Analysis of grassland carrying capacity in Inner Mongolia based on ecosystem function

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With the increase of global temperature and the intensification of human activities, numerous ecological problems have occurred in the grasslands of Inner Mongolia, which have seriously disturbed the sustainable development and the improvement of the carrying capacity of grassland ecosystems, and threatened the security of regional ecological environment. There is an urgent need to find a quantitative assessment method for the quantification of the carrying capacity in grassland ecosystems, which is significantly crucial for making a sustainable development strategies of grassland resources. In this study, we considered the ecosystem services as a limited well-beings, and took the Net Primary Production (NPP) as the core indicator for characterizing the occupation of grassland's main ecological functions to ecosystem services. Further more the occupy threshold for environment maintenance and natural regeneration functions were calculated. The spatial distribution of the grasslands carrying capacity in Inner Mongolia was quantitatively analyzed, and the vulnerability of the "human-land system" was evaluated. The results show that: (1) The Above-ground Net Primary Production (ANPP) needed for the ecosystem function maintenance of Inner Mongolia in 2015 was at 38-401 g/m² • a, and there was a decreasing trend from northeast to southwest; (2) In 2015, the ecological carrying capacity of the grassland ecosystem in Inner Mongolia was 79.336 million sheep units, and the average carrying capacity was 1.56 sheep unit / hm² • a. However, the total economic carrying capacity was 174,571 million sheep units, and the average economic carrying capacity was 3.42 sheep unit / hm² • a, whose spatial distribution is basically consistent with the spatial distribution of ecological carrying capacity, while the actual stocking was 145,548 million sheep units. (3) The spatial distribution of the grassland carrying capacity displayed highly spatial heterogeneity in Inner Mongolia. The ecological carrying status index ranged from 0.59 to 12.06, and the economic carrying status index ranged from 0.29 to 3.68. The natural regeneration function of grasslands required the largest NPP, which greatly reduced the grassland ecological carrying capacity in Inner Mongolia. From the perspective of spatial distribution, the ecological carrying capacity of grassland in eastern Inner Mongolia is bigger than that of western region, and there was an imbalance between socioeconomic development and ecological environmental maintenance. The concentration of population in eastern Inner Mongolia is the main limiting factor affecting the ecological carrying capacity, which resulting in the supply of grassland ecological system cannot meet the practical
needs of social development. The environment western characterized by the water deficient and low vegetation coverage were the main limiting factors of ecological carrying capacity in western Inner Mongolia, where the grassland function of windbreak and sand-fixation needed to take up more resources.