1991

PUBLIC EDUCATION - C.J. LEONARD

The video on copepods, "COPEPODS - BIOLOGICAL CONTROL THAT WORKS" was completed early this year. Composed mostly of microphotography of copepods, including feeding on larvae, this tape explains the problems and potential of this new biocontrol agent.

This is the first tape made at NOMCB using a new procedure for producing a preliminary draft for review before editing the master tape. The raw footage is copied to VHS with on-screen time code. These VHS tapes are used to edit a preliminary or rough cut that can be reviewed and changed before the master edit begins. This allows the reviewers to see what the actual video will look like instead of simply reading a script. It also saves wear and tear on the master tapes so that a high quality master is produced. This process actually saved a great deal of time both in the preliminary and final edits.

Distribution of several of our videos to schools through the school board's cable TV channel continued as in the past. Teachers are notified of broadcast times so they can fit these videos into their lesson plans. Several Public Service Announcements have been provided to all local broadcast media. These 30 second spots are broadcast by the stations as a public service. They have the potential to reach large segments of the population in a very cost effective manner. They are free except for the cost of production and duplication.

All of our existing tapes are being reviewed so that they can be updated. The first to be redone is the fogging video. Several parts of this tape are out of date, and since it was originally made on an old 1 inch format, the entire production will be have to be reshot. As of the end of the year, the script is finished and reviewed, and several animation sequences have been produced using a combination of character generator and camera effects.

Other projects completed this year were, a video presentation to the LMCA workshop on public education in mosquito control, revision of the handout used for various classes and general information, and preparation for the AMCA annual meeting that was held in New Orleans this year.

BIOLOGICAL CONTROL - GERRY MARTEN

As in previous years, the primary objective of our biological control program has been to develop new methods of biological control for integration into mosquito control while we reduce the use of chemical pesticides.

Two years ago we began field trials with larvivorous copepods in discarded tires around the city. (We call the copepods "cyclops".) Two species of cyclops (Macrocyclops albidus and Mesocyclops longisetus) proved to be particularly effective, and we now use them on a routine basis.

Last year we began to explore the possibilities for using cyclops in groundwater habitats. We continued the groundwater program during 1991 and expanded it to cover a variety of habitats ranging from roadside ditches and swales to large marshy areas.

During 1991 we also started to explore new forms off biological control in addition to cyclops, focusing our attention on planaria and larvicidal algae. The larvicidal algae are particularly promising and should go into operational use soon.

Cyclops in tires

Survival of Macrocyclops albidus has been excellent when we introduce them into tires around wooded areas, a situation that is particularly common in the eastern part of New Orleans. Many tires that we treated with Macrocyclops two years ago still contain the cyclops, and control of Aedes larvae is excellent. We can maintain effective control in these tires by treating them with Macrocyclops albidus or Mesocyclops longisetus every spring.

We have found that Mesocyclops longisetus is our most effective species for tires out in the open and exposed to hot summer conditions. Control of Aedes larvae in tires containing Mesocyclops longisetus is excellent. Mesocyclops longisetus has a disadvantage that it does not survive the winter as well as Macrocyclops because Mesocyclops longisetus is more sensitive to freezing winter temperatures.

We learned about some of the practical considerations of applying cyclops to large tire piles when we used Mesocyclops longisetus to treat a pile of about 25,000 tires in the middle of New Orleans during 1991. The main mosquito at the pile was Ae. albopictus. We only needed to treat the tires on the surface of the pile. We never find Ae. albopictus larvae in tires deep down in a pile.

We started in the spring, when Ae. albopictus was breeding in tires at the edge of the pile. There were weeds around these tires, which provided plant material to generate food for mosquito larvae inside the tires. Mesocyclops longisetus was introduced to these tires in the spring and maintained control until the end of the year.

However, Mesocyclops longisetus was not able to survive in most tires at the middle of the pile. These tires were too clean inside to provide food for cyclops. Nor was there food for mosquito larvae, until August when phytoplankton blooms in these previously clean tires provided food. Once there was food for mosquito larvae, there was also food for cyclops, and the tires could be treated successfully with cyclops. This experience impressed us with the importance of timing when treating a large tire pile.

Larvicidal algae

Larvicidal microalgae may help us with clean tires like the ones described above. During 1991 we prepared a pure culture of a species of algae that we often see naturally in tires in New Orleans, especially in tires exposed to the hot summer sun. Mosquito larvae never survive in tires that contain these algae, apparently because they eat the algae to the exclusion of other food. They are unable to digest these algae, so they starve.

We do not yet know the scientific name of these algae. We have it narrowed down to the genus Chlorella or a closely related genus such as Palmellacoccus.

