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From science to practical applications: Diatom growth forms in relation to disturbance gradients in the Tagus basin

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Diatom communities colonize substrates following a successional scheme from flat-celled species to erect life forms, motile or tube forming species that extend into the water. The study of diatom growth forms in relation to environmental variables has received increasing attention in the last decade, as it has been found to indicate variation on water quality conditions as well as anthropogenic or physical disturbance. Moreover, studies indicate that such growth forms show a more consistent response to environmental variables than individual species. While strong evidence comes from microcosm experiments and controlled experimental designs, a reduced number of studies tested the response of diatom growth forms in relation to water quality conditions using large datasets. The present study tests the relationship between different diatom growth forms, environmental variables and water quality (IPS diatom index) comprising 255 samples taken in the Tagus basin in 2016. The study shows that diatom growth forms were strongly related to water quality and environmental variables such as nutrient enrichment and physical disturbance. Motile and low profile forms are the most sensitive groups displaying an opposite and predictable behavior along nutrient gradients. The potential use of diatom growth forms in ecological assessments and its inclusion in routine water quality monitoring is emphasized: diatom growth forms allow water quality assessments when reference conditions does not exist and the comparison of ecological status in streams over large geographical areas. In addition, the use of diatom growth forms to assess environmental disturbance supposes an enormous simplification of the diatom data in terms of taxonomic resolution, while keeping a strong ecological value.

iDIAT-ES. A new diatom index to assess the ecological status of Spanish rivers.

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Diatom species have particular autoecological requirements in different geographical areas and understanding this variation is an important aspect for the use of diatoms as environmental indicators. Based on the information provided by diatom assemblages in non-impacted sites, the *distance* of each diatom community from its specific reference community can be calculated in order to assess the ecological status in rivers. The iDIAT-ES index (Índice de Diatomeas Español) was developed with biological and physicochemical data (years 2008-2014) collected from almost 1000 sampling locations distributed all around the Spanish Iberian Peninsula. The index value indicates the distance, on a scale of 0 to 5, of each diatom community from its specific reference community according to 3 groups: siliceous, calcareous and Tinto river. A high index value represents a non or less impacted site while a low index value represents a more heavily impacted site. The results show a good correlation between the iDIAT-ES and the SPI (Specific Pollution Sensitivity Index) and the BDI (Biological Diatom Index) but also with different stressors related with eutrophication and organic pollution in rivers. Thus, this new index is considered a suitable tool to evaluate the ecological status of our rivers under the scope of the Water Framework Directive.



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iDIAT-ES. A new diatom index to assess the ecological status of Spanish rivers: Index validation in the Ebro River Basin.

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The iDIAT-ES index (Índice de Diatomeas Español) was developed based on the structure, composition and organization of diatom assemblages from almost 1000 Spanish rivers. In order to explore the accuracy of the index, a validation was carried out using data from more than 350 samples collected in the Ebro River Basin during the period 2015-2016. The goal was to test the suitability of the iDIAT-ES as a tool for ecological assessment in rivers considering a new dataset not used during the index development process. In terms of index suitability, the following aspects were studied: (1) Composition and frequency of the diatom community; (2) Percentage of diatom species contributing to the index calculations; (3) Statistical correlations with other biological index and environmental variables; (4) Adequacy of the established status class boundaries and its influence in the assessment of the biological status. The results obtained from the evaluation in the Ebro River Basin showed good response and agreement to the biological quality categories based on other diatom indices such SPI (Specific Pollution Sensitivity Index). The evaluation gives a better understanding on the suitability of the new index and reveals ways for improvement bringing up new opportunities to refine the tool in further versions.

Estudio fenológico de *Dreissena polymorpha* (Pallas, 1771) en embalses del País Vasco

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El mejillón cebra (*Dreissena polymorpha*) es considerada unánimemente por la comunidad científica como una de las especies exóticas invasoras más dañinas de cuantas habitan en los ecosistemas acuáticos. Las primeras poblaciones estables de esta especie en la Península Ibérica fueron detectadas en el año 2001 en el tramo bajo del río Ebro (Tarragona). Desde entonces se ha dispersado rápidamente por toda la península Ibérica, llegando al País Vasco en 2006, cuando apareció en el embalse de Sobrón (Álava). En 2011 se detectaron larvas en los embalses de Urrunaga (Álava) y Undurruga (Bizkaia). El presente trabajo, realizado por Cimera Estudios Aplicados, S.L. para la Agencia Vasca del Agua, profundiza en el análisis de las características fenológicas de la especie a través del seguimiento de su presencia en estos dos embalses en el periodo comprendido entre 2011 y 2013. El patrón de distribución temporal a lo largo de cada año se ajusta a la perfección a las preferencias de la especie respecto a las condiciones fisicoquímicas y rangos de tolerancia mostrando una marcada relación con la temperatura. Igualmente, la concentración larvaria en términos absolutos evoluciona a lo largo del periodo de estudio hacia dinámicas de población típicas para la especie en estas latitudes.

Nota: El presente estudio se ha realizado en el marco del contrato "Seguimiento de las poblaciones de mejillón cebra (*Dreissena polymorpha*) en la Comunidad Autónoma del País Vasco. Ref. URA/010A/2011" siendo la entidad adjudicadora Uraren Euskal Agentzia / Agencia Vasca del Agua.



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IDIAT.ES: THE NEW SPANISH DIATOM INDEX INTERCALIBRATION EXERCISE

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The development of the new diatom index iDIAT.ES (2016) brought forward a specific tool for water quality assessments in the Iberian Peninsula because it allows the identification of ecologically meaningful differences among diatom assemblages. The index integrates the effects of multiple stressors on streams and provides information related to the “distance” from the non-impacted state, a requirement defined in the Water Framework Directive to assess ecological status in European streams. The new index allows to calculate biological assessment values of all river typologies (32) in the Spanish Iberian peninsula and integrates the natural variability of the river basin communities by evaluating the ecological distance from one station to the ideal “image community”. Within the scope of this work, an intercalibration exercise was developed for all the Geographical Intercalibration Groups (GIGs) – Alpine, Central Baltic, and Mediterranean under the “Procedure to fit new or updated classification methods to the results of a completed intercalibration exercise” Guidance Document No. 30, Technical Report - 2015 – 085”. The results of the intercalibration exercise are the iDIAT.ES status boundaries based on definitions of reference criteria and the application of the Boundary Setting Protocol (BSP). As a result of the intercalibration exercise, the boundaries of high-good and good moderate status were setting agreement with WFD definitions for status class boundaries for each quality specified.