.02	0.01	0.01	0.01	0.01
pH								7.55	7.43				
Conductivity (µS cm <sup>-1</sup> )	231.00	230.00	230.00	231.00	231.00	231.00	230.00	230.00	228.00	228.00	230.00	229.00	230.00
Water temperature (°C)	17.30	17.30	17.30	17.30	17.30	17.30	17.30	17.30	15.70	15.70	15.20	15.10	14.80
Oxygen saturation (%)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	79.60	81.20	83.50	83.00	83.50
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )				17.66				8.71				32.92	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )				6.13				6.13				4.96	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )				33.65				42.90				46.06	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	1452.60	1110.00	932.00	669.00	364.40	352.70	311.00	289.60	51.28	51.23	51.47	50.70	50.23
F0 (Gain 7, Meas-Int 9)	231.67	223.33	355.00	1242.33	297.00	524.00	355.33	141.00	332.67	489.33	156.00	122.67	0.00
Substratum type (dominance of)	sand	rocks	rocks	rocks	rocks	rocks	sand	sand	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>													
x	1300	1300	1300	1300	1300	1300	1300	1300	1900	1900	1900	1900	1900
y	22	23	24	25	26	27	28	29	1	2	3	5	6
x <sup>2</sup>	1690000	1690000	1690000	1690000	1690000	1690000	1690000	1690000	3610000	3610000	3610000	3610000	3610000
y <sup>2</sup>	484	529	576	625	676	729	784	841	1	4	9	25	36
x*y	28600	29900	31200	32500	33800	35100	36400	37700	1900	3800	5700	9500	11400
x <sup>2</sup> y	37180000	38870000	40560000	42250000	43940000	45630000	47320000	49010000	3610000	7220000	10830000	18050000	21660000
x y <sup>2</sup>	629200	687700	748800	812500	878800	947700	1019200	1093300	1900	7600	17100	47500	68400
x <sup>3</sup>	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	2197000000	6859000000	6859000000	6859000000	6859000000	6859000000
y <sup>3</sup>	10648	12167	13824	15625	17576	19683	21952	24389	1	8	27	125	216



	S1_60	S1_70	S1_80	S1_90	S1_100	S1_110	S1_120	S1_140	S1_150	S1_160	S1_170	S1_180	S1_210
<b>Environmental data</b>													
Depth (cm)	15.00	15.00	9.00	6.00	5.00	5.50	8.50	11.00	8.50	5.00	4.00	5.00	11.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
Reynolds number	1494.02	1494.02	896.41	597.61	498.01	547.81	846.61	1095.62	846.61	498.01	398.41	498.01	4382.47
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.04
pH					7.34								7.31
Conductivity (µS cm <sup>-1</sup> )	229.00	230.00	230.00	229.00	229.00	230.00	230.00	229.00	229.00	230.00	229.00	229.00	229.00
Water temperature (°C)	14.80	14.70	14.70	14.70	14.70	14.60	14.60	14.80	14.70	14.60	14.70	14.70	14.70
Oxygen saturation (%)	83.80	83.90	84.90	85.00	84.20	84.30	85.80	86.80	86.50	86.40	86.30	86.40	86.80
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )				6.34			10.82			8.45			3.71
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )				4.96			5.54			4.96			5.54
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )				40.19			40.19			44.94			44.26
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	51.22	53.03	57.11	56.59	64.78	57.74	56.22	138.78	243.10	254.40	339.90	194.00	61.69
F0 (Gain 7, Meas-Int 9)	173.33	190.33	121.67	54.00	149.33	48.33	48.33	64.67	0.00	59.33	0.00	0.00	24.00
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	sand	rocks	rocks	sand	sand	rocks
<b>Spatial data</b>													
x	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
y	7	8	9	10	11	12	13	15	16	17	18	19	22
x <sup>2</sup>	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000
y <sup>2</sup>	49	64	81	100	121	144	169	225	256	289	324	361	484
x*y	13300	15200	17100	19000	20900	22800	24700	28500	30400	32300	34200	36100	41800
x <sup>2</sup> y	25270000	28880000	32490000	36100000	39710000	43320000	46930000	54150000	57760000	61370000	64980000	68590000	79420000
x y <sup>2</sup>	93100	121600	153900	190000	229900	273600	321100	427500	486400	549100	615600	685900	919600
x <sup>3</sup>	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000
y <sup>3</sup>	343	512	729	1000	1331	1728	2197	3375	4096	4913	5832	6859	10648

	S1_240	S1_250	S1_260	S1_270	S1_280	S1_290	S1_300	S1_310	S1_320	S1_330	S1_340	S1_350	S1_360
<b>Environmental data</b>													
Depth (cm)	6.00	7.00	14.00	16.00	9.00	12.00	20.00	14.00	15.00	14.00	15.00	2.00	4.00
Current velocity (m s <sup>-1</sup> )	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	4183.27	697.21	1394.42	1593.63	896.41	1195.22	1992.03	1394.42	1494.02	1394.42	1494.02	199.20	398.41
Froude number	0.09	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
pH							7.31						7.33
Conductivity (µS cm <sup>-1</sup> )	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00
Water temperature (°C)	14.60	14.60	14.60	14.60	14.60	14.60	14.60	14.60	14.60	14.60	14.70	14.70	14.80
Oxygen saturation (%)	88.20	86.80	87.60	87.90	88.40	88.70	88.70	89.60	89.80	89.50	90.10	89.00	90.40
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )		78.71											16.08
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )		4.96											6.13
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )		54.19											43.13
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	60.02	126.26	74.36	65.86	83.91	98.78	176.80	159.10	111.50	112.60	248.26	50.61	44.69
F0 (Gain 7, Meas-Int 9)	215.00	348.67	233.33	114.33	217.33	263.33	1138.00	0.00	160.33	288.00	23.33	133.00	282.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>													
x	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
y	25	26	27	28	29	30	31	32	33	34	35	36	37
x <sup>2</sup>	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000	3610000
y <sup>2</sup>	625	676	729	784	841	900	961	1024	1089	1156	1225	1296	1369
x*y	47500	49400	51300	53200	55100	57000	58900	60800	62700	64600	66500	68400	70300
x <sup>2</sup> y	90250000	93860000	97470000	101080000	104690000	108300000	111910000	115520000	119130000	122740000	126350000	129960000	133570000
x y <sup>2</sup>	1187500	1284400	1385100	1489600	1597900	1710000	1825900	1945600	2069100	2196400	2327500	2462400	2601100
x <sup>3</sup>	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000	6859000000
y <sup>3</sup>	15625	17576	19683	21952	24389	27000	29791	32768	35937	39304	42875	46656	50653

SHADED REACH  
TRANSECT 2

	S2_0	S2_20	S2_30	S2_40	S2_50	S2_60	S2_80	S2_90	S2_100	S2_110	S2_120	S2_130
<b>Environmental data</b>												
Depth (cm)	1.00	8.00	13.00	8.00	7.50	6.00	5.00	4.00	13.00	1.00	1.00	1.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.02	0.02	0.01	0.14	0.05	0.24	0.05	0.06	0.04
Reynolds number	99.60	796.81	1294.82	1593.63	1494.02	597.61	6972.11	1992.03	31075.70	498.01	597.61	398.41
Froude number	0.03	0.01	0.01	0.02	0.02	0.01	0.20	0.08	0.21	0.16	0.19	0.13
pH	7.39								7.40			
Conductivity (µS cm <sup>-1</sup> )	226.00	230.00	230.00	230.00	229.00	229.00	229.00	230.00	230.00	229.00	230.00	230.00
Water temperature (°C)	16.60	15.90	15.80	15.70	15.70	15.70	15.70	15.60	15.60	15.60	15.60	15.60
Oxygen saturation (%)	84.20	88.40	87.60	87.60	89.50	93.00	93.10	92.90	95.80	96.00	97.00	97.70
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )		5.55		33.97		11.87	18.97		15.29		29.50	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )		4.96		4.66		5.25	6.13		4.96		5.84	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )		32.06		35.00		32.29	34.77		54.19		44.48	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	218.70	80.94	73.44	82.69	83.33	88.81	155.00	105.70	74.77	108.36	136.86	140.24
F0 (Gain 7, Meas-Int 9)	630.33	223.00	135.00	241.67	179.67	0.00	259.33	0.00	343.67	1083.00	1510.67	934.67
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>												
x	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
y	1	3	4	5	6	7	9	10	11	12	13	14
x <sup>2</sup>	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000	6250000
y <sup>2</sup>	1	9	16	25	36	49	81	100	121	144	169	196
x*y	2500	7500	10000	12500	15000	17500	22500	25000	27500	30000	32500	35000
x <sup>2</sup> y	6250000	18750000	25000000	31250000	37500000	43750000	56250000	62500000	68750000	75000000	81250000	87500000
x y <sup>2</sup>	2500	22500	40000	62500	90000	122500	202500	250000	302500	360000	422500	490000
x <sup>3</sup>	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000	15625000000
y <sup>3</sup>	1	27	64	125	216	343	729	1000	1331	1728	2197	2744

**SHADED REACH  
TRANSECT 3**

	S2_140	S2_150	S3_0	S3_10	S3_20	S3_50	S3_60	S3_70	S3_80	S3_90	S3_100	S3_110
<b>Environmental data</b>												
Depth (cm)	7.00	9.00	2.50	4.00	6.00	1.00	4.50	11.00	8.00	11.00	16.00	14.00
Current velocity (m s <sup>-1</sup> )	0.04	0.17	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	2788.84	15239.04	249.00	398.41	597.61	99.60	448.21	1095.62	796.81	1095.62	1593.63	1394.42
Froude number	0.05	0.18	0.02	0.02	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.01
pH		7.40	7.38								7.38	
Conductivity (µS cm <sup>-1</sup> )	230.00	230.00	227.00	228.00	228.00	228.00	228.00	228.00	229.00	229.00	229.00	229.00
Water temperature (°C)	15.60	15.60	17.10	17.10	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Oxygen saturation (%)	98.10	98.10	86.50	86.30	86.40	89.10	88.80	88.50	88.10	89.60	89.70	89.90
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )		17.66		25.55		11.61						16.34
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )		6.13		8.18		5.54						6.13
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )		34.77		32.74		32.97						41.55
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	115.09	112.11	98.78	46.60	31.30	36.60	36.22	36.18	36.48	35.83	35.03	35.17
F0 (Gain 7, Meas-Int 9)	226.67	48.00	0.00	100.67	0.00	1067.33	763.00	765.33	868.33	181.67	294.00	565.00
Substratum type (dominance of)	sand	sand	sand	sand	sand	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>												
x	2500	2500	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100
y	15	16	1	2	3	6	7	8	9	10	11	12
x <sup>2</sup>	6250000	6250000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	225	256	1	4	9	36	49	64	81	100	121	144
x*y	37500	40000	3100	6200	9300	18600	21700	24800	27900	31000	34100	37200
x <sup>2</sup> y	93750000	100000000	9610000	19220000	28830000	57660000	67270000	76880000	86490000	96100000	105710000	115320000
x y <sup>2</sup>	562500	640000	3100	12400	27900	111600	151900	198400	251100	310000	375100	446400
x <sup>3</sup>	15625000000	15625000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	3375	4096	1	8	27	216	343	512	729	1000	1331	1728

	S3_120	S3_130	S3_140	S3_150	S3_160	S3_170	S3_180	S3_190	S3_200	S3_210	S3_220	S3_230
<b>Environmental data</b>												
Depth (cm)	11.00	11.00	19.00	18.00	15.00	16.00	8.00	12.00	13.00	12.50	12.00	7.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	1095.62	1095.62	1892.43	1792.83	1494.02	1593.63	796.81	1195.22	1294.82	1245.02	1195.22	697.21
Froude number	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH									7.38			
Conductivity (µS cm <sup>-1</sup> )	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00
Water temperature (°C)	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Oxygen saturation (%)	90.10	90.20	90.50	91.20	91.70	92.10	92.30	92.40	92.40	92.20	92.50	92.70
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )					4.50						16.08	
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )					5.84						7.01	
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )					39.29						58.03	
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	34.39	33.27	32.06	31.14	30.66	27.33	28.18	27.86	27.16	25.94	25.34	23.98
F0 (Gain 7, Meas-Int 9)	207.33	287.67	471.00	437.67	15.00	324.33	520.33	583.00	805.33	350.00	766.00	562.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>												
x	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100	3100
y	13	14	15	16	17	18	19	20	21	22	23	24
x <sup>2</sup>	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	169	196	225	256	289	324	361	400	441	484	529	576
x*y	40300	43400	46500	49600	52700	55800	58900	62000	65100	68200	71300	74400
x <sup>2</sup> y	124930000	134540000	144150000	153760000	163370000	172980000	182590000	192200000	201810000	211420000	221030000	230640000
x y <sup>2</sup>	523900	607600	697500	793600	895900	1004400	1119100	1240000	1367100	1500400	1639900	1785600
x <sup>3</sup>	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	2197	2744	3375	4096	4913	5832	6859	8000	9261	10648	12167	13824

	S3_240	S3_250	S3_260	S3_280	S3_290	S3_300	S3_310	S3_320
<b>Environmental data</b>								
Depth (cm)	10.50	17.00	4.00	11.00	5.00	12.00	6.00	8.00
Current velocity (m s <sup>-1</sup> )	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Reynolds number	1045.82	1693.23	398.41	1095.62	498.01	1195.22	597.61	796.81
Froude number	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
pH						7.38		7.39
Conductivity (µS cm <sup>-1</sup> )	229.00	229.00	229.00	229.00	229.00	229.00	229.00	229.00
Water temperature (°C)	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Oxygen saturation (%)	92.60	92.60	92.60	92.50	92.70	93.30	93.50	93.60
NH <sub>4</sub> <sup>+</sup> -N (µg L <sup>-1</sup> )					7.92			17.13
PO <sub>4</sub> <sup>3-</sup> -P (µg L <sup>-1</sup> )					7.01			9.65
NO <sub>3</sub> <sup>-</sup> -N (µg L <sup>-1</sup> )					46.97			36.13
Light (µmol photons m <sup>-2</sup> s <sup>-1</sup> )	23.44	22.07	21.97	20.71	25.04	129.02	20.38	18.48
F0 (Gain 7, Meas-Int 9)	328.67	30.00	864.33	107.00	502.33	708.67	416.00	74.33
Substratum type (dominance of)	rocks	rocks	rocks	rocks	rocks	rocks	rocks	rocks
<b>Spatial data</b>								
x	3100	3100	3100	3100	3100	3100	3100	3100
y	25	26	27	29	30	31	32	33
x <sup>2</sup>	9610000	9610000	9610000	9610000	9610000	9610000	9610000	9610000
y <sup>2</sup>	625	676	729	841	900	961	1024	1089
x*y	77500	80600	83700	89900	93000	96100	99200	102300
x <sup>2</sup> y	240250000	249860000	259470000	278690000	288300000	297910000	307520000	317130000
x y <sup>2</sup>	1937500	2095600	2259900	2607100	2790000	2979100	3174400	3375900
x <sup>3</sup>	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000	29791000000
y <sup>3</sup>	15625	17576	19683	24389	27000	29791	32768	35937



## **APPENDIX 4**

Benthic algae and cyanobacteria data corresponding to winter  
(December) 2005 and spring (May) 2006 in Fuirosos.