The strategy for using these algae is to put them into clean tires at the beginning of the summer. When algae bloom in the tires later in the summer, we hope they will be the species that we introduced, which will not support mosquito production.

One of the difficulties with biological control in tires that are exposed to the sun is the fact that they dry out during periods without rain. We expect our larvicidal algae to do well in tires like this because they can survive when a tire dries out.

We set up a small pond outside the Biocontrol Laboratory to mass produce these algae. It is clear that we can produce them in any quantity we need. We plan to begin large-scale field trials with these algae at the beginning of summer 1992.

Cyclops in ground water

During 1991 we studied the role of natural cyclops populations for mosquito control in a variety of groundwater habitats: marshes, grassy swales (temporary pools), woodland pools, rice fields, and septic ditches. Some of the work was done in collaboration with mosquito control districts in St. Tammany Parish, Jefferson Davis Parish, and Cleveland, Mississippi.

The particular species of larvivorous cyclops that we found in different groundwater habitats varied with the habitat, but the general pattern was the same in all habitats. There were natural populations of larvivorous cyclops in a substantial percentage of the sites that we examined, and mosquito production was low in those sites. However, each kind of habitat had a substantial percentage of sites that did not contain larvivorous cyclops, and most of the mosquito production was concentrated in those sites.

In each of the groundwater habitats--marshes, grassy swales, woodland pools, rice fields, and septic ditches--we conducted experimental cyclops introductions to see if we could maintain the cyclops in more sites and on a more continuous basis than happens naturally. We used the following species of cyclops:

Breeding habitat	Species of cyclops
Marshes	Mesocyclops longisetus, Macrocyclops albidus
Grassy swales	Macrocyclops albidus, Acanthocyclops vernalis
Woodland pools	Macrocyclops albidus, Megacyclops viridis
Rice fields	Mesocyclops ruttneri, Mesocyclops longisetus
Septic ditches	Macrocyclops albidus, Megacyclops viridis

Target species of mosquito larvae included Ae. aegypti, Ae. albopictus, Ae. triseriatus, Ae. vexans, Ae. sollicitans, An. crucians, and Cx. quinquefasciatus. (We cannot use cyclops for Cx. salinarius control because Cx. salinarius larvae seem to be resistant to cyclops predation.)

In general, the introductions were successful. It appears that operational use of cyclops in most groundwater habitats will require reintroduction at least once a year to ensure the most complete coverage. We cannot expect cyclops to provide perfect control in groundwater habitats, but treatment with cyclops should substantially reduce the number of sites that require larviciding. To make the treatments last as long as possible, it is important to coordinate the treatments with seasonal wet/dry cycles that affect cyclops survival in these habitats.

Planaria

We conducted laboratory tests with two species of planaria (Dugesia doratocephala, Dugesia tigrina), which proved effective in containers like tires or 50-gallon drums as long as we had enough planaria in the container. However, planaria do not have the impressive powers of self-replication that make cyclops so attractive. We have to apply large numbers of planaria to a container or groundwater site for treatment to be effective, and once introduced, planaria numbers decline over a period of weeks or months until there are no longer enough to provide effective control. Because operational use of planaria would require the application of enormous numbers, and we do not know how to produce them in such large numbers at a reasonable cost, we have no immediate plans to put planaria into operational use.

International cooperation

In association with the Public Health School at Tulane University, we provided technical support for the use of cyclops in two community-based projects for Ae. aegypti control sponsored by the Rockefeller Foundation. One of the projects is in Puerto Rico and managed by the Centers for Disease Control's Dengue Laboratory in San Juan. The other project is in El Progreso, Honduras, and is managed by the Honduran Ministry of Public Health and the Pan American Health Organization. USAID's Vector Biology and Control Project has provided supplementary funding (through a contract with Tulane University) to assist our efforts in Honduras.

The main task during 1991 was to survey local cyclops in Puerto Rico and Honduras and conduct field trials to determine which species do the best job in container habitats where *Ae. aegypti* breeds. The most effective species in Puerto Rico was *Mesocyclops aspericornis*, and the most effective species in Honduras was *Mesocyclops longisetus*. (*Mesocyclops longisetus* is also native to the New Orleans area and is a major part of our biological control operations in New Orleans.)

These cyclops were effective for *Ae. aegypti* control not only in tires, which are a major source of *Ae. aegypti* everywhere, but also in cisterns and water storage containers such as 50-gallon drums, which are in common use in many tropical areas like Puerto Rico and Honduras. They were also effective in bromeliads and vases.

The field trials in Puerto Rico and Honduras showed us that cyclops can provide reliable long-term treatment for a container as long as the container does not dry up, and as long as the cyclops are not dumped out. To keep cyclops in containers that are cleaned periodically, it is best to capture some of them with a net before cleaning, so they can be returned to the container afterwards.

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