Introduction

The benthic macroinvertebrates are used as indicators of quality water and environmental assessment (Giacometti & Berbosa, 2006), these parameters can be inferred by invertebrate community structure. Biotic interactions in a lake are frequently narrow, and some environmental properties as conductivity and salinity gradient determine the macroinvertebrates distribution among wetlands (Schultz & Dibble, 2011). Vegetation presence is an important factor that increases the diversity and abundance of macroinvertebrates since plants constitute refuges for macroinvertebrates and fish larvae (Schultz & Dibble, 2011). The aim of this study was to assess the diversity and abundance of macroinvertebrates in the Tecocomulco lake.

Materials and methods

Study area

Tecocomulco is a wetland in Hidalgo, Mexico, at north of the Great Basin of Mexico. The basin includes 5 municipalities of the Hidalgo state and one in Puebla state. A mean altitude of 2,115 m between coordinates 19°33'N, 99°31'W. The study area got the denomination of the site RAMSAR in September 29th of 2003 due to three classification criteria (1, 2 and 4). This lake is considered as last relict of the ancient lacustrine system of the basin of Mexico Valley. Fish, amphipods and aquatic bird’s refuge in it. Finally, it’s a basing regulatory to aquifers recharge of the region (Ficha informativa de los humedales RAMSAR, 2003).

Methods

Three study sites were selected in different strategic places of the lake, trying to include different ecologic conditions (fig. 1). Sampling was performed in two seasons: wet season in May of 2011 and January of 2012 and dry season in August and November of 2011.

Sampling and data analysis

Abundance range presented components of low stability on sites 1 and 2, then the slope in this sites were mostly steep to difference of site 3 that showed slopes less steep due to abundance and frequency was most balanced to difference of previous sites mentioned (fig. 5).

Diversity index of Shannon-Wiener indicates significant differences between site 3 and site 1 (fig. 6). Mean values in each season also presented significant differences in treated sites. This reflects the maximum diversity that was observed in site 3. Temporal differences between sites were observed. So in order to have a good representation of the principal taxa, it is necessary to sample in site 3.

Evenness was assessed by a seasonal parameter and indicated a significant difference in January with May, August and November, with this last month, January was equal to November in site 1.

Temporal and spatial habitats were characterized by biotic and abiotic parameters, site 3 (right side) shown a relationship with most taxa as Chironomidae, Conchoecidae, Hyalellidae, among others that have habitats in plants as Najas guadalupensis and Potamogeton foliosus and Lemma gibba. Abiotic parameters have an importance in the environmental influence as ammonia, Chlorides and Nitrogen. Sites 1 and 2 had a narrow relation with Gammaridae, Acyliidae and Cambaridae, Lymnaeidae and Haliplidae (left axis), with sulfates and nitrates (fig. 9).

Literature cited


Results

Taxonomic richness was highest in site 3 which presented the widest quantity of families of benthic macroinvertebrates. Site 1 and 2 were less diverse than site 3 (fig. 3).

Families Hyalellidae and Corixidae had high importance value in all sampled sites due to their abundance and frequency. These were remarkably constant taxa during all seasons and sampling sites (fig. 4). Other groups as Baetidae and Lymnaeidae showed lower family values, fluctuating in space and time.

Conclusions

Spatial diversity and abundance of macroinvertebrates were influenced by plants as Lemma gibba, N. guadalupensis and P. foliosus. Temporal diversity and abundance were influenced by concentration of abiotic factors as orthophosphates, sulfates, alkalinity, conductivity and nitrogen compounds, that generates distinct conditions which allowed develop and growth taxa in an environmental with a great amount of resources, so as differences between habitats.

Fig. 1. Tecocomulco lake. Spatial distribution of sampling sites: Sites 1 and 2 are placed in limnetic zone; and site 3 is located in littoral zone.

Fig. 3. Mean values of presence in each site for sampled families in Tecocomulco lake. All seasons are included.

Fig. 4. Total measurements for importance value index of sampled families in Tecocomulco lake.

Fig. 5. Abundance range of present taxa in different sites and seasons.

Fig. 6. Values of diversity of sampled families in Tecocomulco lake. All seasons are included.

Fig. 7. Values of evenness of sampled families in Tecocomulco lake. All seasons are included.

Fig. 8 indicates that in months August and November is probable to found the maximum diversity, also this characteristic it presents in site 3.