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Dynamics of a higher order non-autonomous difference equation

We study the non-autonomous difference equation

$$X_{n+1} = F(n, X_n, X_{n-k}) - H(n, X_n), \quad n \geq 0,$$

where $X_{-k}, \dots, X_{-1}, X_0$ are positive real numbers, $F(n, X_n, X_{n-k})$ is represented by a delay rational difference equation, and H denotes the removal function of individuals during each time period as harvesting or functional responses. In particular, the periodic behavior, the attractivity of solutions and the stability of solutions are discussed in detail. The impact of seasonality on the behavior of solutions is also considered.