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白洋淀湿地水质与水生物相关性研究

Correlation between water quality and aquatic life in Baiyangdian wetland

关键词：白洋淀 湿地 水质 水生物 冗余分析

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摘要：水质与水生物间关系是湿地生态学的研究热点,研究成果可为湿地水生态修复提供科学依据.在白洋淀湿地设置14个采样点,选取9个水质因子、4类11个水生物指标,利用冗余分析(RDA)方法对其进行研究.结果表明,白洋淀湿地水质和水生物相关性显著,前两个排序轴水质与水生物的相关系数分别为0.973和0.821,特征值分别是0.862和0.059.DO、NO_3^--N、SD、TN和TP是影响水生物的主要水质因子,第一排序轴与NO_3^--N和DO显著正相关;第二排序轴与SD显著正相关,与TN和TP显著负相关.比较可知,NO_3^--N、DO对浮游动植物影响显著,特征值占主要水质因子总特征值的89%;SD、TN和TP对底栖动物及大型水生植物影响大,特征值占主要水质因子总特征值的94%.

Abstract: The relationship between water quality and aquatic life is a hot topic of wetland ecology. The research outcomes can provide scientific basis for ecological restoration of wetland. In the paper, 14 sampling sites over Baiyangdian wetland were set up according to the discrepancy for water areas under different interferences. Nine water quality factors and 4 kinds (11 aquatic bioindicators) were selected to analyse the relationship between water quality and aquatic life with redundancy analysis (RDA). Water quality factors included pH, Temp, SD, DO, NO_3^--N, NH_4^+-N, TN, TP and DIP. The results showed that water quality has significant correlations with aquatic life and the sum of all canonical eigenvalues was 0.922. The eigenvalues of the first two axes were 0.862 and 0.059, respectively, and the species-environment correlations of the first two axes were 0.973 and 0.821. Overall, DO, NO_3^--N, SD, TP and TN were the main explanatory factors for aquatic life, while pH, Temp, NH_4^+-N, and DIP were not sensitive factors. DO and NO_3^--N showed a significant positive correlation with RDA axis 1, while TP and TN showed a significant positive correlation with axis 2 and SD significant positive correlation with axis 2. Moreover, DO and NO_3^--N were key factors for phytoplankton and zooplankton, and the relationship between them was positive. The sum of eigenvalues of DO and NO_3^--N was 0.89 which accounted for 89% of the eigenvalues of five major factors. SD, TP and TN were the key factors for benthic macroinvertebrate and macrophyte, and the relationship between them was negative. The sum of eigenvalues of SD, TP and TN was 0.94 which accounted for 94% of the eigenvalues of five major factors.

Key words: Baiyangdian wetland water quality aquatic life RDA

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