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Global stability of the coexistence equilibrium for a general class of models of facultative mutualism.

Many models of mutualism have been proposed and studied individually. In this paper, we develop a general class of models of facultative mutualism that covers many of such published models. Using mild assumptions on the growth and self-limiting functions, we establish necessary and sufficient conditions on the boundedness of model solutions and prove the global stability of a unique coexistence equilibrium whenever it exists. These results allow for a greater flexibility in the way each mutualist species can be modeled and avoid the need to analyze any single model of mutualism in isolation. Our generalization also allows each of the mutualists to be subject to a weak Allee effect. Moreover, we find that if one of the interacting species is subject to a strong Allee effect, then the mutualism can overcome it and cause a unique coexistence equilibrium to be globally stable.

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