

SCUDEM IV 2019

Obafemi Awolowo University, Ile-Ife, Nigeria.

PROBLEM OF INTEREST

PROBLEM C: CHEMICAL ESPIONAGE

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INTRODUCTION

The presented model seeks to find a balance between the butterfly population and the wasp population to ensure that the relationship which exist between them (i.e. the predator – prey relationship) does not drive the butterfly to extinction and by implication drive the wasp to extinction as well.

This model uses the presented problem; the interaction of the Large Cabbage White Butterfly (*pieris brassicae*) and Parasitic Wasps. The mated butterfly in order to mate discharge a chemical to attract the male butterfly which in turn discharge anti-aphrodisiacs which helps in egg fertilizing to dissuade other male from mating with the mated butterfly. This gives the mated butterfly time to lay more eggs.

This relationship leads to an eventual problem where a wasp detects the secreted anti-aphrodisiac and follow the butterfly to the point of egg laying, and laying her egg next to the butterfly eggs, which eventually leads to the larva of the wasp eating up the eggs of the butterfly.

BACKGROUND

The first approach was first to determine the useful factors in the presented problem and represent them as variable. This gave series of relationship which was somewhat a problem. I however tried to research on population relationships and got the Lokta-Voltera predator prey formula which perfectly represented the relationship at hand. I therefore followed steady state equation to solve the generated non-linear equation from the given relationship. Hence, arrived at a probable balance.

METHODS

This model is made up of two ordinary differential equations, one which relates the relationship between the wasp and the female butterfly, represented as the prey mated female butterfly and the preying wasp. The solution is used to deduce our conclusion as follows:

CONCLUSIONS

I was able to deduce that if the given situation remains so, there is bound to be extinction in the part of the butterfly. However, if we reduce the growth rate of the wasps in a situation, there will be growth of the butterfly as the time tends to infinity.