Composition and Diversity of the Larval Chironomidae (Diptera) Species on Gediz River Basin: Effects of Significant Environmental Variables and Altitude

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Aim of the study: The main aims of this study were to evaluate the spatial distribution of larval chironomids on Gediz River Basin and to investigate the importance of some main environmental predictors and altitude in distribution of this group.

Material and Methods: Chironomidae specimens along Gediz Basin consist of 15 streams were collected seasonally between 2016–2017. All phases of the study including sampling, collecting and identification were performed according to the methods (10870 BS EN ISO 2012) given by Water Framework Directive (WFD). Chironomidae specimens collected from the field were immediately fixed in Ethanol 70%. Samples were sorted and identified to the lowest possible taxon. Environmental parameters measured are: water temperature (WT), pH, Conductivity, dissolved Oxygen (dO_2), Ammonium-Nitrogen (NH_3-N), Nitrate-Nitrogen (NO_3-N), Total Phosphor (TP), Total Dissolved Solids (TDS), Total Organic Carbon (TOC), Total Nitrogen (TN) and Ortho-Phosphate (PO_4P). Benthos was identified at species-level. Observed dissimilarity and ordination distance was calculated using Non-Metric Multidimensional Scaling (NMDS). Significant environmental variables were selected by forward selection while p values based on 999 permutations. Inflated variation parameters (VIF) over 10 were excluded. Canonical Correspondence Analysis (CCA) was applied to figure out ordination between biological parameters, environmental variables and sampling sites. All statistical analysis were calculated and graphed by R. Altitude was used both as a vector and as a factor variable and evaluated in three different categories such as low, mid and high by using quantiles.

Results: As the result of the study, 105 species from 39 genera belonging to Chironomidae family were sorted from 2390 chironomid specimens. Unconstrained rank was found as 14 in CCA. Expanded scores based on NMDS are non-metric $R^2 = 0.942$ and linear fit $R^2 = 0.915$. Environmental variables except WT, pH, NO_3-N and TDS were found significant (p<0.05). TP and TN were excluded from the ordination analysis because of VIF>10. According to forward selection while p values based on Monte-Carlo permutations; Altitude, dO_2, Conductivity and NH_4-N were found as the most significant environmental variables that affected chironomids and water quality on the basin. Altitude, water temperature and NH_4-N was correlated with CCA Axis-1 while others such as dO_2, pH and Cond was correlated with CCA Axis-2. High section on the CCA ordination diagram was mostly correlated with low water temperatures and high altitudes instead of dO_2. Particularly High and Low sections were seperated clearly from eachother, Mid section was found on the intersection of both High and Low sections.