USE OF AN EVOLVING COMPUTER SIMULATION (ECOSIM)

TO SUPPORT LARVAL CONTROL - AN ENTOMOLOGICAL PERSPECTIVE

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The overall goal of our District's computer ECOSIM is to increase the efficiency of the larval control program (Mead et al. 1990; Roberts et al. 1990; Rusmisel and King 1990). The payoff is to inspect only sources that are positive for larvae.

From the point of view of the entomologist in charge of control programs, one of the questions in my mind must be, is the model providing a help to the technicians? Does the model help them accomplish their work in a more efficient manner?

Alameda County Mosquito Abatement District encompasses 825 square miles of territory with a population of approximately 1,200,000 people. This provides a heavy workload for seven technicians.

The technicians are assigned zones within which they are responsible for mosquito control. These zones obviously have variances in size, number of breeding sources, temperature, population, ecological diversity, diversity of mosquito species, and differing rates of mosquito larval production and growth rates.

One of the programs developed by our District is the Zone Inspection Guidelines (ZING) (Roberts et al. 1990). Its objective is to generate a list of sources in each zone on a weekly basis, with information available to describe their most current condition and then to display them in a logical inspection and treatment schedule for review by each technician.

I believe that the weekly zone inspection guidelines do help the technicians with their daily workload. Obviously, a good technician knows the mosquito production taking place in his or her zone throughout the year, but the ZING printout is a good reminder or backup for memory.

The ZING printout prioritizes the breeding sources, highest priority at the top of the page and lowest priority at the bottom. The priority is established by the simulation providing a projected date of threshold. This allows the technician to make a judgment on which sources must be attended to immediately, which sources he may be able to ignore and for how many days he may ignore them without problems.

The ZING program predicts when the mosquito larval threshold has been reached and when the source must be treated. The simulation actually has a conservative view, in-so-far as when a source has been inspected and found to be negative for larvae, the model assumes oviposition will occur the next day.

A number of years ago (1974 - 1975) management was concerned with resistance and with the number of insecticidal treatments that were occurring during the normal mosquito-breeding seasons. We made attempts to reduce insecticide pressure, lower costs and reduce the technicians' workload, yet still have an efficient and effective mosquito control program. We moved toward this goal by establishing a larval treatment threshold. Larvae would need to be in sufficient numbers and develop to a certain instar before treatment was to occur. A threshold was established for each mosquito species and the threshold could be altered to accommodate the program in case of emergency or other unusual circumstances. ECOSIM is a tool designed to utilize this approach and move us closer to those original goals.

Time spent in the field is the best way for technicians to accumulate knowledge about mosquito control. Our technicians have accumulated a great amount of field experience which they use to good advantage. The computer simulation model is an added benefit and is designed to be a helpful tool. Technicians use the ZING program, but they must also use their field knowledge. By prudent use of the ZING program, the technicians could make better allocation of their time; for example, more time for thorough sampling of breeding sources. Also, they could become more involved in computer programming; thereby insuring they understand how ZING works and its strengths and limitations.

Secondary benefits of the simulation model are that the entomologist and technicians, by helping develop the model, have learned much more about mosquitoes and the need for good reliable data. The effectiveness of the simulation is contingent upon it being structured in a realistic way analogous to the "real mosquito world". It is dependent upon data from the environment. These demands, met by

the technicians, have provided a valuable learning experience. The required monitoring system has also increased the knowledge about new and more efficient monitoring techniques. The model demands these things and we therefore must provide it. As you have heard from the speakers before me, we must depend upon specific individuals to do certain specialized jobs as well as meeting their zone responsibilities. Therefore, the overall job becomes more interesting and learning is accelerated. The bottom-up method of computer modeling has created an opportunity for everyone to learn from the beginning.

The use of biorational pesticides that do not persist in the environment means more intrusions on a habitat, more inspections and more frequent treatments. We feel using the computer prioritization of the sources can help us better time the applications and reduce the frequency of inspections and treatments.

The computer makes more specific information available to the entomologist. In the past, the data was of a more general nature. Now all the data is being utilized for a specific purpose in the decision-making process. For example, light trap data is used in the simulation to determine threshold on a certain day. This information is available and the entomologist has that data for decision making. Light trap data is now, therefore, utilized routinely in decision making.

The computer simulation model appears to be a valuable tool that helps increase our efficiency and effectiveness in mosquito control.

References.

Mead, S.S., T.J. McMahon and W.A. Maffei. 1990. Prediction of larval source temperatures by an Evolving Computer Simulation (ECOSIM) of mosquitoes. Proc. Calif. Mosq. Vector Control Assoc. 58:81-85.

Roberts, F.C., G.E. Conner and P.S. Turney. 1990. An Evolving Computer Simulation (ECOSIM) of mosquitoes to support a larval control program in Alameda County, California. Proc. Calif. Mosq. Vector Control Assoc. 58:70-78.

Rusmisel, J.R. and E.M. King. 1990. Preliminary assessment of the oviposition component of an Evolving Computer Simulation (ECOSIM) of mosquitoes. Proc. Calif. Mosq. Vector Control Assoc. 58:86-87.