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**Implementation of control strategies for sterile insect techniques.** (English) Zbl 1425.92126  
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**Summary:** In this paper, we propose a sex-structured entomological model that serves as a basis for design of control strategies relying on releases of sterile male mosquitoes (*Aedes* spp) and aiming at elimination of the wild vector population in some target locality. We consider different types of releases (constant and periodic impulsive), providing sufficient conditions to reach elimination. However, the main part of the paper is focused on the study of the periodic impulsive control in different situations. When the size of wild mosquito population cannot be assessed in real time, we propose the so-called open-loop control strategy that relies on periodic impulsive releases of sterile males with constant release size. Under this control mode, global convergence towards the mosquito-free equilibrium is proved on the grounds of sufficient condition that relates the size and frequency of releases. If periodic assessments (either synchronized with the releases or more sparse) of the wild population size are available in real time, we propose the so-called closed-loop control strategy, under which the release size is adjusted in accordance with the wild population size estimate. Finally, we propose a mixed control strategy that combines open-loop and closed-loop strategies. This control mode renders the best result, in terms of overall time needed to reach elimination and the number of releases to be effectively carried out during the whole release campaign, while requiring for a reasonable amount of released sterile insects.

**MSC:**

92C60 Medical epidemiology  
34D23 Global stability of solutions to ordinary differential equations  
93B52 Feedback control  
93D20 Asymptotic stability in control theory

Cited in 7 Documents

**Keywords:**

sterile insect technique; periodic impulsive control; open-loop and closed-loop control; global stability; exponential convergence; saturated control

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