2005-2021 年沉湖湿地水鸟群落动态及其对景观格局变化的尺度响应

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摘要：【目的】水鸟作为湿地生态系统中的关键类群与湿地生态系统环境的指示物种，对于维持湿地生态系统的健康具有重要作用。沉湖湿地作为长江中下游与东亚—澳大利西亚水鸟迁徙路线上的重要湖泊之一，是多种濒危珍稀水鸟的越冬地、繁殖地或停歇点。沉湖湿地小流域的土地利用变化可能对水鸟群落的结构产生了深远的影响。【结果】本研究结合沉湖湿地 2005-2021 年水鸟观测数据和遥感影像，分析沉湖湿地 2005-2021 年水鸟群落动态及其与景观格局变化之间关系，得到的主要结果如下：沉湖湿地水鸟的物种数与个体数在 2005-2021 年间大幅度增加。冬候鸟是组成水鸟群落的主体；涉禽总体上为生态型物种组成的优势类群，游禽为个体数组成的优势类群；杂食性水鸟为食性物种组成的优势类群，个体数组成由无明显优势食性转变植食性优势；雁形目和鸻形目为水鸟群落组成的优势目；水鸟群落优势物种的物种数在 2015 年后逐渐减少。水鸟群落的物种多样性指数波动上升。水鸟群落经历了物种组成变化剧烈和物种组成变化较小两个阶段。（2）沉湖湿地冬候鸟的物种数与个体数在 2005-2021 年间大幅度增加。游禽总体上为冬候鸟群落生态型组成的主体；杂食性为食性物种组成的优势类群，植食性为个体数组成的优势类群；雁形目和鸻形目为冬候鸟群落的优势目；冬候鸟群落雁鸭类水鸟种群的优势度越来越高。冬候鸟群落的物种多样性指数波动上升。群落物种组成变化越来越小，物种组成较为稳定。（3）在 2005-2021 年沉湖湿地每年均有观测到濒危珍稀水鸟，2017 年后濒危珍稀水鸟物种数量开始稳定上升。在 2018 年以后，每年均有观测到年份特有水鸟物种。（4）在沉湖湿地自然保护区尺度下，浅水区等自然湿地景观为水鸟群落物种多样性提高，物种数和个体数增加主要的正向驱动力因素；在保护区外围和小流域尺度下，转变为水产养殖塘、藕田/水稻田等人工湿地景观。【结论】在不同的空间尺度下，水鸟群落动态的驱动力因素发生显著变化。

关键词：沉湖湿地；水鸟群落；群落动态；景观格局；尺度效应

Study on waterbird community dynamics and its scale effect to landscape pattern changes in Chenhu Wetlands from 2005-2021

Abstract: 【Objective】As key taxa in wetlands ecosystems and indicator species of wetlands ecosystem environments, waterbird play an important role in maintaining the health of Wetlands ecosystems. As one of the important lakes along the migration route of waterbird between the middle and lower reaches of Yangtze River and East Asia-Australia, the Chenhu Wetlands is a wintering site, breeding site or resting place for a variety of endangered and rare waterbird. Land use changes in the sub-basin of the Chenhu Wetlands may have had a profound impact on the structure of the waterbird community. To investigate the waterbird community dynamics in the Chenhu Wetlands and to reveal the response of waterbird community dynamics to changes in landscape patterns at different spatial scales, this study combined the waterbird observation data of the Chenhu Wetlands from 2005 to 2021, remote sensing images and analyze the relationship between waterbird community dynamics and landscape pattern dynamics in the Chennhu Wetlands from 2005 to 2021. The main results are as follows:

(1) The number of species and individuals of waterbirds in the Chenhu Wetlands increased substantially between 2005 and 2021. Winter migratory birds are the mainstay of the waterbird community; wading birds are generally the dominant taxon in the ecological composition of the waterbird community, and the number of individuals is mainly composed of wading birds; omnivorous waterbirds are the dominant group of feeding species, and the composition of the number of individuals changes from no obvious dominant feeding to phytophagy; Geese and Plovers are the dominant order in waterbird communities; the number of dominant species in the waterbird community gradually decreased after 2015. The species diversity index of the waterbird community fluctuated up. The waterbird community experienced two stages of drastic change in species composition and less change in species composition.(2) The number of species and individuals of winter migratory birds in the Chenhu Wetlands increased substantially between 2005 and 2021. Wading birds were generally the mainstay of the ecotype composition of the winter migratory bird community; the composition of dietary species was mainly omnivorous, the number of individuals was dominated by phytophagy; Geese and Plovers were the dominant species in the composition of winter migratory bird communities; the dominance of goose and duck populations is increasing. The species diversity index of the winter migratory bird community fluctuated upward; the species composition of the community changed less and less, and the species composition was relatively stable. (3) Endangered and rare waterbirds were observed in the Chenhu Wetlands each year from 2005 to 2021, the number of endangered and rare waterbird species began to increase steadily after 2017. After 2018, endemic waterbird species were observed every year. (4) At the scale of the Chenhu Wetlands Nature Reserve, the natural wetlands landscape type in shallow water is the main positive driving factor for the increase in species diversity, species number and individuals of waterbird communities; at the scale of the periphery of the reserve and the sub-basin, it is transformed into artificial wetlands landscapes such as aquaculture ponds and root/rice fields. The driving factors of waterbird community dynamics changed significantly at different spatial scales.

Keywords: Chenhu Wetlands; waterbird community; community dynamics; landscape patterns; scale effect