## **WINTER 2005**

Benthic algae and cyanobacteria data corresponding to December 2005 in Fuirosos.



UNSHADED REACH  
TRANSECT 1

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_20	US1_30
Bacillariophyta	ABIA	ADBI	<i>Achnanthes bioeletiana</i> Grunow	<i>Achnanthidium bioeletianum</i> (Grunow in Cl. & Grun.) Round & Bukhtiyarova	1082964.84	2559450.10
Bacillariophyta	ABIO	PBIO	<i>Achnanthes bioretti</i> Germain	<i>Psammothidium bioretti</i> (Germain) Bukhtiyarova	1553428.62	7342663.21
Bacillariophyta	ACLE	KCLE	<i>Achnanthes clevei</i> Grunow	<i>Karayevia clevei</i> (Grun. in Cl. & Grun.) Round & Bukhtiyarova	0.00	0.00
Bacillariophyta	ACOA		<i>Achnanthes coarctata</i> (Brébisson) Grunow in Cl. & Grun.		0.00	0.00
Bacillariophyta	ADAO	PDAO	<i>Achnanthes daonensis</i> Lange-Bertalot	<i>Psammothidium daonense</i> (Lange-Bertalot) Lange-Bertalot	0.00	0.00
Bacillariophyta	AEXG		<i>Achnanthes exigua</i> Grunow in Cl. & Grunow		0.00	0.00
Bacillariophyta	AEEL		<i>Achnanthes exigua</i> Grunow var. <i>elliptica</i> Hustedt		0.00	0.00
Bacillariophyta	AHEL	PHEL	<i>Achnanthes helvetica</i> (Hustedt) Lange-Bertalot	<i>Psammothidium helveticum</i> (Hustedt) Bukhtiyarova et Round	0.00	0.00
Bacillariophyta	ALVS	EULA	<i>Achnanthes laevis</i> Oestrup	<i>Eucocconeis laevis</i> (Oestrup) Lange-Bertalot	0.00	11144823.55
Bacillariophyta	ALFR	PLFR	<i>Achnanthes lanceolata</i> (Breb.) Grun. ssp. <i>frequentissima</i> Lange-Bertalot	<i>Planothidium frequentissimum</i> (Lange-Bertalot) Round & Bukhtiyarova	0.00	0.00
Bacillariophyta	ALAN	PTLA	<i>Achnanthes lanceolata</i> (Breb.) Grunow	<i>Planothidium lanceolatum</i> (Breb.) Round & Bukhtiyarova	0.00	0.00
Bacillariophyta	ALAR	PRST	<i>Achnanthes lanceolata</i> ssp. <i>rostrata</i> (Oestrup) Lange-Bertalot	<i>Planothidium rostratum</i> (Oestrup) Lange-Bertalot	0.00	0.00
Bacillariophyta	AMIN	ADMI	<i>Achnanthes minutissima</i> Kützing	<i>Achnanthidium minutissimum</i> (Kütz.) Czarnecki	3333026.65	19255343.40
Bacillariophyta	ASCL	PSAC	<i>Achnanthes saccula</i> Carter in Carter & Bailey-Watts	<i>Psammothidium sacculum</i> (Carter) Bukhtiyarova et Round	0.00	0.00
Bacillariophyta	APEL		<i>Amphipleura pellicida</i> Kützing		27977508.90	44080863.64
Bacillariophyta	AHOL		<i>Amphora holsatica</i> Hustedt		0.00	0.00
Bacillariophyta	AINA		<i>Amphora inariensis</i> Krammer		0.00	0.00
Bacillariophyta	ALIB	ACOP	<i>Amphora libyca</i> Ehr.	<i>Amphora copulata</i> (Kützing) Schoeman & Archibald	0.00	0.00
Bacillariophyta	AMMO		<i>Amphora montana</i> Krasske		0.00	0.00
Bacillariophyta	AOVA		<i>Amphora ovalis</i> (Kützing) Kützing		0.00	0.00
Bacillariophyta	APED		<i>Amphora pediculus</i> (Kützing) Grunow		0.00	0.00
Bacillariophyta	AVEN		<i>Amphora veneta</i> Kützing		0.00	0.00
Bacillariophyta	AVIT	BVIT	<i>Anomoeoneis vitrea</i> (Grunow) Ross	<i>Brachysira vitrea</i> (Grunow) Ross in Hartley	0.00	0.00
Bacillariophyta	CBAC		<i>Caloneis bacillum</i> (Grunow) Cleve		1375360.32	0.00
Bacillariophyta	CPED		<i>Cocconeis pediculus</i> Ehrenberg		34670574.43	32775802.94
Bacillariophyta	CPLA		<i>Cocconeis placentula</i> Ehrenberg		10241421.45	64544803.36
Bacillariophyta	CDUB		<i>Cyclotephanos dubius</i> (Fricke) Round		0.00	0.00
Bacillariophyta	CDTG		<i>Cyclotella distinguenda</i> Hustedt		0.00	0.00
Bacillariophyta	CDUN		<i>Cyclotella distinguenda</i> var. <i>unipunctata</i> (Hustedt) Hakansson & Carter		0.00	0.00
Bacillariophyta	CMEN		<i>Cyclotella meneghiniana</i> Kützing		0.00	0.00
Bacillariophyta	CPST	DPST	<i>Cyclotella pseudostelligera</i> Hustedt	<i>Discostella pseudostelligera</i> (Hustedt) Houk. et Klee	0.00	0.00
Bacillariophyta	CAFF		<i>Cymbella affinis</i> Kützing	<i>Cymbella gr. excisa/parva</i>	0.00	0.00
Bacillariophyta	CMIC	ENCM	<i>Cymbella microcephala</i> Grunow	<i>Encyonopsis microcephala</i> (Grunow) Krammer	0.00	0.00
Bacillariophyta	CMIN	ENMI	<i>Cymbella minuta</i> Hilse ex Rabenhorst	<i>Encyonema minutum</i> (Hilse in Rabh.) D. G. Mann	0.00	3170849.63
Bacillariophyta	CPRO	EPRO	<i>Cymbella prostrata</i> (Berkeley) Grunow	<i>Encyonema prostratum</i> (Berkeley) Kützing	0.00	0.00
Bacillariophyta	CSLE	ESLE	<i>Cymbella silesiaca</i> Bleisch	<i>Encyonema silesiacum</i> (Bleisch in Rabh.) D.G. Mann	1748057.47	4131312.23
Bacillariophyta	CSIN	RSIN	<i>Cymbella sinuata</i> Gregory	<i>Reimeria sinuata</i> (Gregory) Kociolek & Stoermer	0.00	0.00
Bacillariophyta	CTUM		<i>Cymbella tumida</i> (Brébisson) Van Heurck		0.00	0.00
Bacillariophyta	DVUL		<i>Diatoma vulgare</i> Bory 1824		0.00	0.00
Bacillariophyta	DOBL		<i>Diploneis oblongella</i> (Naegeli) Cleve-Euler		0.00	0.00
Bacillariophyta	ESOR		<i>Epithemia sorex</i> Kützing		0.00	0.00
Bacillariophyta	EIMP		<i>Eunotia implicata</i> Nörpel, Lange-Bertalot & Alles		0.00	0.00
Bacillariophyta	EMIN		<i>Eunotia minor</i> (Kützing) Grunow in Van Heurck		0.00	0.00
Bacillariophyta	EPEC		<i>Eunotia pectinalis</i> (Dyhlwyn) Rabenhorst		0.00	0.00
Bacillariophyta	ESOL		<i>Eunotia soleirolii</i> (Kützing) Rabenhorst		0.00	0.00
Bacillariophyta	FBCP		<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot		0.00	0.00
Bacillariophyta	FBRE		<i>Fragilaria brevistriata</i> Grunow		0.00	0.00
Bacillariophyta	FCCP		<i>Fragilaria capucina</i> Desmazières var. <i>capitellata</i> (Grunow) Lange-Bertalot		0.00	0.00
Bacillariophyta	FCGR	FGRA	<i>Fragilaria capucina</i> Desmazières var. <i>gracilis</i> (Oestrup) Hustedt	<i>Fragilaria gracilis</i> Ostrup	0.00	0.00
Bacillariophyta	FCME		<i>Fragilaria capucina</i> Desmazières var. <i>mesolepta</i> (Rabenhorst) Rabenhorst		0.00	0.00
Bacillariophyta	FCRU		<i>Fragilaria capucina</i> Desmazières var. <i>rumpens</i> (Kütz.) Lange-Bert.		0.00	0.00
Bacillariophyta	FCVA		<i>Fragilaria capucina</i> Desmazières var. <i>vaucheriae</i> (Kützing) Lange-Bertalot		0.00	7994253.23
Bacillariophyta	FCSS	SCSS	<i>Fragilaria construens</i> (Ehrenberg) Grunow f. <i>subsalina</i> (Hustedt) Hustedt	<i>Staurosira construens</i> Ehr. f. <i>subsalina</i> (Hust.) Bukhtiyarova	0.00	0.00
Bacillariophyta	FELL	SELI	<i>Fragilaria elliptica</i> (Schumann) Williams & Round	<i>Staurosira elliptica</i> (Schumann) Williams & Round	0.00	0.00
Bacillariophyta	FPIN	SPIN	<i>Fragilaria pinnata</i> Ehrenberg	<i>Staurosirella pinnata</i> (Ehr.) Williams & Round	0.00	0.00
Bacillariophyta	FULN	UULN	<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot	<i>Ulnaria ulna</i> (Nitzsch.) Compère	46322778.90	875824123.27

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_20	US1_30
Bacillariophyta	FUAC		<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot var. <i>acus</i> (Kütz.) Lange-Bertalot		0.00	0.00
Bacillariophyta	FVUL		<i>Frustulia vulgaris</i> (Thwaites) De Toni		14554383.41	0.00
Bacillariophyta	GACU		<i>Gomphonema acuminatum</i> Ehrenberg		0.00	0.00
Bacillariophyta	GCLA		<i>Gomphonema clavatum</i> Ehr.		0.00	0.00
Bacillariophyta	GGRA		<i>Gomphonema gracile</i> Ehrenberg		0.00	0.00
Bacillariophyta	GMIC		<i>Gomphonema micropus</i> Kützing		4651657.69	21987206.47
Bacillariophyta	GMIN		<i>Gomphonema minutum</i> (Ag.) Agardh		0.00	4592399.95
Bacillariophyta	GOLI		<i>Gomphonema olivaceum</i> (Hornemann) Brébisson		0.00	0.00
Bacillariophyta	GPAR		<i>Gomphonema parvulum</i> Kützing		2744112.97	0.00
Bacillariophyta	GPLA		<i>Gomphonema parvulum</i> Kützing var. <i>lagenula</i> (Kütz.) Frenguelli		0.00	0.00
Bacillariophyta	GPRO		<i>Gomphonema productum</i> (Grunow) Lange-Bertalot & Reichardt		0.00	0.00
Bacillariophyta	GPUM		<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	<i>Gomphonema gr. pumilum</i>	0.00	0.00
Bacillariophyta	GRHO		<i>Gomphonema rhombicum</i> Fricke		0.00	0.00
Bacillariophyta	GTER		<i>Gomphonema tergestinum</i> Fricke		1960812.86	0.00
Bacillariophyta	GTRU		<i>Gomphonema truncatum</i> Ehr.		0.00	0.00
Bacillariophyta	HAMP		<i>Hantzschia amphioxys</i> (Ehr.) Grunow in Cleve et Grunow 1880		0.00	0.00
Bacillariophyta	MVAR		<i>Melosira varians</i> Agardh		0.00	1582932031.19
Bacillariophyta	MCCO		<i>Meridion circulare</i> (Greville) Agardh var. <i>constrictum</i> (Ralfs) Van Heurck		0.00	0.00
Bacillariophyta	MCIR		<i>Meridion circulare</i> (Greville) C.A.Agardh		0.00	0.00
Bacillariophyta	NATO	MAAT	<i>Navicula atomus</i> (Kützing) Lange-Bertalot	<i>Mayamaea atomus</i> (Kützing) Lange-Bertalot	0.00	0.00
Bacillariophyta	NAPE	MAPE	<i>Navicula atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	<i>Mayamaea atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	0.00	0.00
Bacillariophyta	NBAC	SEBA	<i>Navicula bacillum</i> Ehrenberg	<i>Sellaphora bacillum</i> (Ehrenberg) D. G. Mann	0.00	0.00
Bacillariophyta	NBDR	CRBU	<i>Navicula buderi</i> Hustedt	<i>Craticula buderi</i> (Hustedt) Lange-Bertalot	0.00	0.00
Bacillariophyta	NCAP	HCAP	<i>Navicula capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	<i>Hippodonta capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	0.00	9041287.40
Bacillariophyta	NCPR		<i>Navicula capitatoradiata</i> Germain		0.00	0.00
Bacillariophyta	NCIN		<i>Navicula cincta</i> (Ehr.) Ralfs in Pritchard		0.00	0.00
Bacillariophyta	NCON	DCOT	<i>Navicula contenta</i> Grunow	<i>Diademesmis contenta</i> (Grunow ex V. Heurck) Mann	0.00	0.00
Bacillariophyta	NCRY		<i>Navicula cryptocephala</i> Kützing		4324369.06	30660294.20
Bacillariophyta	NCTE		<i>Navicula cryptotenella</i> Lange-Bertalot		5855714.60	11071391.28
Bacillariophyta	NDEC	GDEC	<i>Navicula decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	<i>Geissleria decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	0.00	0.00
Bacillariophyta	NELG	PEEX	<i>Navicula elginensis</i> (Gregory) Ralfs in Pritchard	<i>Placoneis elginensis</i> (Greg.) Cox	0.00	0.00
Bacillariophyta	NGPE	DGAL	<i>Navicula gallica</i> (W.M.Smith) Lagerstedt var. <i>perpusilla</i> (Grunow) Lange-Bertalot	<i>Diademesmis gallica</i> W.M. Smith	0.00	0.00
Bacillariophyta	NGOE	LGOE	<i>Navicula goeppertiana</i> (Bleisch) H. L. Smith	<i>Luticola goeppertiana</i> (Bleisch in Rabenhorst) D.G. Mann	0.00	0.00
Bacillariophyta	NGRE		<i>Navicula gregaria</i> Donkin		16826216.64	114329060.96
Bacillariophyta	NLEN		<i>Navicula lenzi</i> Hustedt		0.00	0.00
Bacillariophyta	NMEG	NANT	<i>Navicula menisculus</i> Schuman var. <i>grunowii</i> Lange-Bertalot	<i>Navicula antonii</i> Lange-Bertalot	0.00	0.00
Bacillariophyta	NMIN	EOMI	<i>Navicula minima</i> Grunow	<i>Eolimna minima</i> (Grunow) Lange-Bertalot	473424.21	1678317.16
Bacillariophyta	NMIS		<i>Navicula minuscula</i> Grunow in Van Heurck 1880	<i>Adlafia minuscula</i> (Grunow) Lange-Bertalot	0.00	0.00
Bacillariophyta	NMUT	LMUT	<i>Navicula mutica</i> (Kützing) D.G. Mann	<i>Luticola mutica</i> (Kützing) D.G. Mann	0.00	0.00
Bacillariophyta	NMVE	LVEN	<i>Navicula mutica</i> Kützing var. <i>ventricosa</i> (Kütz.) Cleve et Grun.	<i>Luticola ventricosa</i> (Kützing) D.G. Mann	0.00	0.00
Bacillariophyta	NPEL	FPEL	<i>Navicula pelliculosa</i> (Brébisson ex Kützing) Hilse	<i>Fistulifera pelliculosa</i> (Brébisson) Lange-Bertalot	0.00	0.00
Bacillariophyta	NPNU		<i>Navicula perminuta</i> Grunow in Van Heurck		0.00	1496794.35
Bacillariophyta	NPSL		<i>Navicula pseudolanceolata</i> Lange-Bertalot		0.00	0.00
Bacillariophyta	NPUP	SPUP	<i>Navicula pupula</i> (Kützing) Mereschkowsky	<i>Sellaphora pupula</i> (Kützing) Mereschkowsky	0.00	0.00
Bacillariophyta	NRAD		<i>Navicula radiosa</i> Kützing		0.00	0.00
Bacillariophyta	NRCS		<i>Navicula recens</i> (Lange-Bertalot) Lange-Bertalot		1327198.92	6273332.80
Bacillariophyta	NRCH		<i>Navicula reichardtiana</i> Lange-Bertalot		0.00	0.00
Bacillariophyta	NSAP	FSAP	<i>Navicula saprophila</i> Lange-Bertalot & Bonik	<i>Fistulifera saprophila</i> (Lange-Bertalot & Bonik) Lange-Bertalot	0.00	0.00
Bacillariophyta	NSHR		<i>Navicula schroeterii</i> Meister		17714660.54	0.00
Bacillariophyta	NSEM	SSEM	<i>Navicula seminulum</i> (Grunow) D.G. Mann	<i>Sellaphora seminulum</i> (Grunow) D.G. Mann	0.00	814822.96
Bacillariophyta	NSBM	ESBM	<i>Navicula subminuscula</i> Manguin	<i>Eolimna subminuscula</i> (Manguin) Moser Lange-Bertalot & Metzeltin	198942.04	940348.56
Bacillariophyta	NTEN		<i>Navicula tenelloides</i> Hustedt		0.00	0.00
Bacillariophyta	NTPT		<i>Navicula tripunctata</i> (O.F.Müller) Bory		4532787.29	21425336.24
Bacillariophyta	NVEN		<i>Navicula veneta</i> Kützing		6276351.94	25428620.80
Bacillariophyta	NVRO		<i>Navicula viridula</i> (Kützing) Ehrenberg var. <i>rostellata</i> (Kützing) Cleve		0.00	0.00
Bacillariophyta	NEDU		<i>Neidium dubium</i> (Ehrenberg) Cleve		0.00	0.00
Bacillariophyta	NACI		<i>Nitzschia acicularis</i> (Kützing) W.M.Smith		0.00	0.00
Bacillariophyta	NACU		<i>Nitzschia acula</i> Hantzsch		0.00	47926363.84

