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研究论文

不同栖息地状态下物种竞争模式及模拟研究与应用

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摘要 物种竞争是影响生态系统演化的重要生态过程之一。而物种在受人类影响出现不同程度毁坏的栖息地上的演化又是非常复杂的，因此研究物种演化对栖息地毁坏的响应是非常必要的。在Tilman研究工作的基础上，将竞争系数引入集合种群动力模式，建立了多物种集合种群竞争共存的数学模型，并对5-物种集合种群在不同栖息地状态下的竞争动态进行了计算机模拟研究。结果表明：（1）不同结构的群落（q值不同），物种之间的竞争排斥作用强度不同，优势物种明显的群落，物种之间的排斥强度大；（2）随着栖息地毁坏程度的增加，对优势物种的负面影响逐渐减小，而对弱势物种的负面影响逐渐增加；（3）随着栖息地恢复幅度的增加，优势物种和弱势物种之间的竞争越强烈，优势物种受到的竞争排斥加大，而弱势物种逐渐变强，出现了强者变弱、弱者变强的格局；（4）物种竞争排斥与共存受迁移扩散能力和竞争能力影响很大，竞争共存的条件是其竞争能力与扩散能力呈非线性负相关关系；（5）竞争共存的物种的强弱序列发生了变化。

关键词 栖息地；物种竞争；迁移扩散能力；竞争能力；模型与模拟

分类号 Q11,Q141,Q145

The competition model of species at different types of habitat and simulation studies and applications

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Abstract Human activities are affecting the habitat, which decrease the number of habitats and recede the quality. The biggest threat to species diversity worldwide is the loss of suitable habitat. Human activities affect species dynamics and further influence species diversity by changing habitat. Species competition is one of the most important ecological courses that affects the evolvement of ecosystem. Species evolvement at different types of habitat is very complex, so there is an urgency to understand species responses to human-caused habitat degradation. On the basis of Tilman's research and model, a competing coefficient is introduced into dynamical model of metapopulation and a mathematical model of competition among the metapopulation species is established, at the same time, the competing trends of five metaspecies at different types of habitat are simulated by means of computer research. The results of simulation show that:(1) The competing exclusion intensity among the species is distinct in different structure of communities(different q values), the competing exclusion intensity of species is bigger in community which includes superior species than that which has inferior species. The dispersal ability of species plays a definite role in species competition.(2)With the level of habitat degradation increased, the negative influence on superior competitors become smaller, while bigger on inferior ones.(3)With the increasing of habitat restoration extent, competition between the superior and inferior species becomes more fierce. Th

e effect of competing exclusion on superior species increases, while the inferior ones becomes str onger, the complexion emerges that the superior one becomes weak and the inferior one become s strong.(4)The competitive and dispersal ability have a profound effect on the competing eliminati on and coexistence of species, the condition of species competition and coexistence is the compet itive ability have a nonlinear minus correlation with dispersal power.(5)The ecological orders of su perior and inferior species will change.

Key words habitat _ species competition _ dispersal ability _ competitive ability _ model and simulation

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