

**Alsharawi, Ziyad; Rhouma, Mohamed**

**Coexistence and extinction in a competitive exclusion Leslie/Gower model with harvesting and stocking.** (English) [Zbl 1176.92050](#)

*J. Difference Equ. Appl.* 15, No. 11-12, 1031-1053 (2009).

Summary: The principle of competitive exclusion states that when the competition between species is sufficiently strong, only the dominant species survives. We examine the strategies of using stocking and harvesting to prevent the extinction of the weak species in a competitive exclusion environment. We find that in a system governed by the *P. H. Leslie* and *J. C. Gower* model [Biometrika 47, 219–234 (1960; [Zbl 0103.12502](#))] careful stocking will ensure the coexistence between all species. We also find that constant harvesting of the dominant species may guarantee the survival of the weaker species when the parameters of the model are in a certain range. Mixed strategies and conditional harvesting strategies are also discussed.

**MSC:**

[92D40](#) Ecology

[91B76](#) Environmental economics (natural resource models, harvesting, pollution, etc.)

[39A60](#) Applications of difference equations

[39A30](#) Stability theory for difference equations

Cited in 14 Documents

**Keywords:**

competitive exclusion; Leslie/Gower model; stocking; harvesting; coexistence; extinction

**Full Text:** [DOI](#)

**References:**

- [1] A.S. Ackleh, Y.M. Dib, and S.R.J. Jang, A discrete-time Beverton–Holt competition model, in Proceedings of the 9th International Conference on Difference Equations and Discrete Dynamical Systems, World Scientific Publishing, 2005, pp. 1–9 · [Zbl 1091.92046](#)
- [2] Allen L., An Introduction to Deterministic Models in Biology (2004)
- [3] Z. AlSharawi and M. Rhouma, The Beverton–Holt model with periodic and conditional harvesting, submitted · [Zbl 1342.91025](#)
- [4] DOI: 10.1080/10236190600949782 · [Zbl 1116.39008](#) · doi:10.1080/10236190600949782
- [5] DOI: 10.1080/10236190410001726421 · [Zbl 1068.39005](#) · doi:10.1080/10236190410001726421
- [6] Beverton R.J.H., On the Dynamics of Exploited Fish Populations (2004)
- [7] DOI: 10.1007/BF00276917 · [Zbl 0469.92010](#) · doi:10.1007/BF00276917
- [8] DOI: 10.2307/3546808 · doi:10.2307/3546808
- [9] DOI: 10.1080/00207177608922181 · [Zbl 0317.92003](#) · doi:10.1080/00207177608922181
- [10] DOI: 10.1007/BF00275152 · [Zbl 0397.92019](#) · doi:10.1007/BF00275152
- [11] DOI: 10.1007/BF00280586 · [Zbl 0406.92020](#) · doi:10.1007/BF00280586
- [12] DOI: 10.1007/BF00275820 · [Zbl 0448.92020](#) · doi:10.1007/BF00275820
- [13] Soudack A.C., *J. Math. Biol.* 12 pp 101– (1981)
- [14] DOI: 10.1016/S0304-3800(99)00190-8 · doi:10.1016/S0304-3800(99)00190-8
- [15] DOI: 10.1016/S0898-1221(01)00326-1 · [Zbl 1001.39017](#) · doi:10.1016/S0898-1221(01)00326-1
- [16] DOI: 10.1090/S0273-0979-1979-14594-4 · [Zbl 0401.60065](#) · doi:10.1090/S0273-0979-1979-14594-4
- [17] DOI: 10.1080/10236190410001652739 · [Zbl 1071.39005](#) · doi:10.1080/10236190410001652739
- [18] Gause G.F., *The Struggle for Existence* (1934) · [Zbl 60.1113.08](#)
- [19] Grove E.A., *Comm. Appl. Nonlinear Anal.* 8 pp 1– (2001)
- [20] DOI: 10.1016/j.mbs.2006.03.023 · [Zbl 1106.92069](#) · doi:10.1016/j.mbs.2006.03.023

- [21] Jonzen N., *Ann. Zool. Fenn.* 36 pp 39– (1999)
- [22] Kocic V.L., *Global Behaviour of Nonlinear Difference Equations of Higher Order with Applications* (1993) · [Zbl 0787.39001](#) · [doi:10.1007/978-94-017-1703-8](#)
- [23] DOI: [10.1201/9781420035384](#) · [doi:10.1201/9781420035384](#)
- [24] Grove E.A., *Periodicities in Nonlinear Difference Equations* (2005) · [Zbl 1078.39009](#)
- [25] Leslie P.H., *Biometrika* 45 pp 316– (1958) · [Zbl 0087.34501](#) · [doi:10.1093/biomet/45.3-4.316](#)
- [26] DOI: [10.1016/j.chaos.2006.03.054](#) · [Zbl 1127.92045](#) · [doi:10.1016/j.chaos.2006.03.054](#)
- [27] DOI: [10.2307/1948641](#) · [doi:10.2307/1948641](#)
- [28] Park T., *Physiol. Zool.* 27 pp 177– (1954) · [doi:10.1086/physzool.27.3.30152164](#)
- [29] Park T., *Physiol. Zool.* 30 pp 22– (1957) · [doi:10.1086/physzool.30.1.30166306](#)
- [30] Park T., *Physiol. Zool.* 37 pp 97– (1964) · [doi:10.1086/physzool.37.2.30152328](#)
- [31] DOI: [10.1577/1548-8675\(2001\)021<0156:ROLTIP>2.0.CO;2](#) · [doi:10.1577/1548-8675\(2001\)021<0156:ROLTIP>2.0.CO;2](#)
- [32] Roeger L.W., *Can. Appl. Math. Q.* 11 pp 175– (2003)
- [33] Selgrade J.F., *Can. Appl. Math. Q.* 6 pp 207– (1998)
- [34] DOI: [10.1017/CBO9780511530043](#) · [doi:10.1017/CBO9780511530043](#)
- [35] DOI: [10.1016/j.na.2006.02.049](#) · [Zbl 1119.39011](#) · [doi:10.1016/j.na.2006.02.049](#)
- [36] DOI: [10.1007/s00285-004-0303-5](#) · [Zbl 1066.92057](#) · [doi:10.1007/s00285-004-0303-5](#)
- [37] DOI: [10.1016/0025-5564\(94\)00033-V](#) · [Zbl 0820.92024](#) · [doi:10.1016/0025-5564\(94\)00033-V](#)
- [38] DOI: [10.2307/1934593](#) · [doi:10.2307/1934593](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.