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研究论文

西太湖湖滨带已恢复与受损芦苇湿地环境功能比较

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摘要 对西太湖湖滨带部分地段受损芦苇（Phragmites australis）湿地进行修复的基础上,开展了修复后湿地和相邻受损湿地内植物生物量,湿地水体与泥积物中氮、磷含量,底泥有机质含量,底泥氮循环微生物种类和数量以及底泥重金属种类和含量等湿地环境功能方面的比较研究。结果表明:(1)受损湿地内近20m宽的陆向辐射带均为水蓼（Polygonum hydropiper）、红蓼（Polygonum orientale）、水莎草（Juncellus serotinus）以及人工种植的苏丹草、苦荬菜和黑麦草等鱼食青饲料所取代。与修复后湿地相比,每1m2植物生物量较少了37%～60%。(2)两类湿地中的氮、磷营养盐浓度沿水向辐射带、水位变幅带到陆向辐射带依次呈递增趋势,且修复后湿地内水体中的无机氮浓度分别比受损湿地增加了25.36%,89.39%和2562.30%,其中以NH+4-N为主,反硝化作用在已修复湿地中占主导地位。(3)两种湿地内的水向辐射带和水位变幅带底泥氮、磷含量均较低,陆向辐射带内较高,磷含量分别比受损湿地同一水位梯度高3.19,2.62、2.25倍和1.74倍;氮含量分别比受损湿地同一水位梯度高1.84,6.08、2.09倍和2.46倍。(4)两种湿地内的水位变幅带和陆向辐射带中的底泥有机质含量较高，其中已恢复湿地底泥有机质含量达到4.13%～5.65%。水向辐射带含量均较低，一般在0.65%～0.8%之间。(5)水位变幅带和陆向辐射带底泥有机质含量较高,其中已修复湿地泥积物有机质含量达到42.17%～56.5%。水向辐射带有机质含量均较低,一般在1.65%～8.03%之间;(5)受损湿地内的陆向辐射区和水位变幅区硝化细菌数量分别比反硝化细菌高3.73倍和1.73倍,水向辐射区底泥中的硝化细菌和反硝化细菌数基本相当;在已修复湿地内的陆向辐射区和水位变幅区反硝化细菌数量分别是硝化细菌数量的10.69倍和8.24倍,反硝化作用占绝对优势;在水向辐射区及开阔湖体,湖水的频繁交换作用,硝化细菌数量相对较多,硝化作用较强。(6)在湿地水位变辐区和陆向辐射区沉积物Mn含量较高，含量在800～1000mg/g之间。Cu、Zn、Pb等重金属污染元素含量分别为35.80～78.95μg/g,53.76～154.50μg/g和48.06～108.88μg/g,重金属污染对该区域水环境无明显影响。

关键词 湖滨带湿地； 环境功能； 芦苇

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The comparison of environmental roles between restored *Phragmites communis* communities and disturbed ones in Lakeside wetlands of West Taihu Lake

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Abstract The research region is located in the west of the Taihu Lake. With the population increasing and economical development, the land of lakeside of west Taihu Lake was reclaimed to develop agriculture, farmland and factories. In this study, the ecological roles between restored Phragmites communis communities and disturbed ones were compared based on restored sectional disturbed wetland structures.

The survey results show that the ecological indices of restored wetlands are higher than that of disturbed ones, including biomass of plants, the concentrations of nitrogen and phosphorus nutrients in water and sediments, the numbers of three nitrogen cycle bacteria in sediments and the concentrations of heavy metals in sediments, etc. The species and numbers of plants in terrestrial area have a great number of changes, the biomass of plants in disturbed wetlands decreased 37%～60%. The concentrations of dissolved inorganic nitrogen in the water of terrestrial area, transition area of water and terrene and water area in the restored wetland are higher 25.36%, 89.39% an

d 2562.30% than those in the water of disturbed wetland. After analyzing the vertical sediments samples, the concentrations of TP in the sediments of terrestrial area of restored wetland are 3.19,2.62,2.25 and 1.74 times as much as those in disturbed one; The concentrations of TN are 1.84,6.08,2.09 and 2.46 times as much as those in disturbed ones. The concentrations of organic in the sediments of terrestrial area and transition area of water and terrene area are higher than those of water areas, especially, the concentrations of organic in the sediments in restored wetland reach to 42.17%～56.5%.On the contrary, the concentrations of organic in the sediments of water area are lower. In the restored wetland, the number of denitrifying bacteria in the terrestrial area and transition area of water and terrene area are 10.69 and 8.24 times as much as those of nitrobacteria in water area. The results demonstrate that denitrification play a significant role in nitrogen removal. Based on the quantitative analysis of four(Mn,Cu,Zn,Pb)heavy metal elements in the surficial sediments, the enrichment of Mn appears higher and that of the other heavy metals appear lower. The assessment result of the heavy metals' ecological risk revealed except Mn, which belongs to middle potential risk, most heavy metals belong to the light potential ecological risk segment.

Key words lakeside wetlands _ environment roles _ Phraginites communis

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