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_20	US1_30
Bacillariophyta	NAMP		<i>Nitzschia amphibia</i> Grunow		0.00	12870856.46
Bacillariophyta	NCPL		<i>Nitzschia capitellata</i> Hustedt		0.00	0.00
Bacillariophyta	NCLA		<i>Nitzschia clausii</i> Hantzsch		0.00	0.00
Bacillariophyta	NCOT		<i>Nitzschia constricta</i> (Kützing) Ralfs		8350092.52	0.00
Bacillariophyta	NDIS		<i>Nitzschia dissipata</i> (Kützing) Grunow		1004647403.30	4803296463.96
Bacillariophyta	NFON		<i>Nitzschia fonticola</i> Grunow		6715418.33	0.00
Bacillariophyta	NIFR		<i>Nitzschia frustulum</i> (Kützing) Grunow		0.00	0.00
Bacillariophyta	NHAN		<i>Nitzschia hantzschiana</i> Rabenhorst		0.00	0.00
Bacillariophyta	NINC		<i>Nitzschia inconspicua</i> Grunow		0.00	0.00
Bacillariophyta	NILA		<i>Nitzschia lacuum</i> Lange-Bertalot		5964351.80	18794652.49
Bacillariophyta	NLBT		<i>Nitzschia liebetruhi</i> Rabenhorst		0.00	0.00
Bacillariophyta	NLSU		<i>Nitzschia linearis</i> (Agardh) Smith var. <i>subtilis</i> (Grunow) Hustedt		6982485.29	0.00
Bacillariophyta	NLIN		<i>Nitzschia linearis</i> (Agardh) W.M. Smith		18578518.00	0.00
Bacillariophyta	NMIC		<i>Nitzschia microcephala</i> Grunow in Cleve & Moller		0.00	0.00
Bacillariophyta	NPAL		<i>Nitzschia palea</i> (Kützing) W. Smith		3744367.60	44246690.65
Bacillariophyta	NPAE		<i>Nitzschia paleacea</i> (Grunow) Grunow in van Heurck		0.00	0.00
Bacillariophyta	NIPU		<i>Nitzschia pusilla</i> (Kützing) Grunow		0.00	0.00
Bacillariophyta	NREC		<i>Nitzschia recta</i> Hantzsch in Rabenhorst		132350291.93	469189704.64
Bacillariophyta	NSIT		<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>tabellaria</i> Grunow		1072940.06	0.00
Bacillariophyta	NZSU		<i>Nitzschia supralitorea</i> Lange-Bertalot		0.00	4825102.84
Bacillariophyta	NIVA		<i>Nitzschia valdestrata</i> Aleem & Hustedt		0.00	0.00
Bacillariophyta	PGLI		<i>Pinnularia gibba</i> Ehrenberg var. <i>linearis</i> Hustedt		0.00	0.00
Bacillariophyta	PMIC		<i>Pinnularia microstauron</i> (Ehr.) Cleve		0.00	0.00
Bacillariophyta	PRUP		<i>Pinnularia rupestris</i> Hantzsch in Rabenhorst 1861		0.00	0.00
Bacillariophyta	PSCA		<i>Pinnularia subcapitata</i> Gregory		0.00	0.00
Bacillariophyta	PVIR		<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg		0.00	0.00
Bacillariophyta	RUNI		<i>Reimeria uniseriata</i> Sala Guerrero & Ferrario		0.00	0.00
Bacillariophyta	RABB		<i>Rhoicosphenia abbreviata</i> (C. Agardh) Lange-Bertalot		7541314.74	11881960.90
Bacillariophyta	SIDE		<i>Simonsenia delognei</i> Lange-Bertalot		0.00	0.00
Bacillariophyta	STAN		<i>Stauroneis anceps</i> Ehrenberg		0.00	0.00
Bacillariophyta	SPHO		<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg		0.00	0.00
Bacillariophyta	STHE		<i>Stauroneis thermicola</i> (Petersen) Lund		0.00	0.00
Bacillariophyta	SHAN		<i>Stephanodiscus hantzschii</i> Grunow in Cl. & Grun. 1880		0.00	0.00
Bacillariophyta	SANG		<i>Surirella angusta</i> Kützing		2701910.44	12771245.57
Bacillariophyta	SUMI		<i>Surirella minuta</i> Brébisson		0.00	0.00
Bacillariophyta	TPSN		<i>Thalassiosira pseudonana</i> Halse et Heimdal		0.00	0.00
Chlorophyta	GDEB		<i>Gongrosira debaryana</i> Rabenhorst		51695501.84	0.00
Chlorophyta	OEDO		<i>Oedogonium</i> sp.		0.00	0.00
Chlorophyta	SCEN1		<i>Scenedesmus</i> sp. 1		0.00	13308158.68
Cyanobacteria	CALO1		<i>Calothrix</i> sp. 1		498451392.11	0.00
Cyanobacteria	CALO2		<i>Calothrix</i> sp. 2		0.00	115767061.24
Cyanobacteria	CHRO1		<i>Chroococcales</i> 1		15126350.34	32648954.19
Cyanobacteria	CHROsp		<i>Chroococcus</i> sp.		0.00	878114.60
Cyanobacteria	DKER	XKER	<i>Dermocarpa kernerii</i> (Hansgirg) Bourrelly	<i>Xenotholos kernerii</i> (Hansgirg) M. Gold-Morgan, G. Montejano & J. Komárek	183979054.65	0.00
Cyanobacteria	DERMsp		<i>Dermocarpa</i> sp.		46411141.77	0.00
Cyanobacteria	GLOEsp		<i>Gloeocapsa</i> sp.		0.00	0.00
Cyanobacteria	HJAN		<i>Homoeothrix janthina</i> (Born. et Flah.) Starmach		0.00	0.00
Cyanobacteria	HOMO1		<i>Homoeothrix</i> sp. 1		0.00	0.00
Cyanobacteria	HOMO2		<i>Homoeothrix</i> sp. 2		22782957.65	11704049.89
Cyanobacteria	LYNG		<i>Lyngbya</i> sp.		0.00	69810110.53
Cyanobacteria	PHOR1		<i>Phormidium</i> sp. 1		3579980.60	4242939.97
Cyanobacteria	PHOR2		<i>Phormidium</i> sp. 2		246969.73	0.00
Cyanobacteria	PHOR3		<i>Phormidium</i> sp. 3		27506253.75	87797739.24
Cyanobacteria	PMIN		<i>Pleurocapsa minor</i> Hansgirg		0.00	4016060.88
Cyanobacteria	PLEU1		<i>Pleurocapsa</i> sp. 1		2154308.33	0.00
Rhodophyta	CHAN		<i>Chantransia</i> stage		0.00	0.00
Rhodophyta	LEMA		<i>Lemanea</i> sp.		0.00	0.00

UNSHADED REACH  
TRANSECT 2

UNSHADED REACH  
TRANSECT 3

ACRONYMS	US1_130	US1_140	US1_210	US1_220	US1_300	US2_20	US2_30	US2_140	US2_150	US2_390	US2_420	US2_500	US3_0	US3_20	US3_100
ABIA	970800.11	3998699.26	1132310.59	1597383.28	55410.55	860194.23	187158.33	423984.53	469636.63	2356785.49	266553.54	44719897.95	673191.75	6044484.17	1366995.19
ABIO	0.00	0.00	0.00	0.00	0.00	0.00	268464.03	1581249.16	538925.70	0.00	1070580.74	8847890.58	0.00	0.00	1622770.77
ACLE	0.00	0.00	0.00	0.00	0.00	186922.94	0.00	179659.71	0.00	0.00	0.00	0.00	0.00	948628.50	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	367299.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	59011.75	27819.11	0.00	0.00	0.00	0.00	0.00	13644.93	598965.83	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	140076.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92309.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	523475.79	84223.01	522789.68	136010.23	1840729.48	842228.09	381593.16	819744.59	642771.60	348949.28	3785139.93	100146.08	3846561.27	2699758.44
ALAN	0.00	0.00	0.00	0.00	10501.58	150486.21	70941.67	0.00	0.00	0.00	60621.68	0.00	0.00	763713.14	643226.25
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	130855.98	0.00	0.00	0.00	0.00
AMIN	1812715.42	12106189.81	1501908.65	11216323.14	143166.29	3228179.00	760908.34	454295.60	1199142.08	60534946.50	2333492.10	112497648.65	1025472.69	21435589.53	2213741.31
ASCL	0.00	0.00	0.00	0.00	3105.68	0.00	0.00	0.00	0.00	0.00	17927.90	0.00	10290.37	225856.07	0.00
APEL	1592369.85	0.00	1772867.63	55022783.70	0.00	0.00	0.00	730219.53	0.00	0.00	918158.95	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	149100.20	35144.14	95537.76	0.00	0.00	0.00	0.00	0.00	1513358.35	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24934.12	180311.07	0.00	0.00	0.00
ALIB	90425.42	312866.27	201350.59	624912.41	18064.30	1294294.75	274568.33	1409869.62	367453.15	0.00	364974.49	0.00	89781.61	1970552.51	1383057.59
AMMO	0.00	366968.78	0.00	0.00	0.00	0.00	0.00	48637.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	2728164.16	321525.36	6992417.18	1290886.41	0.00	1099010.33	0.00	315408.53	0.00	4858769.79
APED	5832.47	40359.97	6493.59	40307.08	582.58	50089.49	9838.75	2674.62	15800.57	49557.68	6726.00	0.00	30885.05	127101.35	47577.45
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	58301.50	0.00	0.00	0.00	0.00	0.00	0.00	1255274.01	176206.04
CBAC	0.00	812532.72	0.00	0.00	0.00	0.00	0.00	646150.07	0.00	0.00	135408.70	0.00	388613.82	0.00	0.00
CPED	0.00	0.00	1318194.68	0.00	236525.44	10168130.03	4793423.75	3257676.37	2405628.86	0.00	682686.19	0.00	1567410.55	197811366.83	1207273.47
CPLA	0.00	2016802.42	3893845.87	4028318.03	1921364.44	50894122.07	12586138.38	7217194.38	5526922.27	0.00	3361004.31	0.00	2507922.31	220178395.41	11887310.40
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	189459.45	0.00	0.00	0.00	0.00
CDUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16849.33	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	243770.97	0.00	0.00	0.00	59561.74	0.00	0.00
CPST	0.00	0.00	0.00	0.00	0.00	0.00	28567.73	38830.05	0.00	0.00	0.00	0.00	56048.50	0.00	0.00
CAFF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2824059.93	0.00	0.00	109999.63	0.00	0.00
CMIC	0.00	0.00	0.00	0.00	2040.64	0.00	0.00	0.00	0.00	173589.72	0.00	0.00	6761.47	0.00	0.00
CMIN	114543.25	0.00	0.00	0.00	0.00	491850.82	0.00	105053.13	77576.41	1946515.10	0.00	0.00	0.00	0.00	350388.00
CPRO	0.00	0.00	1817791.73	11283409.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	0.00	1032714.03	0.00	0.00	0.00	0.00	201399.90	0.00	0.00	0.00	0.00	2489110.39	0.00	2168143.80	304347.91
CSIN	48653.81	168339.13	162506.40	672473.94	82616.43	1392802.39	213391.74	111556.88	263613.12	0.00	224429.93	9737789.69	128819.74	2473951.12	297664.18
CTUM	0.00	0.00	39473995.28	94239718.46	544836.30	0.00	0.00	3752028.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	29941255.70	0.00	0.00	0.00	0.00	0.00	0.00	4996263.39	0.00	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.00	0.00	807927.15	0.00	0.00	0.00	0.00	108488.13	0.00	0.00	1366735.62	0.00
ESOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EIMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	388647.13	0.00	0.00	0.00	0.00	0.00	1170263.75
EMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	14287832.17	0.00	0.00	4592156.01	0.00	0.00	2172872.10	0.00	7399594.19	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	170300.40	0.00	575217.90	781851.91	0.00	0.00	0.00	0.00	564274.71	0.00	0.00
FBCP	205728145.42	177951614.22	85892915.56	177718374.84	0.00	0.00	0.00	11792699.20	0.00	0.00	14827831.86	428909842.58	0.00	373602641.02	26221781.28
FBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1711641.17	0.00	0.00	0.00	0.00	0.00
FCCP	446201.22	10806797.38	4471009.91	86341064.20	44568.85	638665.43	150538.69	409232.63	0.00	0.00	771837.62	7442057.91	147674.78	16206042.71	454976.77
FCGR	763801.79	880902.07	0.00	0.00	0.00	4008618.76	85896.76	116753.23	0.00	2163304.74	0.00	0.00	0.00	5548261.10	259607.89
FCME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	162072.14	1121518.84	180443.29	1120048.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVA	577566.17	999171.33	0.00	0.00	0.00	0.00	97429.20	0.00	0.00	0.00	0.00	0.00	95575.67	0.00	0.00
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69392.55	0.00	0.00	0.00	0.00
FPIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	94914378.40	82099446.41	26418270.49	382628584.32	0.00	11321224.77	16011034.73	3627106.09	10713735.92	0.00	9121256.87	0.00	5235478.05	229819550.58	8065090.19

