

A heuristic approach to estimation of ecosystem stability

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Motivation and Aim: Theoretical forecasting of ecosystem stability is important in our time. Stability of ecosystem means in general coexistence of all ecosystem species without extinction[1]. Stability can be predicted with mathematical model, however modern ecological models can be solved only numerical due to their high complexity.

Methods and Algorithms: In our work we establish a heuristic approach to estimate ecosystem model stability based on Gershgorin's Circles theorem. To check proposed approach, stochastic numerical study of models was used. Models were solved numerically many times with set of random parameters and then results are compared with heuristic method prediction.

Results: It was shown that there is a positive correlation between number of Gershgorin's Circles with centers on negative semi-plane and probability to have Laypunove stable solution of equations. It is an important that Gershgorin's Circles theorem do not predict this result – to increase probability to have stable solution is not necessary to move all circles to negative semiplane.

Conclusion: The results obtained in the research can be widely used in modern ecology. Proposed heuristic approach can be used to predict mechanisms of ecosystems stability and “key species” with high role in stability maintenance.

References

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