Scaling Relations In Food Webs

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In the last three decades, researchers have tried to identify universal patterns in the structure of food webs. It was recently proposed that the exponent $\eta$ characterizing the efficiency of the transport of energy in large and small food webs might have a universal value ($\eta = 1.13$) [1]. In this work we [2] establish a lower and upper bounds for this exponent in a general spanning tree with fixed number of trophic species and levels. When the number of species is large, the lower and upper bounds are equal to 1, implying that the result $\eta = 1.13$ is due to finite size effects and that the value of this exponent depends on the size of the web. We also evaluate analytically and numerically the exponent $\eta$ for hierarchical and random networks. In all cases the exponent $\eta$ depends on the number of trophic species $K$ and when $K$ is large we have that $\eta \to 1$. Moreover, this result holds for any fixed number $M$ of trophic levels.