ACRONYMS	US1_130	US1_140	US1_210	US1_220	US1_300	US2_20	US2_30	US2_140	US2_150	US2_390	US2_420	US2_500	US3_0	US3_20	US3_100
FUAC	1276014.45	0.00	710326.41	0.00	0.00	0.00	645749.74	292573.57	0.00	0.00	735748.73	0.00	0.00	13903465.65	0.00
FVUL	0.00	0.00	15217560.04	34348563.05	124113.96	0.00	419215.53	0.00	841550.44	0.00	0.00	0.00	411240.20	0.00	0.00
GACU	0.00	0.00	0.00	0.00	0.00	1469806.78	0.00	470898.27	0.00	0.00	0.00	0.00	679709.24	0.00	0.00
GCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29050627.17	8155822.34
GGRA	0.00	3413170.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	4765573.31	2748097.37	884293.17	16466972.81	0.00	0.00	267966.99	0.00	1075855.84	0.00	1831883.39	13247264.06	0.00	11539051.68	4049415.82
GMIN	165895.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOLI	0.00	0.00	0.00	0.00	66712.92	0.00	0.00	0.00	0.00	0.00	385108.62	0.00	0.00	0.00	0.00
GPAR	937104.75	8105808.88	521663.57	6476147.74	46801.40	670657.51	790397.46	214865.97	1269341.02	0.00	1891168.00	7814846.13	310144.24	6807134.89	2866605.04
GPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	0.00	1096344.81	352785.98	6569447.03	0.00	1814185.09	427618.35	145307.64	214604.65	0.00	730824.12	5284954.34	104870.79	6905202.57	646200.68
GRHO	0.00	0.00	0.00	0.00	0.00	577861.54	136206.72	0.00	273426.95	0.00	0.00	0.00	0.00	17595783.56	0.00
GTER	0.00	0.00	0.00	0.00	0.00	0.00	338868.30	153533.02	0.00	0.00	772193.65	5584118.06	0.00	4864055.45	341389.98
GTRU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1640107.23	0.00	0.00	0.00	0.00	0.00	0.00
HAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1439091.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MVAR	28590787.77	42395283.98	131873777.18	451623646.99	407970.49	29230802.41	0.00	1872999.14	2766229.84	0.00	9420240.74	68122467.47	2703545.37	89007285.09	4164727.09
MCCO	1937396.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	558550.40	0.00	0.00	0.00	0.00
MCIR	0.00	0.00	0.00	0.00	0.00	2079803.72	163408.95	0.00	0.00	0.00	558550.40	0.00	160300.19	3518314.54	0.00
NATO	0.00	0.00	27021.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13994.51	0.00	0.00	0.00	0.00
NAPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14059.09	0.00	35908.07	0.00	0.00	0.00	0.00
NBAC	0.00	0.00	0.00	0.00	0.00	0.00	440415.66	598625.02	884108.46	0.00	0.00	0.00	0.00	0.00	0.00
NBDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	154608.97	0.00	0.00	0.00	0.00
NCAP	0.00	0.00	363627.31	0.00	0.00	0.00	440759.32	299546.06	0.00	0.00	0.00	0.00	0.00	2372467.89	0.00
NCPR	0.00	557914.99	359055.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1171321.29	0.00
NCIN	0.00	0.00	0.00	0.00	30212.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	0.00	0.00	122373.10	28844.35	78412.05	0.00	0.00	49296.63	0.00	0.00	2484159.70	87176.97
NCRY	184594.57	638685.61	0.00	1275696.98	0.00	1585304.96	186834.71	169300.57	250039.77	0.00	106437.05	0.00	61093.43	2681792.25	941125.17
NCTE	0.00	0.00	0.00	0.00	19974.08	0.00	67465.76	0.00	406300.62	6796484.48	0.00	0.00	132364.53	0.00	203903.42
NDEC	0.00	0.00	0.00	0.00	0.00	0.00	95726.73	390343.16	192165.76	0.00	0.00	0.00	0.00	0.00	1157268.90
NELG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOE	0.00	0.00	0.00	0.00	0.00	182104.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	1077392.38	3106424.96	3598549.84	35987299.44	53807.72	2056152.34	545233.52	4693610.03	2553889.63	0.00	931835.15	2994918.02	237715.90	7826185.16	4760520.78
NLEN	0.00	0.00	0.00	0.00	0.00	91741.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEG	0.00	417193.73	268492.35	1666587.68	0.00	1380709.14	284763.94	331764.80	408319.15	0.00	208576.20	2011091.59	159626.55	2627647.08	860649.00
NMIN	20209.08	139844.32	224998.18	2374237.51	6055.76	173556.36	20454.33	92673.62	150556.50	0.00	34957.62	2022367.93	60195.60	1614788.08	267885.03
NMIS	0.00	0.00	0.00	0.00	0.00	214710.11	33739.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1065189.66	0.00
NPEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	586504.54	0.00	0.00	0.00	0.00	0.00
NPNU	0.00	0.00	60198.87	0.00	5400.78	3637445.51	291872.62	322336.02	183099.08	0.00	31176.68	0.00	0.00	1178293.44	606466.95
NPSP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPUP	0.00	0.00	0.00	0.00	0.00	0.00	91623.22	124536.78	0.00	0.00	0.00	0.00	89880.14	0.00	1107660.32
NRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	412928.73	0.00	1272207.60
NRCS	0.00	784080.02	0.00	3132209.35	0.00	0.00	152911.29	103920.61	0.00	0.00	261334.11	0.00	75001.12	1646146.17	1386442.60
NRCH	228838.96	0.00	0.00	0.00	11428.80	0.00	0.00	0.00	0.00	6805441.23	65974.16	1908368.56	0.00	0.00	0.00
NSAP	0.00	0.00	0.00	0.00	0.00	136468.70	0.00	0.00	10762.16	0.00	0.00	0.00	0.00	0.00	16203.08
NSHR	0.00	0.00	5051409.96	18290503.19	0.00	0.00	255121.11	173383.79	256070.28	0.00	218008.25	0.00	250267.58	0.00	0.00
NSEM	0.00	101841.63	0.00	0.00	0.00	126392.42	19861.15	26995.82	79740.19	0.00	33943.84	0.00	9741.65	855250.46	240107.41
NSBM	33969.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1357359.56	288629.69	19586.49	0.00	0.00	0.00	0.00
NTEN	60949.24	0.00	0.00	421208.30	0.00	0.00	0.00	27949.74	41278.94	0.00	0.00	0.00	60515.30	0.00	124295.89
NTPT	0.00	0.00	861695.57	0.00	0.00	0.00	522238.49	354920.43	1048362.97	0.00	892535.34	0.00	512303.21	0.00	789187.07
NVEN	0.00	529704.45	1363602.40	4232081.34	15292.06	0.00	206605.93	210618.33	725811.13	0.00	441376.63	2553451.97	253344.22	6672565.93	780537.69
NVRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	274645.81	30140025.69	0.00
NEDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2021426.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4672738.24	0.00	0.00	0.00	0.00	0.00
NACU	1731284.06	5990134.07	1927528.00	23929131.44	0.00	0.00	1168196.00	9527063.80	1172542.28	0.00	0.00	0.00	572985.88	0.00	0.00





SHADED REACH  
TRANSECT 1

SHADED REACH  
TRANSECT 2

ACRONYMS	US3_110	US3_210	US3_220	US3_310	S1_0	S1_20	S1_60	S1_90	S1_120	S1_160	S1_200	S2_0	S2_20	S2_40	S2_80
ABIA	682049.12	8995440.54	2859716.16	1466521.11	397182.80	1387919.78	37051.39	140869.51	1472399.47	218979.17	94841.18	97828.83	244271.49	83378.91	188059.31
ABIO	301029.62	0.00	0.00	2103610.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACLE	148211.44	0.00	448807.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	9068.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	93580.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9317.68
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	656569.90	0.00	0.00	0.00	0.00	0.00	0.00
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALFR	1631224.65	1280007.37	779937.05	899927.37	108324.59	69882.57	0.00	19209.83	1204712.82	51190.89	11938.27	0.00	0.00	37211.11	0.00
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26648.29	0.00	0.00
AMIN	1554913.78	9807943.32	5360469.15	2340329.57	1750603.67	895693.64	98546.66	219452.36	57064397.49	213952.16	515591.77	1803332.96	690534.10	373257.00	776480.56
ASCL	70574.42	3682711.27	1495972.10	123294.40	133568.94	14361.38	0.00	0.00	0.00	0.00	0.00	0.00	10952.84	0.00	0.00
APEL	0.00	0.00	0.00	50515161.02	2280198.24	0.00	425418.74	0.00	0.00	0.00	0.00	0.00	560938.11	0.00	0.00
AHOL	118221.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36694.97	0.00	23542.22
AINA	0.00	0.00	0.00	0.00	0.00	4993.45	0.00	0.00	86082.57	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	3181368.75	3442604.50	1553819.07	358573.63	129484.92	0.00	0.00	0.00	0.00	81587.48	0.00	0.00	0.00	0.00	0.00
AMMO	120371.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37362.15	0.00	0.00
AOVA	2163164.89	12094089.83	0.00	0.00	1364666.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	66193.36	0.00	60133.13	92512.51	41759.12	8081.92	1558.21	4443.23	139325.01	2631.21	0.00	63476.58	2054.58	4781.63	0.00
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10112.45
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	3973623.56	807072.50	0.00	2017681.25	271177.18	0.00	59634.54	0.00	0.00	0.00	0.00	165452.62	38505.76	0.00
CPED	59123705.40	5008426.14	0.00	0.00	0.00	0.00	316315.06	0.00	0.00	0.00	0.00	1073808.28	417078.88	0.00	0.00
CPLA	44984803.89	2465751.04	0.00	2311441.74	3338749.17	538475.10	467185.19	888119.93	0.00	262965.11	275968.49	352438.58	2874710.93	573455.10	395210.25
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69172.97	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1433002.50	0.00	0.00	108812.83	0.00	29508.34	0.00
CPST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	0.00	0.00	0.00	0.00	0.00	76758.44	44397.48	84399.69	2646493.09	74970.19	0.00	100478.68	0.00	0.00	75115.13
CMIC	0.00	0.00	0.00	0.00	0.00	23590.99	0.00	0.00	325350.04	4608.28	0.00	12352.48	0.00	0.00	4617.19
CMIN	0.00	484533.25	0.00	454210.64	0.00	0.00	45902.19	0.00	912062.58	51674.05	0.00	0.00	40349.72	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	2337977.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	338745.58	631300.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52571.80	0.00	0.00
CSIN	331306.45	617436.35	167207.89	192932.18	278679.81	0.00	0.00	0.00	0.00	10974.63	7678.21	44126.19	137112.75	31910.23	10995.85
CTUM	0.00	11536908.56	9372927.76	10814916.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	0.00	0.00	2001160.34	578740.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	427070.99	795907.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	815175.78	0.00	0.00	0.00
EIMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	135731.89	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBCP	87556170.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1604019.26	0.00	0.00	0.00	0.00	0.00	0.00
FCCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17764619.17	0.00	140832.81	0.00	3300814.02	73161.70	0.00
FCGR	288949.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	230908.00	0.00	0.00	0.00
FCME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVA	0.00	0.00	0.00	0.00	0.00	66693.31	0.00	0.00	0.00	0.00	0.00	0.00	101728.53	0.00	0.00
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1273780.00	0.00	0.00	0.00	0.00	0.00	36153.56
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36382.89	0.00	0.00	0.00
FPIN	0.00	0.00	0.00	0.00	229069.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	8976613.78	33458375.09	27182579.38	31364514.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2391162.37	2786260.80	0.00	0.00

