CURAÇAO QUIZ

PRINCIPLES OF THE STERILE INSECT RELEASE METHOD

The sterile insect release method (SIRM) of pest population suppression consists of releasing sterilized insects into the natural population in numbers sufficient to ensure that most wild individuals will mate with a sterile insect, resulting in failure to produce viable offspring. Additional releases of sterile insects are made in subsequent generations, and within a few generations the wild population is eradicated. The first practical use of the technique was in the eradication of the screwworm, *Cochliomyia hominivorax*, from the Caribbean island of Curaçao in 1955. The success of the method depends on a number of different factors that must be clearly understood before any insects are reared and released. This quiz is intended to test your understanding of these factors.

1. Assuming random mating and equal competitiveness of native, fertile males with released, sterile males, what percent of the matings would be fertile if we released 9 sterile males for every fertile male in the native population?

   _____ a. 1%
   _____ b. 9%
   _____ c. 10%
   _____ d. 11%
   _____ e. 90%

2. If the normal population trend were a 5-fold increase with each generation (at populations well below those at which the population density becomes limiting), what would be the minimum release ratio (sterile:fertile) to create a downward population trend?

   _____ a. Greater than 1:4
   _____ b. Greater than 1:5
   _____ c. Greater than 4:1
   _____ d. Greater than 5:1
   _____ e. Greater than 9:1

3. If the released (sterile) males were only half as successful as the native males in competing for mates, what release ratio would be necessary to achieve the same rate of extinction as a 9:1 release ratio of equally competitive sterile males?

   _____ a. 1:18
   _____ b. 1:4.5
   _____ c. 4.5:1
   _____ d. 9:1

_____ e. 18:1

4. Suppose that in calculating our initial release ratios we underestimated the fecundity of the native females, and their fecundity was actually greater than what we had originally estimated. What would be the effect on the sterile insect release method?

_____ a. It would require a higher initial release ratio to be effective.
_____ b. It would require a lower initial release ratio to be effective.
_____ c. The required initial release ratio would be the same, but eradication would occur in fewer generations.
_____ d. It would have no effect on the efficacy of the sterile insect release method.
_____ e. The sterile insect release approach to population control would no longer be possible.

5. If we had made a similar error in estimating the insect survival to reproductive age, that is, the actual survival to the adult stage was greater than what we had originally calculated, What would be the effect on the sterile insect release method?

_____ a. It would require a higher initial release ratio to be effective.
_____ b. It would require a lower initial release ratio to be effective.
_____ c. The required initial release ratio would be the same, but eradication would occur in fewer generations.
_____ d. It would have no effect on the efficacy of the sterile insect release method.
_____ e. The sterile insect release approach to population control would no longer be possible.

6. The initial release ratios must be calculated based on an **estimate** of the native population at the time of the release. Since that estimate is subject to sampling error, what precautions must be taken to assure success of the sterile insect release program?

_____ a. Use the sterile insect release method only for insect populations that are uniformly dispersed.
_____ b. Estimate the native population with a large enough number of samples to make the sampling error negligible.
_____ c. Base the minimum initial release ratio upon the sample mean density.
_____ d. Base the initial release ratio on an upper

confidence limit (e.g., 95 or 99%) for the sampled distribution.

_____ e. Use an initial release ratio that has proven successful for that insect species in the past.

7. The original sterile insect release model proposed by Knipling in 1955 assumed a uniform dispersion of the native population and random mating of the native and released insects. What are the implications for the eradication of an insect species that is aggregately dispersed?

_____ a. The sterile insect release method can be used only for insect populations that are uniformly dispersed.
_____ b. The initial release ratio must be determined empirically rather than by calculation from theoretical models.
_____ c. The initial release ratio must be based on the mean population estimated from a very large number of samples.
_____ d. The initial release ratio must be based on an upper confidence limit (e.g., 95 or 99%) for the sampled distribution.
_____ e. To be effective, the sterile insects must be released in aggregates that correspond to the aggregates in the native population.

8. The original sterile insect release model proposed by Knipling in 1955 assumed no migration of insects into or out of the zone in which the sterile insects were released. Which of the following statements is true of the application of the sterile insect release method to a highly mobile insect species?

_____ a. Sterile insects must also be released in a border zone around the target zone to assure eradication.
_____ b. Eradication will be successful regardless of the mobility of the insects because the sterile insects will migrate with the native insects.
_____ c. The higher the rate of migration, the faster the extinction of the native population.
_____ d. The sterile insect release method is effective only for nonmigratory insect species.
_____ e. The dispersal phase must take place before mating in order for eradication to be successful.

9. In applying the sterile insect release method to highly aggregated populations, there can be small, local areas of an upward population trend within a larger area where the population trend is downward. Which of the following statements is true about SIRM in such situations?

_____ a. The sterile insect release method cannot be successful in highly aggregated populations.
_____ b. Within aggregates of high population, the ratio of sterile to fertile insects may have to be adjusted upward

after the initial release.

_____ c. A better estimate of the native population mean is necessary, requiring more detailed monitoring.

_____ d. Eradication will be successful only if the species is highly mobile.

_____ e. The population trend within small, local areas does not matter as long as the population trend in the larger area is downward.

10. It may be necessary to release some insect species from point sources (such as cages) rather than uniformly over an area (such as release from an aircraft). Which of the following statements is true about point source releases?

_____ a. Point source release is less likely to be successful if the insect has its dispersal phase before mating than if it mates before it disperses.

_____ b. Point source release is less likely to be successful with a species that has a high rate of dispersal than one with a low rate of dispersal.

_____ c. Point source release of a given species requires more sterile insects to be successful than uniform release of the same species in the same environment.

_____ d. The sterile insect release method cannot work with point source releases--it requires uniform dispersion of the released insects.

_____ e. Point source release requires a more precise estimate of the native population than uniform release.