11th Conference on Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2020
Trento, Italy, February 4-7, 2020

REPLICATOR EQUATIONS FOR STRUCTURED POPULATIONS: HAWK-DOVE GAME APPLICATION

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In this work, we describe a structured replicator equation model that includes a finite number of strategies and a finite number of physiological states. The population state distribution is considered to be a result of the environmental conditions; whereas, the strategies arise from behavioral plasticity. Our aim is to understand how a state-dependent fitness can affect the existence, stability and distribution of the strategies. As the first result, we prove the existence of an equilibrium point that describes a population with a mix of pure strategies over a partition of the structure set and provide a sufficient condition for its local asymptotic stability. Then, we extend the analysis to a particular case of a structured Hawk-Dove game. We prove that the forms of the cost, gain, and initial population function by the size can shift the population from one of complete coexistence to one with pure strategies.

 ISBN: 978-989-98750-7-4