ACRONYMS	US3_110	US3_210	US3_220	US3_310	S1_0	S1_20	S1_60	S1_90	S1_120	S1_160	S1_200	S2_0	S2_20	S2_40	S2_80
FUAC	724081.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15240597.41	0.00	0.00	0.00	0.00	0.00	0.00
FVUL	0.00	5256226.32	0.00	14781858.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GACU	0.00	0.00	0.00	8143955.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	901416.87	10079505.89	0.00	3149573.26	0.00	0.00	0.00	0.00	6324395.86	179158.28	250689.99	0.00	279791.75	0.00	0.00
GMIN	0.00	0.00	0.00	0.00	0.00	0.00	155122.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	109512.16	0.00
GPAR	531765.21	5946117.42	1610267.57	3716002.08	1341889.64	0.00	0.00	0.00	0.00	0.00	147887.42	424949.87	2970993.16	153653.04	211787.32
GPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPRO	0.00	3248894.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	359617.43	2680791.45	0.00	0.00	0.00	73179.50	0.00	80464.47	5046195.68	0.00	0.00	95793.77	1004598.36	467599.99	0.00
GRHO	0.00	0.00	1387461.84	0.00	0.00	0.00	0.00	0.00	3214669.16	91065.55	0.00	0.00	0.00	198589.11	0.00
GTER	379974.18	0.00	0.00	0.00	479425.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GTRU	0.00	0.00	0.00	0.00	0.00	0.00	323485.44	0.00	38565343.18	0.00	0.00	0.00	0.00	0.00	0.00
HAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	707867.48	0.00	0.00	0.00	0.00	0.00
MVAR	4635428.21	17277550.28	14036795.89	0.00	5848664.95	0.00	0.00	0.00	32522447.58	0.00	0.00	0.00	5755182.19	0.00	0.00
MCCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MCIR	549693.02	0.00	0.00	1920641.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NATO	27545.17	102668.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6807.38	0.00
NBAC	4444556.18	0.00	4486268.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCAP	370668.69	0.00	1122442.31	0.00	0.00	0.00	0.00	0.00	0.00	73671.09	0.00	0.00	0.00	0.00	0.00
NCPR	0.00	682109.19	0.00	0.00	0.00	0.00	21539.84	0.00	0.00	0.00	0.00	97496.30	56802.94	0.00	0.00
NCIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCRY	209498.39	780859.69	1268787.28	1463985.32	528661.37	0.00	0.00	46875.31	0.00	41638.20	0.00	55805.53	65026.43	0.00	41718.70
NCTE	0.00	1691804.34	6185124.79	3964823.59	6586012.51	92364.81	53424.29	355458.84	1592286.43	0.00	0.00	181361.72	563542.98	98364.94	0.00
NDEC	644032.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NELG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	5909931.22	10634198.68	24067288.31	14240999.00	3085549.78	124409.74	23986.41	45598.22	1429808.23	0.00	56675.55	0.00	253019.30	29442.57	0.00
NLEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEG	957920.31	1530188.38	414390.19	2868855.16	517987.74	0.00	48320.73	0.00	0.00	27198.35	0.00	218715.28	84951.40	19770.72	0.00
NMIN	160548.57	341948.50	208356.85	80137.25	636645.94	32670.45	2699.54	25659.13	321833.88	0.00	6378.52	0.00	35594.89	16567.98	0.00
NMIS	0.00	211515.73	0.00	0.00	0.00	0.00	6679.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPNU	613645.80	914892.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19047.02	0.00	0.00
NPSP	0.00	0.00	0.00	0.00	0.00	116183.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPUP	308212.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	439511.78	0.00	0.00
NRCS	514379.85	958619.50	2336433.02	898628.08	0.00	0.00	30271.56	0.00	0.00	0.00	35763.11	0.00	0.00	0.00	0.00
NRCH	0.00	0.00	0.00	453719.84	0.00	0.00	30568.40	0.00	2733231.13	0.00	0.00	69181.23	40306.12	0.00	77577.01
NSAP	36068.74	268876.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSHR	429102.24	0.00	1299388.17	2998588.08	0.00	0.00	0.00	0.00	3010607.54	0.00	0.00	0.00	133189.51	0.00	0.00
NSEM	167027.85	249023.99	101157.25	0.00	210744.27	33988.94	0.00	7474.50	0.00	6639.42	4645.15	0.00	41475.16	4826.25	19956.77
NSBM	0.00	574773.57	0.00	0.00	48641.99	31380.02	0.00	25877.91	0.00	0.00	0.00	20538.61	0.00	33418.50	0.00
NTEN	0.00	0.00	0.00	241688.58	0.00	0.00	0.00	0.00	0.00	13748.06	0.00	0.00	0.00	0.00	0.00
NTPT	0.00	0.00	0.00	3069087.75	2216563.38	0.00	0.00	0.00	6162779.61	0.00	0.00	0.00	8997180.64	253807.54	0.00
NVEN	347501.90	2590475.45	4735303.48	7285082.28	219227.01	0.00	0.00	0.00	1219047.27	34533.32	0.00	46283.24	269653.72	0.00	0.00
NVRO	0.00	0.00	2851919.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEDU	1250691.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACU	3929706.40	0.00	0.00	13730493.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	609872.90	0.00	0.00

ACRONYMS	US3_110	US3_210	US3_220	US3_310	S1_0	S1_20	S1_60	S1_90	S1_120	S1_160	S1_200	S2_0	S2_20	S2_40	S2_80
NAMP	1055341.63	0.00	0.00	1843695.12	0.00	107377.13	0.00	0.00	0.00	0.00	0.00	281118.61	0.00	0.00	0.00
NCPL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCLA	0.00	0.00	0.00	957245.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCOT	0.00	0.00	0.00	0.00	2041625.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDIS	2983672.04	191837051.26	420128518.94	659382849.21	193876511.88	4250087.16	526772.68	1001395.86	88967907.83	593010.38	1037223.65	596085.94	6714262.52	754363.01	297078.43
NFON	0.00	0.00	0.00	0.00	0.00	0.00	76584.68	0.00	0.00	0.00	0.00	86661.77	0.00	94005.28	0.00
NIFR	0.00	172319.13	0.00	0.00	174996.48	0.00	0.00	10344.38	324365.41	0.00	12857.38	172411.31	0.00	46755.26	0.00
NHAN	0.00	812446.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67656.80	0.00	0.00
NINC	54611.36	0.00	0.00	0.00	0.00	0.00	44994.76	73315.82	0.00	0.00	0.00	101830.43	16950.88	7889.95	0.00
NILA	192632.67	2153989.08	3499929.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLBT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31968.01	0.00	0.00	0.00
NLSU	676546.99	5043363.49	0.00	2363872.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLIN	0.00	93933249.93	10902023.85	12579258.29	4542509.94	0.00	0.00	805549.90	50518722.65	0.00	0.00	0.00	13409712.74	0.00	0.00
NMIC	0.00	0.00	327379.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15033.29	0.00	0.00	0.00	0.00
NPAL	2176795.69	27045107.94	7690287.62	24084966.72	1831020.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	225219.32	104830.50	0.00
NPAE	0.00	0.00	0.00	0.00	0.00	0.00	37769.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPU	288949.00	538497.27	437491.20	1009595.09	364576.00	0.00	0.00	0.00	1013641.92	0.00	0.00	0.00	0.00	0.00	0.00
NREC	3205921.26	95594992.70	22652063.06	37338565.49	8090022.52	217460.46	0.00	0.00	7497646.49	0.00	148597.98	0.00	2985268.04	154391.31	212804.90
NSIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZSU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIVA	0.00	172210.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PGLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRUP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSCA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PVIR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1055792.43	0.00	0.00	0.00	0.00	0.00
RUNI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48343.33	0.00	0.00	0.00
RABB	8768317.19	5446999.15	1475101.39	8510200.32	6146255.79	297381.34	401349.46	435980.62	0.00	387270.98	135473.72	0.00	12398433.73	422266.13	194009.85
SIDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPHO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STHE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	399978.58	0.00	0.00	0.00
SANG	523587.03	0.00	0.00	3658852.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TPSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GDEB	0.00	17231833.95	11487889.30	0.00	404948097.76	0.00	0.00	0.00	14359861.62	0.00	8615916.97	0.00	0.00	0.00	0.00
OEDO	0.00	0.00	437054690.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCEN1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CALO1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CALO2	0.00	0.00	0.00	0.00	38589020.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHRO1	0.00	2246487.67	599063.38	0.00	0.00	0.00	0.00	192556.09	0.00	0.00	0.00	0.00	15725413.72	1069756.04	0.00
CHROsp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DKER	0.00	0.00	123067070.34	7458610.32	509671705.45	0.00	0.00	26105136.13	399035652.31	0.00	0.00	2693801428.55	1649595983.24	5731942033.70	24862034.41
DERMsp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7899768.81	0.00	0.00	0.00	0.00
GLOEsp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HJAN	0.00	752607.49	0.00	0.00	0.00	0.00	0.00	0.00	4241969.48	0.00	0.00	0.00	2873592.23	43103883.42	2052565.88
HOMO1	0.00	0.00	84219822.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HOMO2	0.00	0.00	12850143.80	0.00	10592686.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2083807.10	0.00
LYNG	0.00	1975757.85	0.00	365515201.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHOR1	4319624.10	17435831.45	994439.06	0.00	0.00	0.00	0.00	0.00	1325918.74	2252624.71	0.00	0.00	0.00	0.00	0.00
PHOR2	0.00	905555.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHOR3	0.00	12225001.67	0.00	11113637.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2083807.10	0.00	0.00
PMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26104395.75	0.00	0.00	47332146.14	9753290.72	200803044.21	0.00
PLEU1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	199099179.65	0.00	0.00	0.00	3782884413.33	0.00	0.00
LEMA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1917037539.95	0.00	0.00

**SHADED REACH  
TRANSECT 3**

ACRONYMS	S2_90	S2_140	S2_170	S3_20	S3_40	S3_90	S3_170	S3_260	S3_310	S3_350
ABIA	0.00	99101.30	187864.57	66103.67	480992.02	290543.36	46589.84	233231.32	14527.17	316505.04
ABIO	0.00	0.00	0.00	0.00	501778.58	0.00	200488.46	0.00	0.00	0.00
ACLE	0.00	0.00	0.00	0.00	0.00	27358.93	65806.77	28646.30	0.00	0.00
ACOA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADAO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AEXG	0.00	0.00	0.00	0.00	0.00	0.00	20775.26	0.00	0.00	0.00
AEEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56454.16
AHEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	190402.09	0.00	0.00	0.00	0.00	0.00
ALFR	0.00	0.00	11385.94	0.00	71553.86	79240.57	400256.46	365064.49	47544.34	103585.39
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMIN	1023249.70	361484.75	913680.28	572663.93	1614919.42	565223.64	260224.34	550207.69	337809.44	1067905.96
ASCL	0.00	7405.97	0.00	0.00	0.00	0.00	15667.73	47742.17	0.00	21287.55
APEL	0.00	0.00	0.00	0.00	3012371.99	0.00	0.00	0.00	0.00	0.00
AHOL	0.00	0.00	0.00	0.00	0.00	0.00	104982.33	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	10225.74	0.00	0.00	0.00	0.00	14803.36
ALIB	0.00	0.00	0.00	0.00	171062.65	0.00	205047.14	0.00	0.00	247639.91
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	26722.78	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	272547.94	901431.05	0.00	0.00	418096.34	299480.32	0.00
APED	0.00	1389.25	877.86	3336.01	16550.40	7331.34	11756.10	10235.08	5498.50	63891.45
AVEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CBAC	0.00	0.00	35346.24	0.00	888520.18	49198.50	177506.62	309081.07	73797.74	160783.97
CPED	0.00	0.00	0.00	0.00	0.00	248042.65	2088170.18	0.00	0.00	810619.98
CPLA	168436.54	138842.19	701868.44	4667649.28	7167589.97	3419261.72	3377875.48	3835879.11	1099048.41	1596339.45
CDUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDTG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDUN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPST	0.00	0.00	12744.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	96041.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	208889.23	455109.32
CMIC	5903.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIN	0.00	0.00	0.00	32757.79	108343.82	23996.54	0.00	75377.07	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	0.00	0.00	0.00	0.00	282323.17	62530.38	37601.27	0.00	0.00	0.00
CSIN	56236.46	11588.93	139136.49	0.00	138061.56	61157.16	110326.55	32017.44	15289.29	66621.89
CTUM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128818.55
ESOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EIMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125876.25	0.00	0.00
EMIN	0.00	0.00	0.00	0.00	569172.05	252126.25	0.00	131994.98	189094.69	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	747986.08	0.00	0.00
FBCP	0.00	0.00	0.00	7354425.76	170269328.76	5387445.58	6479244.72	0.00	0.00	0.00
FBRE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCCP	257870.65	0.00	67158.55	0.00	844102.94	560868.67	0.00	0.00	140217.17	0.00
FCGR	0.00	0.00	76640.79	0.00	0.00	53338.23	128295.10	0.00	0.00	0.00
FCME	0.00	0.00	0.00	97083.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVA	0.00	0.00	0.00	0.00	0.00	60499.38	0.00	0.00	0.00	0.00
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FPIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	0.00	0.00	0.00	0.00	29925775.46	11599198.31	0.00	3469998.39	0.00	0.00

ACRONYMS	S2_90	S2_140	S2_170	S3_20	S3_40	S3_90	S3_170	S3_260	S3_310	S3_350
FUAC	0.00	151967.91	0.00	0.00	603476.35	267322.04	0.00	139950.39	0.00	0.00
FVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GACU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2738100.65
GGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	216390.54	0.00	0.00
GMIC	0.00	0.00	119545.85	0.00	0.00	0.00	400234.53	0.00	0.00	2175174.03
GMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOLI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPAR	406181.90	0.00	141045.33	133999.50	2659157.45	98160.62	354160.45	0.00	147240.94	0.00
GPLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4426652.85
GPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	732504.17	75475.37	1192310.99	181239.97	1498592.71	66383.19	79836.15	139013.66	398299.14	216944.71
GRHO	0.00	0.00	0.00	0.00	0.00	1268678.48	0.00	0.00	126867.85	0.00
GTER	193492.20	0.00	251960.75	95749.68	316684.61	0.00	84355.41	0.00	0.00	0.00
GTRU	0.00	0.00	0.00	0.00	2290586.64	0.00	0.00	531203.07	0.00	0.00
HAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MVAR	0.00	0.00	1229500.37	0.00	112036811.22	5989703.07	0.00	5375611.17	1283507.80	0.00
MCCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MCIR	0.00	0.00	0.00	0.00	1374403.84	0.00	244067.02	0.00	152204.98	0.00
NATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6523.30	14212.39
NBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCAP	0.00	0.00	0.00	0.00	0.00	68423.19	164579.14	0.00	102634.78	0.00
NCPR	0.00	0.00	0.00	0.00	305045.40	0.00	0.00	0.00	0.00	0.00
NCIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	24450.53	0.00	0.00	0.00	18753.91	0.00	58534.70
NCRY	0.00	0.00	0.00	105582.99	1047622.53	38672.13	139527.83	202459.16	0.00	379149.32
NCTE	115567.90	95262.58	30097.93	171566.45	2269770.57	167573.45	0.00	219323.20	0.00	0.00
NDEC	0.00	0.00	0.00	0.00	0.00	59442.22	0.00	0.00	0.00	0.00
NELG	0.00	0.00	0.00	0.00	0.00	0.00	44783.44	0.00	0.00	0.00
NGPE	0.00	0.00	0.00	0.00	0.00	0.00	17116.40	0.00	0.00	0.00
NGOE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	0.00	0.00	27026.71	51353.22	1358774.22	150474.12	90484.32	827161.78	112855.59	614699.37
NLEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMEG	34842.61	0.00	0.00	34483.76	114052.35	25260.89	182281.03	79348.61	0.00	82554.30
NMIN	0.00	4813.63	3041.71	17338.56	305844.92	46571.31	5091.75	22164.87	0.00	207542.96
NMIS	0.00	0.00	7525.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMUT	0.00	0.00	0.00	0.00	138702.85	30720.61	0.00	0.00	0.00	100397.02
NMVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPNU	0.00	0.00	0.00	0.00	51143.52	0.00	54492.49	0.00	0.00	0.00
NPSP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPUP	0.00	0.00	0.00	0.00	0.00	56894.11	0.00	0.00	0.00	0.00
NRAD	0.00	0.00	0.00	0.00	1180141.76	0.00	0.00	0.00	0.00	0.00
NRCS	0.00	0.00	0.00	64809.28	0.00	0.00	57096.94	0.00	0.00	155153.76
NRCH	66125.83	27253.75	17221.48	0.00	0.00	0.00	28828.41	25098.54	0.00	0.00
NSAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSHR	0.00	0.00	56907.51	108129.46	357629.77	79209.66	0.00	414684.23	0.00	517724.97
NSEM	0.00	0.00	31011.71	8417.87	83524.33	18499.40	22248.41	6456.63	0.00	100762.10
NSBM	0.00	0.00	0.00	19429.33	0.00	7116.43	17117.23	22353.86	10674.64	3302487.42
NTEN	0.00	0.00	0.00	0.00	0.00	0.00	30712.77	0.00	0.00	0.00
NTPT	0.00	0.00	0.00	442686.76	2928303.91	162143.92	0.00	0.00	0.00	0.00
NVEN	0.00	36466.30	23042.84	43783.50	579242.02	96220.11	0.00	167912.85	0.00	104817.92
NVRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	568155.89
NEDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NACI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	172815.86	0.00
NACU	0.00	0.00	0.00	0.00	1637581.75	0.00	0.00	379766.67	0.00	0.00



## **SPRING 2006**

Benthic algae and cyanobacteria data corresponding to spring (May) 2006 in Fuirosos.





UNSHADED REACH  
TRANSECT 1

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_0	US1_30
Bacillariophyta	ABIA	ADBI	<i>Achnanthes biasolettiana</i> Grunow	<i>Achnantheidium biasolettianum</i> (Grunow in Cl. & Grun.) Round & Bukhtiyarova	0.00	3526125.71
Bacillariophyta	ABIO	PBIO	<i>Achnanthes bioretii</i> Germain	<i>Psammothidium bioretii</i> (Germain) Bukhtiyarova	5356251.51	0.00
Bacillariophyta	ACLE	KCLE	<i>Achnanthes clevei</i> Grunow	<i>Karayevia clevei</i> (Grun. in Cl. & Grun.) Round & Bukhtiyarova	0.00	0.00
Bacillariophyta	ALVS	EULA	<i>Achnanthes laevis</i> Oestrup	<i>Eucocconeis laevis</i> (Oestrup) Lange-Bertalot	0.00	7677049.23
Bacillariophyta	ALFR	PLFR	<i>Achnanthes lanceolata</i> (Breb.) Grun. ssp. <i>frequentissima</i> Lange-Bertalot	<i>Planothidium frequentissimum</i> (Lange-Bertalot) Round & Bukhtiyarova	1527607.91	2885065.45
Bacillariophyta	ALAN	PTLA	<i>Achnanthes lanceolata</i> (Breb.) Grunow	<i>Planothidium lanceolatum</i> (Breb.) Round & Bukhtiyarova	0.00	0.00
Bacillariophyta	AMIN	ADMI	<i>Achnanthes minutissima</i> Kützing	<i>Achnantheidium minutissimum</i> (Kütz.) Czarnecki	130246513.85	200164842.82
Bacillariophyta	ASCL	PSAC	<i>Achnanthes saccula</i> Carter in Carter & Bailey-Watts	<i>Psammothidium sacculum</i> (Carter) Bukhtiyarova et Round	1255738.05	0.00
Bacillariophyta	APEL		<i>Amphipleura pellucida</i> Kützing		32155661.47	0.00
Bacillariophyta	AINA		<i>Amphora inariensis</i> Krammer		0.00	0.00
Bacillariophyta	ALIB	ACOP	<i>Amphora libyca</i> Ehr.	<i>Amphora copulata</i> (Kützing) Schoeman & Archibald	0.00	0.00
Bacillariophyta	AMMO		<i>Amphora montana</i> Krasske		0.00	0.00
Bacillariophyta	AOVA		<i>Amphora ovalis</i> (Kützing) Kützing		0.00	0.00
Bacillariophyta	APED		<i>Amphora pediculus</i> (Kützing) Grunow		235557.09	667315.49
Bacillariophyta	CBAC		<i>Caloneis bacillum</i> (Grunow) Cleve		0.00	8956326.57
Bacillariophyta	CSIL		<i>Caloneis silicula</i> (Ehr.) Cleve		0.00	0.00
Bacillariophyta	CPED		<i>Cocconeis pediculus</i> Ehrenberg		0.00	90309712.53
Bacillariophyta	CPLA		<i>Cocconeis placentula</i> Ehrenberg		11770872.18	66691989.00
Bacillariophyta	CATO		<i>Cyclotella atomus</i> Hustedt		0.00	0.00
Bacillariophyta	CMEN		<i>Cyclotella meneghiniana</i> Kützing		0.00	0.00
Bacillariophyta	CAFF		<i>Cymbella affinis</i> Kützing	<i>Cymbella</i> gr. <i>excisa/parva</i>	0.00	0.00
Bacillariophyta	CMIC	ENCM	<i>Cymbella microcephala</i> Grunow	<i>Encyonopsis microcephala</i> (Grunow) Krammer	0.00	0.00
Bacillariophyta	CMIN	ENMI	<i>Cymbella minuta</i> Hilse ex Rabenhorst	<i>Encyonema minutum</i> (Hilse in Rabh.) D. G. Mann	32382549.34	34947551.90
Bacillariophyta	CNAV	CBNA	<i>Cymbella naviculiformis</i> Auerswald	<i>Cymbopleura naviculiformis</i> (Auerswald) Krammer	0.00	15650285.00
Bacillariophyta	CPRO	EPRO	<i>Cymbella prostrata</i> (Berkeley) Grunow	<i>Encyonema prostratum</i> (Berkeley) Kützing	0.00	311342950.12
Bacillariophyta	CSLE	ESLE	<i>Cymbella silesiaca</i> Bleisch	<i>Encyonema silesiacum</i> (Bleisch in Rabh.) D.G. Mann	30136677.57	102449925.77
Bacillariophyta	CSIN	RSIN	<i>Cymbella sinuata</i> Gregory	<i>Reimeria sinuata</i> (Gregory) Kociolek & Stoermer	1964990.05	11133337.66
Bacillariophyta	CTUM		<i>Cymbella tumida</i> (Brébisson) Van Heurck		55074285.24	104014201.85
Bacillariophyta	DVUL		<i>Diatoma vulgare</i> Bory 1824		0.00	0.00
Bacillariophyta	DOBL		<i>Diploneis oblongella</i> (Naegeli) Cleve-Euler		0.00	0.00
Bacillariophyta	EDIO		<i>Eunotia diodon</i> Ehrenberg		0.00	0.00
Bacillariophyta	EMIN		<i>Eunotia minor</i> (Kützing) Grunow in Van Heurck		0.00	0.00
Bacillariophyta	EPEC		<i>Eunotia pectinalis</i> (Dyllwyn) Rabenhorst		0.00	0.00
Bacillariophyta	ESOL		<i>Eunotia soleirolii</i> (Kützing) Rabenhorst		0.00	0.00
Bacillariophyta	FBCP		<i>Fragilaria biceps</i> (Kützing) Lange-Bertalot		0.00	1961512111.31
Bacillariophyta	FCCP		<i>Fragilaria capucina</i> Desmazières var. <i>capitellata</i> (Grunow) Lange-Bertalot		54062423.49	102103183.09
Bacillariophyta	FCDI		<i>Fragilaria capucina</i> Desmazières var. <i>distans</i> (Grunow) Lange-Bertalot		11254923.90	0.00
Bacillariophyta	FCGR	FGRA	<i>Fragilaria capucina</i> Desmazières var. <i>gracilis</i> (Oestrup) Hustedt	<i>Fragilaria gracilis</i> Ostrup	0.00	0.00
Bacillariophyta	FCRU		<i>Fragilaria capucina</i> Desmazières var. <i>rumpens</i> (Kütz.) Lange-Bert.		9818454.29	12362196.28
Bacillariophyta	FCVA		<i>Fragilaria capucina</i> Desmazières var. <i>vaucheriae</i> (Kützing) Lange-Bertalot		0.00	11013593.05
Bacillariophyta	FCSS		<i>Fragilaria construens</i> (Ehrenberg) Grunow f. <i>subsalina</i> (Hustedt) Hustedt	<i>Staurosira construens</i> Ehr. f. <i>subsalina</i> (Hust.) Bukhtiyarova	0.00	0.00
Bacillariophyta	FCVE	SCVE	<i>Fragilaria construens</i> (Ehrenberg) Grunow f. <i>venter</i> (Ehr.) Hustedt	<i>Staurosira construens</i> Ehr. var. <i>venter</i> (Ehr.) Hamilton	0.00	0.00
Bacillariophyta	FELL		<i>Fragilaria elliptica</i> (Schumann) Williams & Round		0.00	0.00
Bacillariophyta	FULN	UULN	<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot	<i>Ulnaria ulna</i> (Nitzsch.) Compère	638887301.35	1508266345.02
Bacillariophyta	FUAC		<i>Fragilaria ulna</i> (Nitzsch.) Lange-Bertalot var. <i>acus</i> (Kütz.) Lange-Bertalot		206138485.60	608307090.28
Bacillariophyta	FVUL		<i>Frustulia vulgaris</i> (Thwaites) De Toni		0.00	0.00
Bacillariophyta	GACU		<i>Gomphonema acuminatum</i> Ehrenberg		0.00	0.00
Bacillariophyta	GANT		<i>Gomphonema angustum</i> Agardh		0.00	0.00
Bacillariophyta	GCLA		<i>Gomphonema clavatum</i> Ehr.		0.00	152523432.07
Bacillariophyta	GGRA		<i>Gomphonema gracile</i> Ehrenberg		0.00	0.00
Bacillariophyta	GMIC		<i>Gomphonema micropus</i> Kützing		0.00	0.00
Bacillariophyta	GMIN		<i>Gomphonema minutum</i> (Ag.) Agardh		0.00	0.00
Bacillariophyta	GPAR		<i>Gomphonema parvulum</i> Kützing		9461753.86	17869624.12
Bacillariophyta	GPRO		<i>Gomphonema productum</i> (Grunow) Lange-Bertalot & Reichardt		46528198.67	58582614.70
Bacillariophyta	GPUM		<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	<i>Gomphonema</i> gr. <i>pumilum</i>	19196131.17	0.00

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_0	US1_30
Bacillariophyta	GRHO		<i>Gomphonema rhombicum</i> Fricke		24457716.16	107779572.65
Bacillariophyta	GTER		<i>Gomphonema tergestinum</i> Fricke		33804600.72	51075140.39
Bacillariophyta	GTRU		<i>Gomphonema truncatum</i> Ehr.		0.00	0.00
Bacillariophyta	MVAR		<i>Melosira varians</i> Agardh		329914631.02	1713476060.66
Bacillariophyta	MCCO		<i>Meridion circulare</i> (Greville) Agardh var. <i>constrictum</i> (Ralfs) Van Heurck		0.00	0.00
Bacillariophyta	MCIR		<i>Meridion circulare</i> (Greville) C.A.Agardh		9780745.26	36944153.05
Bacillariophyta	NAPE	MAPE	<i>Navicula atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	<i>Mayamaea atomus</i> var. <i>permitis</i> (Hustedt) Lange-Bertalot	419189.49	0.00
Bacillariophyta	NBAC	SEBA	<i>Navicula bacillum</i> Ehrenberg	<i>Sellaphora bacillum</i> (Ehrenberg) D. G. Mann	0.00	0.00
Bacillariophyta	NBDR	CRBU	<i>Navicula buderi</i> Hustedt	<i>Craticula buderi</i> (Hustedt) Lange-Bertalot	0.00	0.00
Bacillariophyta	NCAP	HCAP	<i>Navicula capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	<i>Hippodonta capitata</i> (Ehr.) Lange-Bert. Metzeltin & Witkowski	0.00	0.00
Bacillariophyta	NCPR		<i>Navicula capitatoradiata</i> Germain		3256216.86	0.00
Bacillariophyta	NCAR		<i>Navicula cari</i> Ehrenberg		0.00	0.00
Bacillariophyta	NCON	DCOT	<i>Navicula contenta</i> Grunow	<i>Diadesmis contenta</i> (Grunow ex V. Heurck) Mann	0.00	0.00
Bacillariophyta	NCRY		<i>Navicula cryptocephala</i> Kützing		7455253.52	28160229.07
Bacillariophyta	NCTE		<i>Navicula cryptotenella</i> Lange-Bertalot		4038123.13	15252931.65
Bacillariophyta	NDEC	GDEC	<i>Navicula decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	<i>Geissleria decussis</i> (Ostrup) Lange-Bertalot & Metzeltin	0.00	0.00
Bacillariophyta	NGRE		<i>Navicula gregaria</i> Donkin		0.00	6848255.02
Bacillariophyta	NLAN		<i>Navicula lanceolata</i> (Agardh) Ehrenberg		0.00	0.00
Bacillariophyta	NMEG	NANT	<i>Navicula menisculus</i> Schuman var. <i>grunowii</i> Lange-Bertalot	<i>Navicula antonii</i> Lange-Bertalot	2434910.85	0.00
Bacillariophyta	NMIN	EOMI	<i>Navicula minima</i> Grunow	<i>Eolimna minima</i> (Grunow) Lange-Bertalot	0.00	0.00
Bacillariophyta	NMIS		<i>Navicula minuscula</i> Grunow in Van Heurck 1880	<i>Adlafia minuscula</i> (Grunow) Lange-Bertalot	1009722.63	0.00
Bacillariophyta	NPNU		<i>Navicula perminuta</i> Grunow in Van Heurck		0.00	0.00
Bacillariophyta	NPUP	SPUP	<i>Navicula pupula</i> (Kützing) Mereschkowsky	<i>Sellaphora pupula</i> (Kützing) Mereschkowsky	0.00	0.00
Bacillariophyta	NRCH		<i>Navicula reichardtiana</i> Lange-Bertalot		0.00	0.00
Bacillariophyta	NSEM	SSEM	<i>Navicula seminulum</i> (Grunow) D.G. Mann	<i>Sellaphora seminulum</i> (Grunow) D.G. Mann	0.00	0.00
Bacillariophyta	NSBM	ESBM	<i>Navicula subminuscula</i> Manguin	<i>Eolimna subminuscula</i> (Manguin) Moser Lange-Bertalot & Metzeltin	0.00	0.00
Bacillariophyta	NTEN		<i>Navicula tenelloides</i> Hustedt		0.00	0.00
Bacillariophyta	NTPT		<i>Navicula tripunctata</i> (O.F.Müller) Bory		0.00	0.00
Bacillariophyta	NVEN		<i>Navicula veneta</i> Kützing		0.00	0.00
Bacillariophyta	NVIP		<i>Navicula vilaplanii</i> (Lange-Bertalot & Sabater) Lange-Bertalot & Sabater		0.00	0.00
Bacillariophyta	NEDU		<i>Neidium dubium</i> (Ehrenberg) Cleve		0.00	0.00
Bacillariophyta	NAMP		<i>Nitzschia amphibia</i> Grunow		0.00	0.00
Bacillariophyta	NCPL		<i>Nitzschia capitellata</i> Hustedt		0.00	0.00
Bacillariophyta	NCOT		<i>Nitzschia constricta</i> (Kützing) Ralfs		0.00	0.00
Bacillariophyta	NDIS		<i>Nitzschia dissipata</i> (Kützing) Grunow		106177575.86	501321794.70
Bacillariophyta	NDRA		<i>Nitzschia draveillensis</i> Coste & Ricard		0.00	18964732.93
Bacillariophyta	NFON		<i>Nitzschia fonticola</i> Grunow		0.00	0.00
Bacillariophyta	NIFR		<i>Nitzschia frustulum</i> (Kützing) Grunow		0.00	0.00
Bacillariophyta	NHAN		<i>Nitzschia hantzschiana</i> Rabenhorst		0.00	0.00
Bacillariophyta	NINC		<i>Nitzschia inconspicua</i> Grunow		0.00	0.00
Bacillariophyta	NILA		<i>Nitzschia lacuum</i> Lange-Bertalot		0.00	6473295.51
Bacillariophyta	NLSU		<i>Nitzschia linearis</i> (Agardh) Smith var. <i>subtilis</i> (Grunow)Hustedt		0.00	0.00
Bacillariophyta	NLIN		<i>Nitzschia linearis</i> (Agardh) W.M.Smith		0.00	120983041.66
Bacillariophyta	NMIC		<i>Nitzschia microcephala</i> Grunow in Cleve & Moller		0.00	0.00
Bacillariophyta	NPAL		<i>Nitzschia palea</i> (Kützing) W. Smith		0.00	0.00
Bacillariophyta	NPAE		<i>Nitzschia paleacea</i> (Grunow) Grunow in van Heurck		0.00	0.00
Bacillariophyta	NIPM		<i>Nitzschia perminuta</i> (Grunow) M. Peragallo		0.00	0.00
Bacillariophyta	NREC		<i>Nitzschia recta</i> Hantzsch in Rabenhorst		0.00	0.00
Bacillariophyta	NSDE	NSOL	<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>delognei</i> (Grunow) Lange-Bertalot	<i>Nitzschia solgensis</i> Cleve-Euler	0.00	0.00
Bacillariophyta	NSIT		<i>Nitzschia sinuata</i> (Thwaites) Grunow var. <i>tabellaria</i> Grunow		0.00	0.00
Bacillariophyta	NUMB		<i>Nitzschia umbonata</i> (Ehrenberg) Lange-Bertalot		0.00	0.00
Bacillariophyta	RABB		<i>Rhoicosphenia abbreviata</i> (C.Agardh) Lange-Bertalot		17335064.72	98217865.93
Bacillariophyta	STHE		<i>Stauroneis thermicola</i> (Petersen) Lund		0.00	0.00
Bacillariophyta	SANG		<i>Surirella angusta</i> Kützing		0.00	0.00
Bacillariophyta	SBRE		<i>Surirella brebissonii</i> Krammer & Lange-Bertalot		0.00	0.00
Bacillariophyta	TFEN		<i>Tabellaria fenestrata</i> (Lyngbye) Kützing		0.00	0.00
Bacillariophyta	TPSN		<i>Thalassiosira pseudonana</i> Halse et Heimdal		0.00	0.00

PHYLUM	ACRONYMS	SYNONYMS	TAXA	SYNONYMS	US1_0	US1_30
Charophyta	CLOS		<i>Closterium</i> sp.		0.00	0.00
Charophyta	KLEB		<i>Klebsormidium</i> sp.		0.00	170172845.08
Charophyta	SPIR		<i>Spirogyra</i> sp.		0.00	0.00
Chlorophyta	CGLO		<i>Cladophora glomerata</i> (Linnaeus) Kützing		0.00	15554873.35
Chlorophyta	GDEB		<i>Gongrosira debaryana</i> Rabenhorst		25847750.92	152214533.20
Chlorophyta	OEDO		<i>Oedogonium</i> sp.		437054690.55	4589074250.81
Chlorophyta	SCEN1		<i>Scenedesmus</i> sp. 1		0.00	0.00
Chlorophyta	SCEN2		<i>Scenedesmus</i> sp. 2		0.00	11183028.48
Cyanobacteria	CALO2		<i>Calothrix</i> sp. 2		0.00	0.00
Cyanobacteria	CHAM		<i>Chamaesiphon</i> sp.		0.00	0.00
Cyanobacteria	CHRO1		<i>Chroococcales</i> 1		0.00	4043677.81
Cyanobacteria	CHRO2		<i>Chroococcales</i> 2		0.00	32943017.96
Cyanobacteria	DKER	XKER	<i>Dermocarpa kernerii</i> (Hansgirg) Bourrelly	<i>Xenotholos kernerii</i> (Hansgirg) M. Gold-Morgan, G. Montejano & J. Komárek	28591339.57	202625580.46
Cyanobacteria	GLOE		<i>Gloeocapsa</i> sp.		0.00	1756229.20
Cyanobacteria	HJAN		<i>Homoeothrix janthina</i> (Born. et Flah.) Starmach		0.00	3831456.30
Cyanobacteria	HOMO2		<i>Homoeothrix</i> sp. 2		11460939.06	4514915.39
Cyanobacteria	LYNG		<i>Lyngbya</i> sp.		5927273.54	36880813.11
Cyanobacteria	PHOR1		<i>Phormidium</i> sp. 1		0.00	0.00
Cyanobacteria	PHOR2		<i>Phormidium</i> sp. 2		277840.95	0.00
Cyanobacteria	PHOR3		<i>Phormidium</i> sp. 3		0.00	29728981.33
Cyanobacteria	PMIN		<i>Pleurocapsa minor</i> Hansgirg		5163506.85	11474459.67
Cyanobacteria	PLEU1		<i>Pleurocapsa</i> sp. 1		0.00	0.00
Cyanobacteria	PLEU2		<i>Pleurocapsa</i> sp. 2		0.00	0.00
Rhodophyta	LEMA		<i>Lemanea</i> sp.		0.00	0.00

UNSHADED REACH  
TRANSECT 2

UNSHADED REACH  
TRANSECT 3

ACRONYMS	US1_70	US1_120	US1_160	US1_190	US1_240	US2_0	US2_50	US2_70	US2_100	US2_130	US2_150	US2_190	US3_10	US3_40
ABIA	13341761.95	0.00	560781.44	11580.12	10140.49	423631.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	149460.72
ABJO	0.00	2083808.95	0.00	0.00	0.00	2430663.90	0.00	0.00	28669.88	126269.45	291326.07	569985.79	78569433.52	428779.48
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14115.57	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	3689304.48	217472.53	7670638.80	21757.82	95827.00	110544.96	432567.23	51108887.14	0.00
ALFR	0.00	0.00	0.00	0.00	0.00	1386455.21	0.00	2882656.39	16353.35	36012.16	0.00	81280.24	9603460.93	122288.31
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4006346.66	0.00	0.00	115474.46	225928.29	4448997.55	0.00
AMIN	592100517.61	56135980.97	28211165.34	1251359.43	841494.11	58140013.31	5032581.30	212848960.63	462493.42	2197486.03	2928556.41	5865668.49	285423205.80	8995424.11
ASCL	0.00	0.00	125723.77	0.00	0.00	0.00	33591.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	153188215.01	12509915.74	12877625.61	398883.89	349295.07	14592220.97	0.00	60679001.58	172116.41	1516089.26	1748943.72	0.00	67383267.68	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALIB	0.00	0.00	0.00	0.00	0.00	828644.00	0.00	0.00	0.00	0.00	0.00	0.00	11479419.23	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	209048.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80655868.16	0.00
APED	0.00	0.00	0.00	2922.03	0.00	106895.67	18903.46	0.00	1260.84	5553.07	6405.97	0.00	740426.68	9428.43
CBAC	0.00	0.00	949586.43	0.00	0.00	2152038.81	0.00	8948847.92	25383.47	111795.28	0.00	0.00	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	569506394.89	9301599.36	4787502.83	5635122.19	1038856.82	32549618.10	67793867.02	45117151.39	2303552.09	1690905.26	650203.17	5088546.56	0.00	3827927.68
CPLA	112151877.23	4579368.37	14141915.74	1898195.94	639313.18	37391305.93	5667675.77	133272600.68	1260095.55	3607358.65	2240758.61	5636690.92	73998772.98	3769134.81
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57746.91
CMEN	0.00	0.00	0.00	45081.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIN	275480534.37	4499351.69	3242122.28	286927.41	201005.53	5248279.49	1979961.87	43647962.81	61903.88	436224.76	377418.03	984568.77	4847051.34	1110982.67
CNAV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	195351.08	0.00	0.00	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	100498902.60	10552000.85	603453.38	411222.72	229154.52	4102802.17	3547087.46	113738198.64	516190.72	2202390.84	1885001.06	2886296.52	18945725.75	5066262.66
CSIN	18722259.41	382232.22	590201.03	146251.61	96052.32	2675134.11	315380.95	11124041.18	105178.07	301100.20	267189.11	575037.43	6176553.87	707857.61
CTUM	0.00	42852464.31	55140058.81	683184.36	1196503.24	24992679.47	5892949.37	207854697.34	2063534.57	5193333.20	0.00	0.00	0.00	8817630.60
DVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2379267.62	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EDIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5495697.61	0.00	0.00
FBCP	0.00	202029209.09	311951323.73	38650713.99	11281899.73	235657451.56	111129935.69	2939811335.62	11118393.93	97936491.23	28244612.03	110522394.88	1088207831.28	124712940.04
FCCP	128775552.65	7010858.34	9021164.77	335316.22	0.00	28622413.37	1928226.72	136023900.84	144687.28	1274479.45	2940450.66	479421.30	207697641.48	6491720.38
FCDI	0.00	0.00	0.00	0.00	122258.08	0.00	0.00	0.00	0.00	0.00	306077.18	598846.66	0.00	0.00
FCGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	46774702.12	5093060.04	655345.34	121795.76	71102.83	5940812.00	525287.38	18527810.53	105108.53	385770.66	801037.35	1044831.33	34291500.74	2619961.47
FCVA	0.00	0.00	0.00	0.00	0.00	7939085.12	311988.87	0.00	0.00	0.00	158589.21	0.00	0.00	0.00
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	3043632157.30	62138562.39	31982515.27	11887884.00	1734999.19	289926695.71	34180475.56	602802769.37	3419708.56	18826587.00	21718141.58	42492016.14	1004107334.64	51144306.25
FUAC	1043412241.78	40098305.67	28377892.21	799094.51	1119603.12	70159146.06	14474788.87	316055555.98	1517143.35	5163276.07	6657038.83	14395656.06	107992528.52	15470465.92
FVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52580909.73	0.00
GACU	0.00	0.00	0.00	0.00	225250.68	9410117.51	0.00	0.00	0.00	0.00	563922.58	2206653.59	43453595.47	1659984.88
GANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6769356.86	0.00
GCLA	0.00	31418810.18	0.00	3005405.63	877258.96	0.00	0.00	152396073.06	0.00	0.00	0.00	0.00	0.00	0.00
GGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	0.00	0.00	0.00	0.00	174225.78	0.00	858086.86	0.00	0.00	1512428.06	436180.05	853395.75	33610272.04	1283956.89
GMIN	0.00	0.00	0.00	124668.68	0.00	0.00	0.00	0.00	0.00	91103.58	0.00	0.00	0.00	0.00
GPAR	180301585.27	0.00	0.00	117370.97	102779.54	0.00	506203.90	0.00	50644.99	446106.93	0.00	1006873.04	0.00	1514867.60
GPRO	73886125.34	12067628.08	0.00	0.00	168472.88	14076313.48	0.00	29266848.73	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	91449559.24	14936217.91	14093974.79	1031869.68	9800462.68	2903731.15	1369324.22	48298475.61	273997.93	1055912.23	2088151.92	3745055.07	67043561.73	7171227.92





SHADED REACH  
TRANSECT 1

SHADED REACH  
TRANSECT 2

ACRONYMS	US3_100	US3_140	US3_200	US3_240	US3_280	S1_40	S1_90	S1_120	S1_160	S1_210	S1_250	S1_360	S2_20	S2_40	S2_60
ABIA	0.00	0.00	0.00	0.00	0.00	0.00	79871.06	6065.52	4269.97	0.00	0.00	0.00	0.00	0.00	4106.62
ABJO	532036.33	0.00	0.00	668638.83	46801973.75	67515.14	0.00	23201.38	0.00	0.00	0.00	26049113.38	0.00	150625.99	23562.50
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	51562.31	0.00	0.00	17759215.01	51237.83	0.00	8803.87	0.00	0.00	0.00	19768901.54	0.00	0.00	0.00
ALFR	0.00	0.00	0.00	0.00	0.00	0.00	16337.56	3308.53	3493.67	0.00	0.00	7429231.36	71116.46	42958.67	6720.05
ALAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5162612.57	0.00	29852.21	0.00
AMIN	3466880.39	728887.03	5111036.43	15568362.37	175421602.20	1475426.52	1219986.16	229544.54	120708.25	25280.63	158266.78	299119352.89	2902956.54	1179016.48	134814.83
ASCL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	1064673.68	0.00	0.00	4014098.99	0.00	405319.65	0.00	0.00	0.00	0.00	0.00	78191480.50	0.00	0.00	0.00
AINA	0.00	0.00	0.00	27252.37	0.00	0.00	0.00	945.64	0.00	0.00	0.00	0.00	0.00	6139.21	0.00
ALIB	0.00	0.00	79732.55	0.00	2659230.59	0.00	19528.98	11864.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AMMO	0.00	0.00	0.00	267365.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41680.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	7799.29	1493.99	0.00	29405.38	171521.33	1484.59	0.00	510.17	269.36	368.18	527.63	572793.61	0.00	0.00	259.06
CBAC	157016.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7081.61	0.00	0.00	0.00	0.00
CSIL	1612631.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	5541378.34	151639.54	75166579.94	59692713.10	69637415.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	336178.29	0.00
CPLA	3117867.83	447931.57	5653702.21	7346987.11	85709824.23	1186967.53	881215.47	713821.49	323043.10	73591.60	369125.18	200358915.48	3835879.11	10757985.82	776712.66
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9603.01	168223.32	1814.85
CMIN	153169.42	44010.47	302995.27	1443722.20	13473950.51	58311.36	0.00	15028.90	10579.95	7230.57	3454.05	5624513.83	0.00	97569.31	10175.21
CNAV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	1596520.22	363162.29	1052729.90	5643093.69	30721708.78	113961.15	32230.78	26108.28	27569.31	9420.74	9000.59	36641003.93	70149.34	423744.76	26514.65
CSIN	195182.41	49850.80	214502.31	613240.73	20031356.08	148611.29	483352.11	48941.94	103361.49	12285.14	52817.59	21501801.94	320174.42	55258.53	10805.15
CTUM	3647018.24	0.00	0.00	6875107.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8357.04
EDIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	191405.95	0.00
EMIN	0.00	0.00	0.00	0.00	0.00	153166.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	816634.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	1503350.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	484102.66	0.00
FBCP	51581925.73	9880757.85	90700320.03	453780570.75	756256609.57	0.00	5553830.95	0.00	0.00	0.00	0.00	1262755344.89	0.00	21905211.40	1142214.61
FCCP	1491671.99	514326.08	786875.20	2249597.84	157462615.95	567877.25	192730.16	117089.64	20607.00	0.00	26910.39	131461171.64	0.00	506772.71	19818.68
FCDI	372650.44	71382.92	0.00	1404989.87	0.00	141867.45	0.00	0.00	0.00	0.00	16806.93	54736187.82	0.00	158252.85	0.00
FCGR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	239348.74	0.00	0.00
FCRU	650177.88	83029.73	285813.98	2451341.11	28597302.84	123760.86	35002.36	7088.34	7485.01	0.00	0.00	31833460.19	152363.20	230091.64	14397.34
FCVA	0.00	36985.97	0.00	0.00	0.00	73506.45	0.00	0.00	0.00	0.00	0.00	14180359.54	0.00	0.00	12826.72
FCSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	75193.62	0.00	0.00
FELL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	15865164.87	4052061.52	0.00	39877221.48	930413948.17	4026562.74	1708203.84	691858.38	0.00	499291.13	0.00	1553553610.17	0.00	2245811.14	351313.43
FUAC	13650487.04	1797684.83	4500499.18	19299718.50	243912696.34	649589.95	275577.99	195326.01	117860.88	0.00	38478.21	626572143.12	299893.69	1630386.52	85014.08
FVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GACU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7105.31
GCLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GGRA	1319144.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMIC	1062102.60	0.00	700340.12	0.00	70072985.09	606511.27	0.00	0.00	73363.15	0.00	0.00	273009296.64	373340.96	676562.04	105834.96
GMIN	0.00	0.00	0.00	0.00	0.00	42226.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPAR	939835.77	180029.91	1239437.13	0.00	41337561.79	596323.41	404768.83	61477.45	0.00	29577.48	56516.77	92030890.80	660725.60	399118.51	41622.88
GPRO	0.00	0.00	0.00	0.00	0.00	195494.79	0.00	0.00	35470.36	0.00	0.00	0.00	0.00	0.00	34113.44
GPUM	2966057.46	324664.06	558796.98	11981586.93	65229259.81	2258347.11	3695401.60	457329.63	497555.98	40004.79	286654.95	77797286.03	5361955.27	2339239.93	239260.97



ACRONYMS	US3_100	US3_140	US3_200	US3_240	US3_280	S1_40	S1_90	S1_120	S1_160	S1_210	S1_250	S1_360	S2_20	S2_40	S2_60
GRHO	539863.18	51706.65	0.00	0.00	0.00	616575.28	174381.36	17657.03	18645.12	0.00	73045.19	0.00	0.00	229262.81	17931.85
GTER	1119270.04	85760.55	0.00	0.00	39383812.40	255662.64	216921.45	58571.82	46387.14	0.00	30288.15	98641358.59	157374.38	380254.85	0.00
GTRU	0.00	620307.94	0.00	6104585.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MVAR	10923470.65	3661772.84	0.00	20592174.52	360341926.22	8317097.28	0.00	1071805.00	754522.43	0.00	123165.00	1604477237.16	0.00	4638852.28	1269901.71
MCCO	0.00	62033.13	0.00	0.00	28487471.24	0.00	104603.78	0.00	0.00	0.00	0.00	0.00	0.00	137524.77	0.00
MCIR	971521.18	248132.54	854148.82	2441926.42	85462413.72	369856.63	418415.12	63550.09	22368.79	0.00	58422.17	118916998.92	0.00	550099.06	43026.14
NAPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBAC	872806.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NBDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	126038.29	0.00	0.00
NCAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCPR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCRY	123421.69	141851.99	162766.12	0.00	0.00	0.00	0.00	8073.38	8525.17	0.00	5566.45	27192908.65	0.00	52413.29	8199.04
NCTE	0.00	0.00	0.00	504092.44	0.00	101800.47	0.00	0.00	0.00	0.00	0.00	0.00	281986.97	0.00	26645.96
NDEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NGRE	120059.14	91991.55	158331.66	1357963.32	10561317.66	45706.33	38780.34	15706.85	8292.91	0.00	0.00	44086756.26	84404.26	0.00	7975.66
NLAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	626874.63	0.00	0.00
NMEG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5273.59	5568.70	7611.54	0.00	5920863.56	0.00	34236.71	0.00
NMIN	13511.99	0.00	17819.34	50943.73	1188617.41	20575.97	0.00	0.00	933.32	0.00	0.00	0.00	18998.46	0.00	0.00
NMIS	100295.72	12808.07	0.00	126047.06	4411388.44	25454.95	0.00	4373.76	0.00	0.00	0.00	4910594.51	0.00	14197.47	2220.92
NPNU	36151.69	13850.05	0.00	0.00	1590089.05	0.00	11677.37	2364.79	0.00	0.00	0.00	2655042.50	0.00	0.00	2401.60
NPUP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRCH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64344.98	0.00
NSEM	0.00	0.00	0.00	0.00	865610.60	7492.23	0.00	0.00	0.00	0.00	0.00	0.00	27671.25	0.00	1307.38
NSBM	0.00	0.00	0.00	0.00	0.00	34585.69	0.00	0.00	0.00	0.00	0.00	0.00	15967.04	0.00	21122.96
NTEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTPT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NVEN	102361.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14140.98	0.00	0.00	0.00	71962.65	43469.82	0.00
NVIP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2500373.60	0.00	0.00	0.00
NEDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NAMP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCPL	0.00	0.00	0.00	0.00	0.00	81368.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NCOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	404827.41	0.00
NDIS	3515538.64	589240.56	579527.99	1656812.83	77313398.90	1003770.16	0.00	86235.68	60707.65	0.00	0.00	193640438.55	0.00	559851.75	58385.27
NDRA	332477.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NFON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	269488.95	0.00	0.00
NIFR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3563.25	0.00	0.00	0.00	0.00	19147.90	0.00	0.00
NHAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8870.02	0.00	0.00	0.00	0.00	0.00	0.00
NINC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3037.56	0.00	0.00	0.00	0.00	0.00
NILA	0.00	0.00	0.00	427870.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLSU	398573.82	0.00	0.00	1502727.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	169261.69	26477.70
NLIN	0.00	406286.60	0.00	0.00	93289482.51	1614919.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140900.07
NMIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPAL	0.00	0.00	281870.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9639.71	0.00	0.00	0.00	0.00
NPAE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NIPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NREC	0.00	0.00	830261.54	0.00	27690785.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	885200.29	0.00	0.00
NSDE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NSIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NUMB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RABB	0.00	54972.72	0.00	1081997.11	0.00	218507.16	0.00	37544.68	39645.70	27094.74	12943.19	0.00	201754.72	487488.56	38129.05
STHE	25680.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SANG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SBRE	4647706.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	986866.85	0.00
TFEN	0.00	0.00	0.00	0.00	0.00	189666.81	0.00	0.00	0.00	0.00	0.00	0.00	350250.97	423145.85	33096.46
TPSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22060.21	0.00	0.00



SHADED REACH  
TRANSECT 3

ACRONYMS	S2_80	S2_100	S2_120	S2_150	S3_10	S3_50	S3_110	S3_160	S3_220	S3_290	S3_320
ABIA	0.00	16077.67	1184252.48	6131.86	519595.23	88133.26	132606.44	371708.83	172388.37	489607.59	270806.45
ABJO	0.00	0.00	4076922.83	8795.67	5962550.70	0.00	380427.19	193886.30	0.00	0.00	621521.19
ACLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALVS	0.00	0.00	0.00	0.00	0.00	63960.98	0.00	147142.02	0.00	355323.08	0.00
ALFR	384675.39	0.00	387580.73	7525.60	425131.25	48073.58	0.00	0.00	225676.23	133531.82	88629.21
ALAN	0.00	0.00	0.00	0.00	590851.96	0.00	150791.94	76851.74	0.00	0.00	0.00
AMIN	41587126.65	825922.42	25270324.15	123017.05	30798471.35	1734638.67	9220513.47	4699273.11	4495982.83	11608394.12	7877716.49
ASCL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APEL	0.00	0.00	0.00	52803.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AINA	0.00	0.00	0.00	0.00	0.00	0.00	15505.44	7902.41	24188.49	0.00	12665.97
ALIB	0.00	0.00	1389874.45	5997.11	2032708.79	28732.18	129692.43	66098.29	0.00	319232.36	0.00
AMMO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AOVA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APED	59316.93	1352.30	59764.94	386.82	0.00	0.00	0.00	8526.73	26099.45	0.00	6833.31
CBAC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	175145.94	0.00	0.00
CSIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CPED	0.00	0.00	12132239.15	117784.98	13307663.80	0.00	0.00	0.00	0.00	0.00	0.00
CPLA	0.00	2770577.97	134391385.59	947136.75	26206544.65	926068.75	7524224.40	426083.59	2173664.83	3086759.32	2731703.87
CATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMEN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAFF	1690097.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CMIC	103887.13	0.00	1151389.29	0.00	0.00	6491.48	0.00	14933.63	0.00	0.00	0.00
CMIN	0.00	0.00	1760574.99	3798.31	1287431.49	72790.98	164283.36	0.00	85427.35	0.00	268397.20
CNAV	0.00	0.00	0.00	13607.75	2306160.94	0.00	0.00	0.00	0.00	0.00	0.00
CPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CSLE	0.00	0.00	2293859.96	39590.71	5032198.38	142259.48	642136.29	109089.14	111303.62	263431.82	524543.62
CSIN	0.00	39482.65	2991313.14	20974.02	5468541.18	170054.30	976942.45	853547.64	435437.21	1202350.99	285013.44
CTUM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DVUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EDIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EPEC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ESOL	0.00	0.00	0.00	0.00	0.00	541742.72	0.00	0.00	0.00	0.00	0.00
FBCP	0.00	0.00	131755120.04	852756.80	289040270.21	16342248.20	73766267.43	0.00	19179229.53	0.00	0.00
FCCP	0.00	0.00	13716578.21	14796.27	17553084.02	1134223.98	3839777.83	652319.59	1663903.72	2362862.14	2091073.19
FCDI	0.00	0.00	0.00	0.00	0.00	177095.34	0.00	0.00	0.00	0.00	652991.53
FCGR	3883977.30	59031.09	2608874.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCRU	824146.42	18788.83	3321483.76	26871.99	8197388.33	566472.89	929806.22	236939.81	362624.42	858254.31	379766.67
FCVA	0.00	0.00	1479570.04	0.00	6491669.14	91759.25	414186.41	0.00	0.00	0.00	338337.58
FCSS	1626916.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FCVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FELL	0.00	0.00	0.00	3990.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FULN	0.00	0.00	40524208.28	262284.26	88900743.34	2513210.38	11344225.50	5781631.79	0.00	13961662.44	0.00
FUAC	0.00	0.00	32688077.02	148096.60	57368066.52	3040849.57	11895783.10	3730914.11	5709975.89	11261907.80	5232414.27
FVUL	0.00	0.00	0.00	0.00	6983041.25	0.00	1782149.21	0.00	0.00	0.00	0.00
GACU	0.00	0.00	5261158.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GCLA	0.00	0.00	0.00	132617.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GGRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMC	0.00	0.00	4069374.71	52676.31	4463633.62	0.00	1139168.57	0.00	592367.66	1402007.31	1861111.47
GMIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPAR	4765233.10	0.00	7201835.13	31074.89	0.00	297759.91	0.00	684995.64	349450.43	827074.28	1097909.71
GPRO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GPUM	3222589.28	220405.07	34092749.13	241673.07	12465268.17	3624595.39	9998289.81	5327291.43	5671757.13	21254403.43	7424845.69



